Frameworks for Mathematics and Collegiate Learning

2014 version 2.0

full course with updates

a publication of
The Charles A. Dana Center
at The University of Texas at Austin
in collaboration with the Texas Association
of Community Colleges

Dana Center
Mathematics
PATHWAYS

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Frameworks version 2.0 was originally released in July 2013.

This 2014 release of version 2.0 also includes updates to a number of the lessons and to the Success Group Presentation. Version 2.0 and the updates were developed in Microsoft Word. **July 2014 release.**

As always, we welcome your comments and suggestions for improvements. Please contact us at **dana-txshop@utlists.utexas.edu** or at the mailing address above.

About the Charles A. Dana Center at The University of Texas at Austin

The Dana Center develops and scales math and science education innovations to support educators, administrators, and policy makers in creating seamless transitions throughout the K–14 system for all students, especially those who have historically been underserved.

We work with our nation's education systems to ensure that every student leaves school prepared for success in postsecondary education and the contemporary workplace—and for active participation in our modern democracy. We are committed to ensuring that the accident of where a student attends school does not limit the academic opportunities he or she can pursue. Thus, we advocate for high academic standards, and we collaborate with local partners to build the capacity of education systems to ensure that all students can master the content described in these standards.

Our portfolio of initiatives, grounded in research and two decades of experience, centers on mathematics and science education from prekindergarten through the early years of college. We focus in particular on strategies for improving student engagement, motivation, persistence, and achievement.

We help educators and education organizations adapt promising research to meet their local needs and develop innovative resources and systems that we implement through multiple channels, from the highly local and personal to the regional and national. We provide long-term technical assistance, collaborate with partners at all levels of the education system, and advise community colleges and states.

We have significant experience and expertise in the following:

- Developing and implementing standards and building the capacity of schools, districts, and systems
- Supporting education leadership, instructional coaching, and teaching
- Designing and developing instructional materials, assessments, curricula, and programs for bridging critical transitions
- Convening networks focused on policy, research, and practice

The Center was founded in 1991 at The University of Texas at Austin. Our staff members have expertise in leadership, literacy, research, program evaluation, mathematics and science education, policy and systemic reform, and services to high-need populations. We have worked with states and education systems throughout Texas and across the country. For more information about our programs and resources, see our homepage at **www.utdanacenter.org**.

About the Dana Center Mathematics Pathways

The DCMP is a systemic approach to improving student success and completion through implementation of processes, strategies, and structures based on four fundamental principles:

1. Multiple pathways with relevant and challenging mathematics content aligned to specific fields of study
2. Acceleration that allows students to complete a college-level math course more quickly than in the traditional developmental math sequence
3. Intentional use of strategies to help students develop skills as learners
4. Curriculum design and pedagogy based on proven practice

The Dana Center is developing curricular materials to implement the DCMP through three accelerated pathways—Statistical Reasoning, Quantitative Reasoning, and STEM Prep. The pathways are designed for students who have completed arithmetic or who are placed at a beginning algebra level. All three pathways have a common starting point—a developmental math course that helps students develop foundational skills and conceptual understanding in the context of college-level course material.

In addition to the curricular materials, the Dana Center is developing tools and services to support project implementation. These tools and services include an implementation guide, data templates and planning tools for colleges, and training materials for faculty and staff. The DCMP is being developed through a collaboration between the Charles A. Dana Center and the Texas Association of Community Colleges.

For more information about the Dana Center Mathematics Pathways, see www.dcmathpathways.org.

For more information about the Texas Association of Community Colleges, see **www.tacc.org.**

About the *Frameworks for Mathematics and Collegiate Learning* Course

Frameworks for Mathematics and Collegiate Learning is a semester-long course developed as a part of the Dana Center Mathematics Pathways. The course teaches concepts from the learning sciences to help developmental math students acquire the strategies and tenacity necessary to succeed in mathematics, in other college coursework, and in their careers.

Course instruction focuses on four main content strands:

Building community and connecting to campus resources: Classroom activities help foster a sense of belonging in the classroom so as to build trust among peers and with the instructor. Both in class and outside of class, students will explore campus resources via face-to-face meetings with academic advisors and financial aid representatives and visits to learning centers and libraries.

Developing and maintaining motivation for college success: Students identify values, beliefs, and attitudes about themselves and how those values, beliefs, and attitudes influence their performance in college. Students will develop a system to monitor and manage their attitudes, emotions, and thoughts when faced with academic challenges. They work to curtail self-defeating habits, such as attributing failure to uncontrollable factors, and to create a productive mindset by focusing on controllable behaviors.

Developing and using study strategies and skills: Students demonstrate critical thinking skills and work to enhance their self-regulatory thoughts and behaviors. Some classroom activities focus on how the brain works, including memory and brain plasticity. Students also identify, select, and implement appropriate time management, note-taking, test-taking, reading, and oral and written communication strategies.

Finding your direction in college: Students set and work toward academic, personal, and occupational goals. They engage with their instructor and their academic advisor to select math coursework for future semesters and will complete a semester-long career project that help them identify skills and competencies they should build while in college.

Frameworks is intended as a 3-credit-hour college-level course, so students should be able to start accumulating college credit in their first semester. Students will complete numerous written assignments, including journal entries and formal reports, and will also deliver oral presentations. Students will complete initial assessments as well as assessments at the end of the course to measure changes in their use of study strategies and in their values, beliefs, and attitudes around their academic work.

About the Development of This Course

Version 1.0 (released spring 2013)

The development of this course began with the formation of the *Frameworks for Mathematics and Collegiate Learning* design team, who set the course objectives and created the course outline. The team members were:

Angela Bush-Richards, Ph.D., research associate, Charles A. Dana Center, and lecturer, the University of Texas at Austin

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Julie Phelps, professor of mathematics, Valencia College, Orlando, Florida

Nancy K. Stano, research associate, Charles A. Dana Center, and doctoral student, the University of Texas at Austin

Lynda Villanueva, vice president, academic and student affairs, Brazosport College, Lake Jackson, Texas

The Dana Center then convened four development teams (see acknowledgments), constituting a broad coalition of representatives from nineteen community colleges across Texas (and two from outside Texas), including dedicated mathematics and student success faculty and student support administrators. Each team provided valuable information focused on one of the following thematic strands identified by the *Frameworks* design team:

- Motivation
- Strategies and skills
- Building community and connection to campus resources
- Finding direction in college

Nancy K. Stano, project lead, collaborated with the consulting writer, Dr. Liz Alexander, to incorporate the ideas that emerged from these meetings. The materials were then reviewed by members of the development teams.

Version 2.0 (released July 2013)

Frameworks version 1.0 was field-tested at Brazosport College during the spring 2013 semester. The Brazosport faculty (see acknowledgements) involved in the field test functioned as key development collaborators whose extensive feedback greatly improved the materials. In addition, members of the four development teams also provided feedback that has been implemented in this version.

Version 2.0 with updates (released July 2014)

The release of version 2.0 includes an Update resource that provides resource with advice from faculty who have taught the course, suggestions for adjustments and enhancements to lessons, and updated links to external resources. The updates, which may be printed as one document, have also been added to the version 2.0 lessons; each update has been placed as additional pages that appear just before the Frameworks lesson they update. No changes were made to the lessons themselves.

The *Frameworks* course was produced in Microsoft Word for the Mac.

This version is supplied in PDF form. The following are some issues to be aware of:

- PDF files need to be viewed with Adobe Acrobat for full functionality. If viewed through Preview, which is the default on some computers, URLs in the content may not render accurately.
- We recommend you print the Course Overview as a guide to the electronic files.
- The file names indicate the lesson number and whether the document is a lesson or some other component of the course.

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Acknowledgments for Version 2.0 with Updates

Development of version 1.0 (released spring 2013) and version 2.0 of *Frameworks for Mathematics and Collegiate Learning* (released July 2013) was made possible by a grant from the Greater Texas Foundation as well as a collaborationwith Brazosport College made possible by support from the Achieving the Dream Catalyst Fund. The statements made and views expressed in *Frameworks* are those of the authors. The publication was also supported through a collaborationbetween the Charles A. Dana Center at The University of Texas at Austin and the Texas Association of Community Colleges.

Additional funding and support for the Dana Center Mathematics Pathways was provided by Carnegie Corporation of New York, Greater Texas Foundation, Houston Endowment, a Texas legislative appropriations request, and TG.

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Introduction

What is *Frameworks for Mathematics and Collegiate Learning*?

Frameworks is a college-level student success course that is part of the Dana Center Mathematics Pathways. This introduction, which describes the course content, its pedagogy, its defining characteristics, and how it supports the success of underprepared students, is intended for faculty members and staff from colleges in Texas and other states who are interested in implementing the Dana Center Mathematics Pathways, adopting the *Frameworks* course, or enhancing the rigor of their own student success courses.

The Dana Center Mathematics Project

The Dana Center Mathematics Pathways model provides a systemic approach to improving student success in and completion of higher education degree programs. The DCMP does so by implementing processes, strategies, and structures that are built into three accelerated mathematics pathways and the supporting *Frameworks for Mathematics and Collegiate Learning* student success course.

The DCMP offers mathematics courses aligned with the skills students need for their programs of study, future jobs, and lives as informed consumers and citizens. The project's accelerated, aligned approach offers students three options with different mathematical content: a statistics pathway, a quantitative literacy pathway, and a STEM pathway. The DCMP is structured so that students can move from developmental math to and through a college-credit course on an accelerated timeline.

The DCMP is a joint initiative of the Dana Center and the Texas Association of Community Colleges. Together, the Dana Center and TACC are working with all 50 community college districts in Texas to transform developmental and gateway mathematics at scale in the state.

In Fall 2013, nine community colleges will implement the first complete DCMP pathway.

The importance of frameworks for learning

A growing body of evidence shows that student success courses can increase student retention and graduation rates (Moore & Shulock, 2009). The effects are particularly beneficial for underprepared students who have been referred to developmental education. The content covered in student success courses varies widely, but most courses teach study skills and time management and introduce students to campus resources such as financial aid and tutoring.

In Texas, learning frameworks courses are credit-bearing, college-level student success courses. What makes these courses worthy of college credit is the topics they cover, which draw on

theory from the fields of psychology and the learning sciences and include applied learning, cognition, and motivation.

In this tradition, the DCMP's *Frameworks for Mathematics and Collegiate Learning* course covers study strategies and time management as well as an introduction to campus resources. It also draws on learning theory to support students' development of the mindsets, skills, and behaviors necessary for college success.

As community college students confront the demands of college-level work and strive to balance their studies with life outside the classroom, they can quickly become overwhelmed. Students who are equipped with the necessary mindsets, skills, and behaviors are more likely to persist in their studies and to select productive strategies as they work toward completion of their programs. As a senior administrator at Brazosport College[1] put it,

> One of the fundamental philosophies that we've embraced is that there are a number of predictors for student success. While many are cognitive factors . . . there are also a number of noncognitive variables that affect student success, including motivation and overcoming the belief that intelligence is fixed. We're trying to teach students to develop tenacity and persistence, to tackle tasks that are difficult or require a lot of effort.

Productively persistent[2] students are fully engaged in learning and are motivated to expend effort to reach long-term, personally meaningful goals. In addition, they challenge themselves to continue working toward these goals, even in the wake of setbacks. These students know multiple strategies that can be applied in diverse learning situations, and they are able to choose a strategy that fits the demands of the academic tasks that face them.

Productive persistence can be measured through data such as attendance records, consistent homework completion, and engagement in class, as well as by student reports of academic confidence.

Many students can benefit from the content presented in the *Frameworks* course. A Brazosport instructor reported that

> this course is beneficial to traditional students because it gives them the opportunity to see how college is different from high school, and it allows them to have a seamless transition to the college environment. For nontraditional students coming back to school for the first time in a while, I think it's also great because it reintroduces them to the college environment and eases them back into a classroom setting. Ultimately, though, I feel that it's extremely beneficial to all students because it provides them with the skills necessary to succeed in academics and in life.

[1] Brazosport College, based in Lake Jackson, Texas, piloted the *Frameworks* course in Spring 2013.

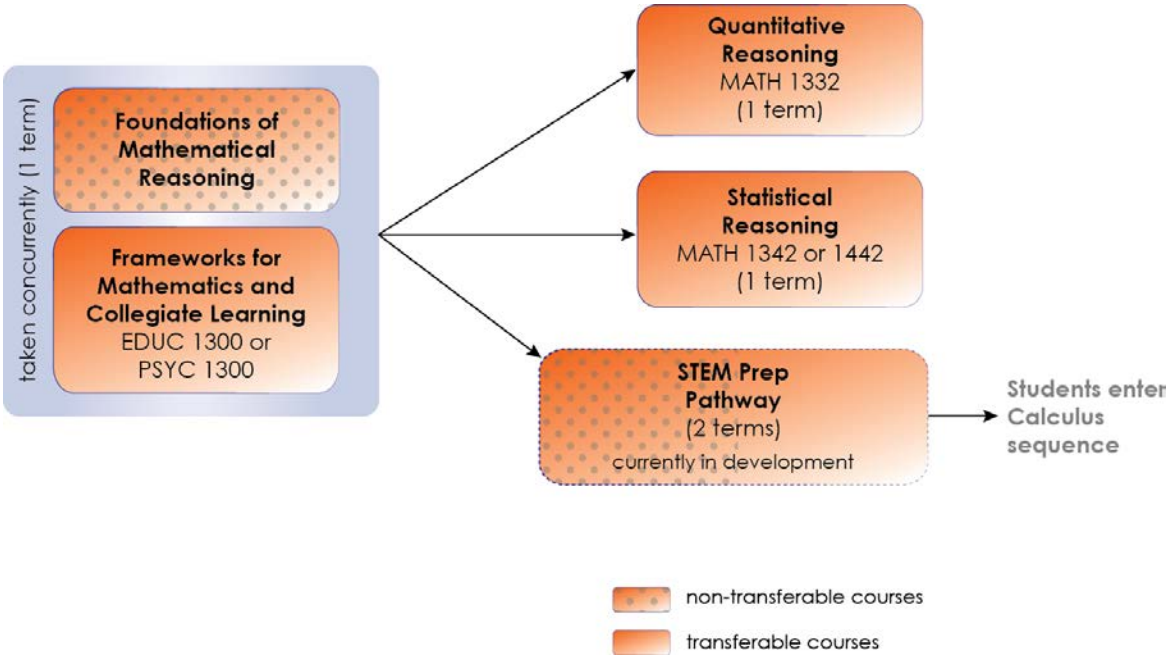
[2] *Productive persistence* was coined by Professor of Mathematics (and Dana Center Director) Uri Treisman. See, for example, David S. Yeager, Jane Muhich, Laura Torres, and Rose Asera. (2010, December 31). Carnegie Foundation for the Advancement of Teaching Summary Report: 90-Day Project: Measures of Developmental Math Student Motivation and Engagement. : Stanford, CA: Carnegie Foundation for the Advancement of Teaching, p. 7.

How does *Frameworks* fit in the DCMP course structure?

Frameworks is a semester-long course designed to help students develop the productive persistence and acquire the strategies necessary to succeed in college coursework (particularly mathematics coursework) and in their future careers. It is a college-level, credit-bearing course that is structured to help meet the immediate and long-term academic needs of students placed into developmental education courses.

As part of the Dana Center Mathematics Pathways curricular model, students enrolled in *Frameworks* are co-enrolled in the DCMP's *Foundations of Mathematical Reasoning* course, the first-semester mathematics course in the mathematics pathways.[3] In the second semester of an DCMP pathway, students progress to the course in the mathematics pathway best aligned to their program of study (see figure).

Figure: The Dana Center Mathematics Pathways Course Structure



Frameworks is not a mathematics course, though it does have a mathematics focus. *Frameworks* and *Foundations* are designed to be complementary experiences with some intentional redundancies.

[3] The Spring 2013 pilot of the *Frameworks* course, however, was independent of the *Foundations* course; students involved in the pilot were not necessarily enrolled in any math class and were not necessarily recommended for developmental coursework.

The concepts and strategies introduced in *Frameworks* are applied and reinforced in the *Foundations* course. Embedded throughout the *Frameworks* lessons are connections to mathematics learning issues, such as math anxiety. Likewise, *Foundations* coursework presents opportunities for students to reflect on their *Frameworks* knowledge and strategies using authentic examples and contexts.

Career and academic planning are key to the DCMP pathway model and are embedded throughout the *Frameworks* course. One Brazosport instructor commented, "from the first day, we ask 'Who are you? Why are you here? Where are you going?'"

This emphasis on planning is designed to address a key challenge in implementing a multiple-pathways approach: advising and placing students into the appropriate pathway. Proper placement depends on students knowing their major or program of study and receiving sufficient advising support. A great many students do not have a program of study identified when they begin college, and advising caseloads rarely permit intensive support for students to explore career options deeply and develop strong commitments.

By creating a common starting point for the pathways with the *Foundations* course and pairing it with *Frameworks*, the DCMP provides students with a full semester in a highly supported academic environment. During that time they can choose the right mathematics pathway for them.

What are the main objectives of the course?

The *Frameworks* course is built on four main content strands, each of which is supported by broad learning outcomes. These four strands are woven throughout the course to create a coherent curriculum.

Early lessons focus on helping students build a community and connect with campus resources. Next, students work on developing study strategies and skills and applying them as they learn about developing and maintaining motivation, which includes learning about the malleability of intelligence, knowledge acquisition, and metacognition. Throughout the course, students also explore various college and career pathways to help them find their direction in college.

Each strand is grounded in empirical research. For instance, research shows the importance of building a community with students. Students who feel that they belong in their classroom, who trust their instructor and peers, and who feel connected to the campus community have more quality interactions with their instructor and peers, are more engaged, and have more positive academic outcomes.

The *Frameworks* course helps build community by engaging students in active learning and collaborative work. Classroom activities provide regular opportunities for students to engage in discussions and tasks using a variety of different instructional strategies—e.g., small groups, whole-class discussions, and interactive lectures.

At the end of this introduction we provide citations for a selection of the research that informs these four themes:

1. **Building community and connecting to campus resources**

    - Some activities foster a sense of belonging in the classroom to build trust among students and between students and the instructor. Students explore campus resources in class and outside class via face-to-face meetings with academic advisors and financial aid representatives as well as visits to learning centers and libraries (Terenzini et al., 1996; Goodenow, 1993; Goode, Rattan, & Dweck, 2012; Tschannen-Moran & Hoy, 2000).

2. **Developing and maintaining motivation for college success**

    - Students identify values, beliefs, and attitudes they have about themselves as individuals and as students, and they explore how their values, beliefs, and attitudes influence their performance in college. They develop a system to monitor and manage their attitudes, emotions, and thoughts when faced with academic challenges. They work to curtail self-defeating habits, such as attributing failure to uncontrollable factors, and to create a productive mindset by focusing on controllable behaviors (Weiner, 2000; Hulleman, Godes, Hendricks, & Harackiewicz, 2010; Bandura, 1993; Usher & Pajares, 2008; Eccles & Wigfield, 2002; Elliot & Murayama, 2008; Oyserman, Bybee, & Terry, 2006).

3. **Developing and using study strategies and skills**

    - Students demonstrate critical thinking skills and work to enhance their self-regulatory thoughts and behaviors. Some classroom activities focus on how the brain works, including memory and brain plasticity. Students also identify, select, and implement appropriate strategies for time management, procrastination reduction, note taking, test taking, reading, and oral and written communication (Pintrich, 1989 & 2002; Zimmerman, 2000 & 2002; Dweck, 2008; Karabenick & Knapp, 1991; Pennebaker, 1997; Weinstein & Mayer, 1986; Weinstein et al., 1999).

4. **Finding your direction in college**

    - Students set and work toward academic, personal, and occupational goals. They work with their instructor and their academic advisor to select math courses for future semesters and complete a semester-long career project that will help them identify skills and competencies they should build while in college (Zimmerman, Bandura, & Martinez-Pons, 1992; Shell & Husman, 2010).

How is course content sequenced?

Frameworks consists of thirty 75-minute lessons designed to be taught at the rate of two lessons a week over the course of a 15-week semester. Each lesson includes an overview, student objectives, detailed advanced preparation instructions as well as a lesson plan for each activity, and a wrap-up section that points toward the next lesson.

The lessons are sequenced to have students experience a model of change based on Kurt Lewin's theory of change. First, students must "unfreeze" by unpacking baggage about previous experiences and connecting with the instructor on a personal level. Next, students build competencies and acquire success strategies, including questioning, exam preparation, and metacognition. Finally, students make their new learning stick by solidifying concepts and viewing them as a cohesive, connected whole; this synthesis helps reinforce habits and lock in new learning.

The organization of the course's topics supports our theory of change and aligns with current research on productive persistence. Most students who drop out do so in the first three weeks because they do not feel connected to the academic culture, so the first few *Frameworks* lessons emphasize culture-building activities. As one Brazosport instructor commented, "one of the first things we want to do is build a family within the class."

Lessons about time management, stress, and anxiety are scheduled for typically stressful points in the semester—that is, near midterms and final exams. Concepts are developed and reinforced throughout the assignments and activities. Lessons later in the semester rely on and connect to content learned earlier in the semester.

What sorts of assignments are included?

Students engage in many types of assignments throughout the *Frameworks* course, including:

- Two formal assessments: a midterm exam and a final exam.
- Journal activities: Students practice informal writing and reflection through journal activities. Many of the Brazosport faculty indicated that their students found the journaling to be one of the most challenging, but also most rewarding, aspects of the course.
- A learning questionnaire[4]: In the first and final week of the course, students self-evaluate their academic behaviors and beliefs—including critical thinking, help seeking, and beliefs about the malleability of intelligence.
- Career exploration project: Students explore their interests and find reliable information on industries and careers, then determine the academic requirements for their chosen career.
- Group presentation: Students work collaboratively to use library resources to investigate a course concept in depth; they evaluate potential sources and present information to their peers.

[4] The learning questionnaire is adapted from the Motivated Strategies for Learning Questionnaire. See *A Manual for the Use of the Motivated Strategies for Learning Questionnaire (MSLQ)*: www.eric.ed.gov/PDFS/ED338122.pdf.

Implementing and teaching the course

This course represents a departure from many traditional study skills courses. It incorporates information about learning theory and about many of the mindsets and beliefs that support and reinforce traditional topics such as note taking and test taking. Further, the active learning environment that the *Frameworks* course seeks to create may represent a different style of pedagogy for some instructors.

Instructors should be aware of the changes that this course may bring and be ready to adapt to new ideas and instructional techniques. Ideally, instructors will take on a facilitator role in their classrooms, enabling students to take ownership of their own academic paths. Students have the opportunity to observe their instructors modeling effective behavior and thought processes. However, students are quickly called upon to engage in such behaviors and thought processes themselves.

Because *Frameworks* is such a departure from typical instruction in community college classrooms (Grubb & Associates, 1999), the course offers robust support for instructors, including curricular materials with detailed lessons, assignments, and instructor notes. Ample detail, however, is not intended as a script. Naturally, instructors must make professional judgments to adjust the suggested lesson plans to fit their particular constellations of skills, students, and environment.

Faculty and institutions considering adoption of this course will need to plan significant professional learning opportunities for faculty members, advisors, and other staff. For instructors, additional preparation time and professional learning will likely be necessary to prepare for a strong implementation.

For example, Brazosport instructors emphasized the importance of taking the time to internalize the lesson plans and adjust them to suit their teaching styles. Further, many of the *Frameworks* lessons are designed to expose students to the various resources available to them on campus, including resources for advising, financial aid, tutoring, and library research. It is important that faculty members or administrators reach out to the staff of these academic services early in the semester to facilitate strong communication.

Finally, the *Frameworks* and *Foundations* courses are designed to be implemented as co-requisites. *Frameworks* faculty are not directly responsible for teaching the mathematics content included in *Foundations*, but they will need a deep appreciation for the *Foundations* curriculum and approach. Some colleges are planning to implement the *Frameworks* and *Foundations* courses as a learning community in which instructors for each course work closely in pairs to align the two courses for a cohort of students enrolled simultaneously in both.

Summary of first implementation

This section describes the experience of Brazosport College in its first implementation of *Frameworks for Mathematics and Collegiate Learning*.

Brazosport College

Brazosport College is an open-door, equal-access institution of higher education. Since its establishment in 1968, Brazosport has been committed to providing a variety of courses, programs, and activities that meet the needs of adult learners in and around Lake Jackson, Texas.

In particular, Brazosport has had a strong history of success with its learning frameworks courses. The Brazosport learning frameworks course was first piloted in Spring 2007. Since then, Brazosport has offered 289 sections of its learning frameworks to more than 6,600 students.

In Fall 2012, Brazosport's enrollment was just over 4,000 students. In the Spring 2013 semester, 594 students were enrolled in 27 sections of the DCMP *Frameworks* course (Version 1.0); each section was taught by one of nine faculty members.

Students	N = 594
Sections	N = 27
Faculty	N = 9

Student and instructor feedback

Throughout the first implementation semester of the *Frameworks* course, the Dana Center solicited feedback from each participating faculty member. At the end of the course, the Dana Center also conducted a focus group with the faculty and interviews with students. Below, we highlight quotes from faculty and students about their experiences with *Frameworks*.

A common theme that both students and faculty spoke to was that of student confidence. Upon completing the course, one student said,

> I feel optimistic about my future and my capabilities in college. At one time, I would have said "There's no way! It's impossible [to succeed in difficult courses] like physics." But learning *Frameworks* has given me the confidence to say "You know what? I can handle that."

Faculty members also noticed a change in their students over the course of the semester; one instructor noted "this course builds their confidence—their academic confidence as well as their social confidence."

The *Frameworks* course covers key topics such as brain plasticity, the malleability of intelligence, and metacognition. As students learned about how the brain works, they felt empowered to work hard and change their academic trajectories.

One student noted that "brain plasticity was a really important lesson." An instructor reported that "several students mentioned that metacognition and brain plasticity were especially significant—they had never considered that they could change their brains."

And for at least a few students, these were potentially transformative topics. One instructor related the following anecdotes:

> The Plastic Brain is a lesson that many of my students really enjoyed. I really did not think that the lesson would impact my students the way that it did. One of my students spoke to me about a conversation she had with her mother about the video that is shown during the lesson. The student told her mother, "If the little girl can learn in new ways after a traumatic brain injury, I know that I can be successful in college."
>
> A second student left the class and began to do additional research on brain plasticity. On the last day of the course he told me that he has decided to change his major to psychology because he is now so interested in how the brain works.

The *Frameworks* course also helped students develop key skills that will be beneficial throughout their academic careers. One student commented,

> now that I'm almost through with the course, I realize that the things I thought I knew how to do, I wasn't choosing the best strategies . . . I wasn't taking notes well, I wasn't studying well, I wasn't using my time wisely.

One of the instructors also noted that "at first, using particular learning strategies was very directed, but by the end of the semester, they were doing it on their own."

Many *Frameworks* assignments also include writing. Although some of the instructors initially noted difficulties with writing assignments—that is, that they were time-consuming to grade and difficult for students with inadequate writing skills—they also acknowledged that writing was a critical element of the course.

As one instructor noted, "my students' writing has improved considerably over the semester, as has their confidence in writing."

Another instructor stated that

> the most critical and important part of the course was the journaling that students did throughout the semester. The journaling allowed students to think critically about their own behaviors and thoughts, and being able to think about those thoughts and behaviors will allow them to succeed in life and throughout their academic careers.

Students and faculty also emphasized the importance of being connected to various campus resources. Faculty reported that it was helpful for students to be able to put a face to a name with financial aid advisors, academic advisors, librarians, and others on campus who could support students' college and career goals.

One of the students noted, "it made it a lot easier, knowing that there was someone to walk with me through the college life."

In particular, one instructor shared that "getting to work with our reference librarian, and getting to do research—learning what *is* good research—was an important learning experience for my students."

Perhaps most importantly, students engaged in a process of change and growth throughout the semester. One student said,

> My attitude has changed drastically. When I first entered college, I wasn't too sure where I wanted to go or how I would get there. But taking this course has guided me and helped me focus on the things I need to do. I feel like I'm more focused, like I'm more motivated to do what I have to do, and I have an understanding of how to get there.

Conclusion and next steps

Frameworks for Mathematics and Collegiate Learning is a key course in the Dana Center Mathematics Pathways curricular model. The course supports student success in college and mathematics by building community and connecting students to campus resources.

It helps students develop and maintain motivation for college success. It develops study strategies and skills and helps students find their direction college.

To develop the evidentiary base for the course, DCMP staff will continue qualitative and quantitative evaluation of *Frameworks* as it is fully implemented beginning in Fall 2013. Results will be shared as they become available.

The *Frameworks* course, including lessons, assignments, and instructor notes, is now publicly available for your use. We hope you will dig into the materials and see how they might enhance student success for students at your institution.

For further information about the *Frameworks* course, please contact the Dana Center at dcmathpathways@austin.utexas.edu.

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Frameworks for Mathematics and Collegiate Learning
Instructor Materials
Updates to Version 2.0

Introduction

During the first year of *Frameworks* implementation in Texas (2013–2014), 18 instructors used this curriculum in 46 sections of their learning frameworks courses, ultimately engaging more than 1,000 students.

As these instructors implemented the course materials, they shared their experiences and ideas with us. While we will use their feedback when creating future versions of the course, we have created this *Updates* document to make available to you right away some of these instructors' insights and practice wisdom.

Updates includes

- Updates to links
- Additional thoughts around facilitation of some activities
- Ideas and reflections from some of the faculty who have taught this course

Some lessons do not have any updates, and some lesson updates refer you to the ***Frameworks Course Essentials*** document,[1] which provides additional information about which *Frameworks* lesson components are essential to implementing the defining features of a learning frameworks course—and which components are essential to implementing the larger DCMP curricular model.

We encourage you to access additional faculty feedback and support in the Dana Center Mathematics Pathways *Frameworks for Mathematics and Collegiate Learning* **online community**. Contact us at dcmathpathways@austin.utexas.edu for information on accessing the community.

Format note: You'll see that some pages in this resource are blank. These blank pages are in place because we've set up this document so it can be printed doublesided.

[1] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

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Frameworks for Mathematics and Collegiate Learning

Dana Center Mathematics PATHWAYS

Selected supporting research
An annotated bibliography

Summer 2014

Overview

These annotated citations were developed by Dana Center staff[1] as a resource for practitioners and other professionals interested in learning more about the research underpinning the Dana Center Mathematics Pathways. This document is one of three related bibliographies that explore the research literature that informs the following DCMP core ideas:

- The DCMP's four fundamental principles[2]
- The DCMP's eight curriculum design standards[3]
- **The DCMP's *Frameworks for Mathematics and Collegiate Learning* course's four pillars (or themes).**[4]

This document looks at the research that grounds the four pillars of the *Frameworks* course.

About this bibliography

The *Frameworks for Mathematics and Collegiate Learning* course is built on four pillars or themes:

1. Building community and connecting to campus resources
2. Developing and maintaining motivation for success
3. Developing and using study strategies and skills
4. Finding your direction in college (and beyond)

These themes are woven throughout the course to create a coherent curriculum grounded in current research.

Note that these citations are not alphabetically ordered; instead, they are sequenced to illuminate, for example, the historical development of a concept, or to illustrate the connections among research findings on a given concept.

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[1] See last page of this document for acknowledgments.

[2] The DCMP's four fundamental principles are described here: https://dcmathpathways.org/resources/dcmps-four-guiding-principles-selected-supporting-research-annotated-bibliography.

[3] The DCMP's eight curriculum design standards are described here: https://dcmathpathways.org/resources/curriculum-design-standards-selected-supporting-research-annotated-bibliography.

[4] The DCMP's *Frameworks for Mathematics and Collegiate Learning* course's four pillars (or themes) are described here: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-selected-supporting-research and in more detail in the introduction to the *Frameworks* 2.0 course, freely available online at https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-materials.

FRAMEWORKS PILLAR 1:
Building community and connecting to campus resources

Learning is a social endeavor, and high-quality interactions among members of a learning community are essential to making a social learning environment work. Research demonstrates that student relationships with classroom instructors and with other campus community members can affect student academic achievement and persistence in college.

The *Frameworks* curricular materials provide opportunities for students, faculty, and campus personnel to foster positive relationships. Students explore campus resources inside and outside the classroom via face-to-face meetings with academic advisors and financial aid representatives and through visits to learning centers and libraries.

In addition, the early lessons in *Frameworks* strive to enhance students' sense of belongingness in math by establishing a classroom environment that honors and values individual contributions. Research supports the course's emphasis on building trusting relationships among student peers and instructors. The following articles highlight why it's important to student success that students build community and connect to campus resources.

Kuh, G. D. (2003). What we're learning about student engagement from NSSE: Benchmarks for effective educational practices. *Change: The Magazine of Higher Learning, 35*(2), 24–32.

George Kuh, director of the National Survey of Student Engagement (NSSE) at the Center for Postsecondary Research and Planning at Indiana University Bloomington, summarizes some of the findings that emerged as researchers analyzed NSSE survey data collected from approximately 285,000 students from more than 600 four-year colleges and universities.

This survey measures how engaged students are in college by asking them about the campus environment, the educational experiences available to them, their interactions with faculty, and the academic challenge and pedagogy of their coursework. Research analysis of this data concludes that student persistence is related to the extent to which students interact with supportive adults on campus, both inside and outside the classroom.

Kuh notes that both the nature and the frequency of these interactions matter; more specifically, Kuh notes that high-quality interactions are those that encourage students to devote greater effort to other educationally purposeful activities during college. Providing opportunities for these kinds of interaction is important, as other research has found that frequent student–professor interactions contribute to students' greater satisfaction with college life, a decreased likelihood of dropping out, and increased aspirations with respect to their careers.

The *Frameworks* course includes multiple opportunities for students to engage with faculty and staff from across campus. Some opportunities are more informal (e.g., briefly visiting offices across campus to become familiar with resources), while others include extended sessions with individuals with whom students should

continue working throughout their college careers (e.g., academic advisors, career counselors, research librarians).

These research findings speak to specific *Frameworks* lessons, including the following:

- *Lesson 2: Finding the Support to Be Successful*—Activity 3 (Introduction to the Scavenger Hunt)
- *Lesson 6: Meeting an Academic Advisor and a Career Counselor*—Activities 1 (Joint "Who We Are" Introduction by Guests), 2 (Making the Most of Academic Advising), 3 (What to Expect at the Career Center), and 4 (Preparing to Visit the Career Center and Assignment)
- *Lesson 10: Metacognition and Financial Advisor Visit*—Activity 3 (Visit from Financial Aid Office Representative)
- *Lesson 20: Site visit: Library Resources*—Activities 1 (Be Careful Who You Listen To!), 2 (Using Library Resources), and 3 (Success Team Work on Group Presentation)
- *Lesson 21: Using Library Resources and Group Presentation Preparation*—Activities 1 (Understanding Plagiarism, Citations, and Supporting Documentation) and 2 (Individual Work on Group Presentation)

Additional resources:

Chickering, A. W., & Reisser, L. (1993). *Education and identity* (2nd ed.). San Francisco, CA: Jossey-Bass.

Pascarella, E. T., & Terenzini, P. T. (2005). *How college affects students: A third decade of research*. San Francisco, CA: Jossey-Bass.

Rosenthal, G., Folse, E. J., Allerman, N. W., Boudreaux, D., Soper, B., & Von Bergen, C. (2000). The one-to-one survey: Traditional versus non-traditional student satisfaction with professors during one-to-one contacts. *College Student Journal*, *34*(6), 315–312.

Hausmann, L., Schofield, J., & Woods, R. (2007). Sense of belonging as a predictor of intentions to persist among African American and white first-year college students. *Research in Higher Education, 48*(7), 803–839.

Researchers used a longitudinal experimental design to test the effects of an intervention aimed at increasing students' sense of belonging within an institution. Their approach included having university administrators write brief notes to students "emphasizing that they were valued members of the community" (p. 808).

These students also received small gifts emblazoned with the university's name, logo, and colors (p. 808). The researchers found that even these small connections positively affected students' perception of belonging on campus. Additionally, the researchers found that this sense of belonging significantly predicted students' commitment to the institution and their intention to persist.

This study demonstrates that the responsibility of helping students feel connected to the campus community should not solely be the responsibility of the classroom instructor. Even brief interactions with campus community members can positively affect students' dedication to the campus community and enhance their commitment to persist in their degree programs.

In *Frameworks*, early lessons focus on establishing a culture that encourages students to embrace their own backgrounds, share their background with their peers and instructor, and gradually begin engaging with others across campus. Activities include first having students gather general information about the services and expectations across the institution (via scavenger hunt) and then engaging students with more focused information from academic, career, and financial aid advisors.

Key to the *Frameworks* introduction of campus resources is having members of the campus community come to class to speak with students. The focus is on campus representatives (e.g., the registrar, advisors, librarians, and so on) who are most likely to help these students rather than representatives who are less likely to have subsequent face-to-face contact with students. *Frameworks* also builds in opportunities for instructors to collaborate with other instructors on campus and with members of the community outside campus.

- *Lesson 1: Building the Foundation for Our Success*—Activity 1 (My Story) and Activity 2 (Letting Go of Fears and Anxiety About Math)
- *Lesson 2: Finding the Support to Be Successful*—Activity 3 (Introduction to the Scavenger Hunt)
- *Lesson 6: Meeting an Academic Advisor and a Career Counselor*—Activities 1 (Joint "Who We Are" Introduction by Guests), 2 (Making the Most of Academic Advising), 3 (What to Expect at the Career Center), and 4 (Preparing to Visit the Career Center and Assignment)
- *Lesson 10: Metacognition and Financial Advisor Visit*—Activity 3 (Visit from Financial Aid Office Representative)

- *Lesson 20: Site visit: Library Resources*—Activities 1 (Be Careful Who You Listen To!), 2 (Using Library Resources), and 3 (Success Team Work on Group Presentation)
- *Lesson 21: Using Library Resources and Group Presentation Preparation*—Activities 1 (Understanding Plagiarism, Citations, and Supporting Documentation), and 2 (Individual Work on Group Presentation)
- *Lesson 22: Effective Oral Communication and Using Evaluation Rubrics*

Additional resources:

Astin, A. W. (1984). Student involvement: A developmental theory for higher education. *Journal of College Student Personnel, 25*(3), 297–308.

Good, C., Rattan, A., & Dweck, C. S. (2012). Why do women opt out? Sense of belonging and women's representation in mathematics. *Journal of Personality and Social Psychology, 102*(4), 700–717.

The authors, psychologists who study the social forces and mindsets that shape academic achievement and motivation, conducted this lab-based study. They used a newly validated scale ("Math Sense of Belonging," included in the article) to assess the impact of students' sense of belonging on their academic achievement and intentions to persist in the discipline.

The authors define *sense of belonging* as the feeling that you fit in and that you are an accepted, valued, contributing member of a specific community. They hypothesized that regardless of gender, having a high sense of belonging positively relates to academic achievement outcomes. Their data support this hypothesis, showing that *math sense of belonging* did predict math achievement constructs such as anxiety, confidence, and usefulness. This sense of belonging also predicted students' intentions to persist within the mathematics discipline, regardless of gender.

The researchers also discuss findings from a longitudinal study they conducted with calculus students to investigate the impact of environmental culture on sense of belonging, academic achievement, and intent to pursue study within the discipline. They found that "the more women perceived their math environments to convey either a high degree of stereotyping or a fixed view of math intelligence, the lower was their sense of belonging" (p. 712). The researchers go on to demonstrate that establishing a culture in which mathematics ability is seen as a malleable trait helped protect women from the effects of existing negative stereotypes about their abilities in math and contributed to a higher sense of belonging and a higher intention to continue studying mathematics in the future.

Taken together, these two studies underscore the importance of helping students feel valued within the mathematics community. Activities within the *Frameworks* curriculum seek to help instructors establish an academic community in which students feel welcome, reject stereotyped views, and endorse malleable beliefs about their mathematics ability.

Early *Frameworks* lessons include activities to help instructors establish a classroom culture that affirms and encourages students' positive attitudes about their mathematical abilities and that helps students find the relevance of mathematics to their lives.

The first class meeting day sets the foundation for establishing a supportive culture by first acknowledging students' prior mathematics experiences and, in subsequent lessons, studying the theory underlying the malleability of intelligence and applying it to students' own transformation within mathematics study. As part of the course's career project, students create an academic plan for how mathematics study supports their career aspirations, including determining which mathematics classes they should take in subsequent semesters.

- *Lesson 1: Building the Foundation for Our Success*—Activities 1 (My Story) and 2 (Letting Go of Fears and Anxiety About Math)
- *Lesson 3: Your Plastic Brain and Smart Thinking*—Activity 1 (Your Plastic Brain)
- *Lesson 8: Creating Motivating Goals and the Career Project*—Activities 1 (Ensuring that Your Goals Motivate You) and 2 (Introduction to the Career Project)
- *Lesson 10: Metacognition and Financial Advisor Visit*—Activity 3 (Visit from Financial Aid Office Representative)
- *Lesson 23: Career Project Sharing, Course Planning, and Guest Speaker*—Activities 1 (Career Project Sharing) and 2 (Planning What Courses to Take Next Semester)

Tschannen-Moran, M., & Hoy, W. K. (2000). A multidisciplinary analysis of the nature, meaning, and measurement of trust. *Review of Educational Research, 70(*4), 547–593.**

The authors discuss the historical evolution of the concept of trust and build on their prior factor-analytic study (see additional resources below) establishing seven facets that together constitute "trust."

According to these researchers, *trust* is defined as a student's willingness to be vulnerable to his or her teacher based on the student's confidence that the teacher is benevolent, reliable, competent, honest, and open. The article includes detailed explanations of the elements of trust, as well as the results of studies investigating how trust is established—and how it is violated.

Establishing a trusting relationship is important because students who view their professors as trustworthy will be more willing to engage with and be responsive to their professors' messages. A high degree of trust between a student and an instructor could lead to students' sharing more relevant, accurate, and complete information about problems they are facing. This kind of honest communication enables an instructor to provide relevant and helpful assistance.

Early *Frameworks* activities provide opportunities for instructors and campus community members to establish trusting relationships with students. This process is initiated in the course by having instructors and campus members share their own personal struggles and triumphs. Because this conceptualization of trust includes many complex elements, establishing and maintaining trust is, in turn, a complex, ongoing endeavor. Thus, the activities and dialogue are a starting point from which strong, productive classroom relationships can be built through repeated interactions across the semester.

- *Lesson 1: Building the Foundation for Our Success*—Activities 1 (My Story) and 2 (Letting Go of Fears and Anxiety About Math)
- *Lesson 6: Meeting an Academic Advisor and a Career Counselor*—Activities 1 (Joint "Who We Are" Introduction by Guests), 2 (Making the Most of Academic Advising), 3 (What to Expect at the Career Center), and 4 (Preparing to Visit the Career Center and Assignment)

Additional resources:

Tschannen-Moran, M., & Hoy, W. K. (1998). Trust in schools: A conceptual and empirical analysis of trust in schools. *Journal of Educational Administration*, *36*(4), 334–352.

FRAMEWORKS PILLAR 2:
Developing and maintaining motivation for success

Motivation theories exist to help us explain why people think and behave in certain ways. Numerous such theories exist, all shedding light on how students' values, beliefs, and attitudes influence their desire to perform and their actual performance in academic and nonacademic settings.

Within the *Frameworks* course, students study motivational theories and engage in activities that help them build and sustain motivation throughout the semester. Students identify values, beliefs, and attitudes about themselves as individuals and as students and learn how these values, beliefs, and attitudes influence their performance in college.

Students develop a system to monitor and manage their attitudes, emotions, and thoughts when faced with academic challenges. They work to curtail self-defeating habits (such as attributing failure to uncontrollable factors) and to create a productive mindset by focusing on controllable behaviors. These activities help students within their DCMP courses and prepare them to maintain that motivation throughout college and life.

While the *Frameworks* course focuses on self-efficacy, attributions, interest, value, and goal setting, deeper study of other such motivational theories would be appropriate extensions. The following articles highlight the importance of developing and maintaining motivation for success with all students.

Dweck, C. S. (2008). Can personality be changed? The role of beliefs in personality and change. *Current Directions in Psychological Science, 17*(6), 391–394.

> Dweck proposes that we can enhance our understanding of an individual's personality if, instead of thinking of *personality* as broad traits or habits, we focus on it as a collection of individually held core beliefs.
>
> According to Dweck and other researchers cited in this article, *core beliefs* are an individual's mental representations of how things work. Thus, core beliefs can include beliefs about the self (e.g., "I am smart"), others ("she is good at math") and events ("this class is a waste of time"). These beliefs can inform behavior and thought patterns by shaping individuals' choices of which goals to pursue and influencing how they interpret and respond to environmental factors that affect that striving toward goals.
>
> To demonstrate how beliefs affect goals and experiences, Dweck cites a variety of studies investigating beliefs about the malleability of personal attributes such as intelligence. For example, students who view intelligence as a characteristic that can change with effort (that is, as malleable) perform better when faced with academic challenges, are more open to learning, stick with difficult tasks, and bounce back from failure better than do students who endorse a view that their intelligence is fixed or unchangeable (p. 392).

Dweck goes on to discuss a study that shows that it is possible for students to change their "theory of mind" from a view that intelligence is fixed to a view that it is malleable. Research exploring perceptions and beliefs about the malleablity of various traits is ongoing and continues to influence how ideas about such traits are presented to students.

In the *Frameworks* course, students engage in an activity (similar to an activity described in the article) demonstrating that it is possible to teach that the mind is malleable. In *Frameworks*, students are shown a video of how the brain is capable of adapting and changing over the course of a person's life; students then engage in discussions about the conditions that lead to these brain changes as well as recent neuroscience findings about brain plasticity. Additional study of how the brain works follows in later lessons, but instructors are encouraged to continually prompt students in all lessons (not just in those lessons focused on the brain) to think about how their brains can be malleable.

- *Lesson 3: Your Plastic Brain and Smart Thinking*—Activities 1 (Your Plastic Brain) and 2 (Introduction to Smart Thinking)
- *Lesson 11: Build a Better Memory Part 1: Attention and Deep Processing*—Activities 1 (Our Complex Brains), 2 (The Difference Between Deep and Shallow Processing), and 3 (Making Information Meaningful)
- *Lesson 12: Build a Better Memory Part 2: Elaboration and Organization Strategies*—Activities 1 (Elaboration and Organization Strategies), 2 (Practice Using Think-Alouds), and 3 (Creating Flash Cards)

Additional resources:

Dupeyrat, C., & Mariné, C. (2005). Implicit theories of intelligence, goal orientation, cognitive engagement, and achievement: A test of Dweck's model with returning to school adults. *Contemporary Educational Psychology*, *30*(1), 43–59.

Dweck, C. S. (2000). *Self-theories: Their role in motivation, personality, and development*. Philadelphia, PA: Psychology Press.

Mueller, C. M., & Dweck, C. S. (1998). Praise for intelligence can undermine children's motivation and performance. *Journal of Personality and Social Psychology*, *75*(1), 33–52.

Schunk, D. H. (1991). Self-efficacy and academic motivation. *Educational Psychologist, 26*(3/4), 207–231.

Self-efficacy theory posits that an individual's confidence in his or her ability to be successful at a given task influences how that person thinks and behaves. This confidence can exert tremendous influence on an individual's thoughts and behaviors, including on their choice to participate in a specific activity and their persistence in the face of adversity.

Research indicates that this sense of self-efficacy is influenced by four factors: an individual's own prior experiences, their vicarious experiences (what they have seen others do or experience), personally experienced persuasion (someone telling the individual that they can be successful), and their own internal physiological cues (symptoms of anxiety, for example).

In this article, Dale Schunk reviews Albert Bandura's early work establishing the concept of self-efficacy and demonstrates how self-efficacy relates to other motivation constructs, including an individual's perceived control of a situation, their understanding of the causes of outcomes, their perceived value of those outcomes (e.g., "is it worth it?"), and their self-concept.

The *Frameworks* course provides multiple opportunities for students to analyze their own confidence or sense of self-efficacy and further develop it via mastery experiences that are spiraled throughout the course. The following activities are two examples, with the "Value of Goals" activity providing an opportunity for students to dig deeper into the theoretical foundations of self-efficacy.

- *Lesson 1: Building the Foundation for Our Success*—Activity 2 (Letting Go of Fears and Anxiety About Math)
- *Lesson 7: Identifying Your Impact on the World*—Activity 2 (Value of Goals)

Additional resources:

Usher, E. L., & Pajares, F. (2008). Sources of self-efficacy in school: Critical review of the literature and future directions. *Review of Educational Research*, *78*(4), 751–796.

Schunk, D. H. (2008). Attributions as motivators of self-regulated learning. In D. H. Schunk and B. J. Zimmerman (Eds.), *Motivation and self-regulated learning: Theory, research, and applications* (pp. 245–266). New York: Lawrence Erlbaum Associates.

Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal, 29*(3), 663–676.

Weiner, B. (1985). An attribution theory of achievement motivation and emotion. *Psychological Review*, *92*(4), 548–573.

Attribution theory describes how an individual's motivation to achieve is affected by what they believe leads to that achievement (e.g., luck versus hard work). In this article, Weiner establishes the foundation of an attribution theory of motivation by presenting empirical evidence showing that individuals can and do explain achievement outcomes in relation to what they think caused the outcome.

He outlines previous research to identify examples of these dominant attributions within the literature, including attributions of effort, ability, luck, interest, and use of strategy as causes of outcomes. He then categorizes these perceived causes of successes and failures along three dimensions: internal or external to an individual, controllable or uncontrollable by the individual, and stable or unstable over time.

In addition, Weiner discusses the impact that emotion has on an individual's attributions and the influence that both emotions and attributions have on an individual's subsequent behaviors. Accurately assessing the cause of an outcome helps students take control of their learning, replicate the behaviors or processes that lead to success, and avoid the behaviors or processes that resulted in undesired outcomes.

In the *Frameworks course*, students identify and share the attributions they make for their successes and failures and develop a process through which they can begin to systematically reflect on the beliefs, attitudes, and behaviors that affect their desired outcomes.

- *Lesson 1: Building the Foundation for Our Success*—Activity 2 (Letting Go of Fears and Anxiety About Math)
- *Lesson 3: Your Plastic Brain and Smart Thinking*—Activities 1 (Your Plastic Brain) and 2 (Introduction to Smart Thinking)
- *Lesson 18: Midterm Exam Debrief*—Activities 1 (Design a Review Process) and 2 (Apply Your Review Process)

Additional resources:

Wilson, T. D., Damiani, M., & Shelton, N. (2002). Improving the academic performance of college students with brief attributional interventions. In J. Aronson (Ed.), *Improving academic achievement: Impact of psychological factors on education* (pp. 89–108). San Diego, CA: Academic Press.

Weiner, B. (2010). The development of an attribution-based theory of motivation: A history of ideas. *Educational Psychologist*, *45*(1), 28–36.

Hulleman, C. S., Godes, O., Hendricks, B. L., & Harackiewicz, J. M. (2010). Enhancing interest and performance with a utility value intervention. *Journal of Educational Psychology, 102*(4), 880–895.

This article expands on work conducted by J. Eccles, A. Wigfield, and others (see additional resources below) regarding the effects of students' expectancy beliefs about tasks. *Expectancy beliefs* are an individual's beliefs about what the outcomes of certain tasks will be and what the value of those outcomes are for them.

The authors of this report discuss findings from a classroom intervention in which students are encouraged to write about how the course material is relevant to their lives in an effort to increase the value that students perceive for the activity. Early expectancy value research established that an individual's perceived importance of a task, or *task value*, is four-pronged and includes utility value, intrinsic value, attainment value, and cost.

The authors focus on *utility value*, or an individual's perception about the usefulness of a task (or aspects of a task) for future tasks they will engage in. The findings indicate that encouraging students to apply course material to their own lives helps them feel that the material is useful, which in turn influences their interest—and performance in—the course. Beyond course performance, increased utility value and the *perceived instrumentality* (defined as how the task or skill is perceived as useful in achieving a goal) of a task have also been linked to a student's interest in an academic major and subsequent enrollment intentions.

Throughout the semester in *Frameworks*, students complete short writing assignments as part of informal journaling. Just as in the study described here, these writing exercises are part of the course syllabus and are completed for course credit. The suggested writing prompts encourage students to write about the relevance of the class material to their own lives. In addition, the following activities afford students opportunities to explore their interests and make the course personally meaningful.

- *Lesson 7: Identifying Your Impact on the World*—Activities 2 (Value of Goals) and 3 (Nine Boxes)
- *Lesson 8: Creating Motivating Goals and the Career Project*—Activities 1 (Ensuring that Your Goals Motivate You) and 2 (Introduction to the Career Project)
- *Lesson 23: Career Project Sharing, Course Planning, and Guest Speaker*—Activities 1 (Career Project Sharing) and 2 (Planning What Courses to Take Next Semester)
- *Lesson 30: Where Will You Be in 10 Years?*—Activity 1 (Let's Party Like Our Successful Future Is Now: The 10-Year Class Reunion)

Additional resources:

Eccles, J., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectancies, values, and academic behaviors. In J. T. Spence (Ed.), *Achievement and achievement motives: Psychological and sociological approaches* (pp. 75–146). San Francisco, CA: Freeman.

Eccles, J. S., & Wigfield, A. (2002). Motivational beliefs, values, and goals. *Annual Review of Psychology*, *53*(1), 109–132.

Elliot, A. J. (2005). A conceptual history of the achievement goal construct. In A. Elliot & C. Dweck (Eds.), *Handbook of competence and motivation* (pp. 52–72). New York: Guilford Press.

Hulleman, C. S., Durik, A. M., Schweigert, S. B., & Harackiewicz, J. M. (2008). Task values, achievement goals, and interest: An integrative analysis. *Journal of Educational Psychology*, *100*(2), 398–416.

Oyserman, D., Bybee, D., & Terry, K. (2006). Possible selves and academic outcomes: How and when possible selves impel action. *Journal of Personality and Social Psychology, 91*(1), 188–204.

The phrase *possible selves* refers to an individual's ideas about who he or she might become in the future, including both who they would like to become and who they fear they may become.

In this intervention study, *possible selves* researcher Oyserman and her team build upon previous research findings that possible selves that are academically oriented are positively linked to school outcomes and school connectedness.

In the intervention, students, in a series of ten workshops, generated academic possible selves—visions of themselves in the future that include or rely on academic success. The students then identified skills and abilities they already possessed that could help them be successful, acknowledged negative forces and challenges that could stand in their way, articulated specific strategies they could enact in order to attain their possible selves (planning for the anticipated obstacles), and created timelines to guide their future actions.

Researchers found that students in the intervention had improved grades and demonstrated an increase in academic initiative, an effect sustained over a two-year follow-up period. The authors concluded that these results were possible because students identified that the careers they wanted to have and the lives they envisioned for themselves require mastering academic work.

Students also linked their academic possible selves to specific strategies for success, came to view difficulties as normal, and came to view academic success as consistent with their social identities. When encouraging students to think about and plan for their future possible selves, it is important to have them address these elements as well.

In the *Frameworks* course, identifying future possible selves and developing a plan to attain that future version of oneself is central to the course's career project, which includes three main activities: identifying possible career paths by completing a possible selves mind map and reflection, analyzing one of the possible selves mind map branches by completing a SWOT (strengths, weaknesses, opportunities, and threats) analysis, and developing an action plan (focusing on degree plan and necessary coursework) to acquire the skills and knowledge necessary for successfully becoming the possible self.

In addition, students publicly share the results of their work to strengthen their commitment to enacting the plans they created within the project in the following two lessons:

- *Lesson 23: Career Project Sharing, Course Planning and Guest Speaker*—Activities 1 (Career Project Sharing) and 2 (Planning What Courses to Take Next Semester).
- *Lesson 30: Where Will You Be in 10 Years?*—Activity 1 (Let's Party Like Our Successful Future Is Now: The 10-Year Class Reunion)

Additional resources:

Markus, H., & Nurius, P. (1986). Possible selves. *American Psychologist*, *41*(9), 954–969.

FRAMEWORKS PILLAR 3:
Developing and using study strategies and skills

A sizable body of research demonstrates that students' use of learning strategies promotes academic achievement. In addition, researchers have demonstrated that students can effectively use learning strategies by studying the elements that contribute to self-regulation—cognition, metacognition, and motivation—and applying these ideas.

The *Frameworks* course is designed to help students become self-regulated learners who understand themselves as learners, who monitor and regulate their own learning, and who are empowered to analyze their learning environment and choose from a variety of learning strategies as they respond to various environmental factors.

Within *Frameworks*, students begin to assemble a toolbox of learning strategies that they can draw upon as they engage in activities in and out of school. Some *Frameworks* classroom activities focus on how the brain works, including memory and brain plasticity. Others enable students to demonstrate critical thinking skills and work to enhance their self-regulatory thoughts and behaviors.

Students also identify, select, and implement appropriate strategies for time management, procrastination reduction, reading, note taking, test taking, and oral and written communication. The following articles highlight the importance of helping students to develop and use study strategies and skills, including self-regulation skills.

McKeachie, W. J., Pintrich, P. R., & Lin, Y. G. (1985). Teaching learning strategies. *Educational Psychologist, 20*(3), 153–160.

In this article, McKeachie and colleagues provide insight into their early work creating a college-level course in strategic learning. They briefly summarize how strategic learning frameworks courses improve student outcomes by focusing on the study and application of cognitive psychology concepts.

The authors reference foundational cognition, metacognition, and motivation articles in order to build the case for creating a systematic course that helps students identify and build a toolbox of learning strategies. The authors include preliminary results demonstrating the impact of one such course that included teaching students about cognition and metacognition to help them to develop as strategic learners. Students who enrolled in this "Learning to Learn" course reported greater use of learning strategies as well as decreased anxiety compared to those students enrolled in a general introductory psychology course.

The authors point out that the "Learning to Learn" students' academic performance in subsequent semesters did not differ substantially from what would be expected from a traditional study skills course, providing valuable feedback that has been used to refine and expand the content and pedagogy used within success courses. Strategic learning courses have evolved since the publication of this article, and the

Frameworks curriculum builds on this work as well as on recent trends in success course offerings.

In the *Frameworks* course, students engage with key concepts from cognition, metacognition, and motivation theory. In addition to studying these theories, students complete activities that help them apply what they are studying to their own lives. While *theory of mind* content is included in every *Frameworks* lesson, it is the primary focus within the following lessons. The semester-long group project also provides an opportunity for students to dig deeper into the theory and application; more information on those lessons is available in the course curriculum.

- *Lesson 1: Building the Foundation for Our Success*—Activity 2 (Letting Go of Fears and Anxiety About Math)
- *Lesson 7: Identifying Your Impact on the World*—Activities 2 (Value of Goals) and 3 (Nine Boxes)
- *Lesson 8: Creating Motivating Goals and the Career Project*—Activities 1 (Ensuring that Your Goals Motivate You) and 2 (Introduction to the Career Project)
- *Lesson 10: Metacognition and Financial Advisor Visit*—Activity 3 (Visit from Financial Aid Office Representative)
- *Lesson 11: Build a Better Memory Part 1: Attention and Deep Processing*—Activities 1 (Our Complex Brains), 2 (The Difference Between Deep and Shallow Processing), and 3 (Making Information Meaningful)
- *Lesson 12: Build a Better Memory Part 2: Elaboration and Organization Strategies*—Activities 1 (Elaboration and Organization Strategies), 2 (Practice Using Think-Alouds), and 3 (Creating Flash Cards)

Additional resources:

Weinstein, C. E., & Mayer, R. E. (1986). The teaching of learning strategies. In M.C. Wittrock (Ed.), *Handbook of research on teaching* (3rd ed.) (pp. 315–327). New York: Macmillan.

Hodges, R. B., Dochen, C. W., & Sellers, D. C. (2001). Implementing a learning framework course. In J. L. Higbee (Ed.), *2001: A developmental odyssey* (pp. 3–13). Warrensburg, MO: The National Association for Developmental Education.

Pintrich, P. R. (2003). A motivational science perspective on the role of student motivation in learning and teaching contexts. *Journal of Educational Psychology, 95*(4), 667–686.

The author begins this article by describing how our understanding of the factors that affect learning has evolved from a focus on cognitive factors to a focus that now also includes motivational and affective factors under the umbrella of self-regulated learning.

Pintrich then outlines the general assumptions of this perspective and discusses in depth a cyclical process of self-regulated learning. Among the assumptions is the idea that self-regulated students are active throughout learning activities, mentally monitoring and exerting control not only over their actions but also over the affect, beliefs, attitudes, and thoughts that underlie those actions. He describes a model of self-regulated learning that includes four phases (*forethought, monitoring, control,* and *reaction/reflection*) and discusses other researchers' work that examines how learners attempt to monitor, control, and regulate the cognitive, motivational, behavioral, and contextual elements of self-regulated learning.

The self-regulation model included within the *Frameworks* course uses an adaptation of the self-regulation model outlined in this article; specifically, *Frameworks* condenses the phases of this model into *planning, implementing and monitoring,* and *evaluation*. In the *planning* (or forethought) phase, individuals select appropriate learning strategies to employ in order to achieve learning goals. Self-motivation beliefs (self-efficacy, goal orientations, outcome expectations, and value) and task analysis (goal setting, strategic planning) are key within this phase.

In the *implementing and monitoring* phase, individuals use the selected strategies, continuously monitoring task performance and comprehension. They observe their own behavior and determine the amount of effort they will expend in an effort to reach the target goals they set during the planning phase.

Finally, in the *evaluation* (or self-reflection) phase, individuals evaluate the product of the performance stage. They judge the outcome, take stock of their own emotional reactions, and determine what actions led to this outcome. These evaluations feed forward into the planning phase of the next self-regulation cycle. Students routinely engage in self-regulatory activities within the *Frameworks* course, as illustrated in the following three lessons.

- *Lesson 10: Metacognition and Financial Advisor Visit*—Activity 3 (Visit from Financial Aid Office Representative)
- *Lesson 16: Where We've Been, Where We're Going*—Activity 2 (Reflection and Strategy Modification)
- *Lesson 18: Midterm Exam Debrief*—Activities 1 (Design a Review Process) and 2 (Apply Your Review Process) and goal modification assignment

Additional resources:

Zimmerman, B. J. (1989). Models of self-regulated learning and academic achievement. In B. J. Zimmerman and D. H. Schunk (Eds.), *Self-regulated learning and academic achievement: Theory, research, and practice* (pp. 1–25). New York: Springer-Verlag.

Zimmerman, B. J. (2000). Attaining self-regulation: A social cognitive perspective. In M. Boekaerts, P. R. Pintrich, & M. Zeidner (Eds.), *Handbook of self-regulation: Theory, research, and applications* (pp. 13–39). San Diego, CA: Academic Press.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive–developmental inquiry. *American Psychologist, 34*(10), 906–911.

In this seminal article on metacognition, Stanford University psychologist John Flavell proposes a model to capture how individuals engage in higher-order thinking to actively control their cognitive processes in learning situations. Often simplified as "thinking about thinking," the model proposed in this article was the impetus for extensive research into metacognition, and today, two components of metacognition are generally accepted within the field: *knowledge of cognition* and *regulation of cognition*.

Knowledge of cognition, also known as metacognitive knowledge, includes declarative (factual) knowledge about oneself as a learner, procedural knowledge (knowledge of how to do things), and conditional knowledge (knowledge of when and why to do things). Flavell elaborates on these ideas and discusses the influence that metacognitive knowledge can have on an individual's choice of goals and tasks as well as on his or her evaluation and reflection regarding whether the goal or task is complete. For more information about regulation of cognition, the description of self-regulated learning included under the Pintrich (2003) entry has relevant information.

In *Frameworks*, many activities in the first half of the course are designed to help students make their thinking processes more transparent. These activities prepare them for Lesson 10, in which they identify key components of metacognition and apply knowledge and regulation strategies to new situations.

- *Lesson 10: Metacognition and Financial Advisor Visit*—Activity 3 (Visit from Financial Aid Office Representative)

Additional resources:

Schraw, G. (1994). The effect of metacognitive knowledge on local and global monitoring. *Contemporary Educational Psychology, 19*(2), 143–154.

Schraw, G. (1998). Promoting general metacognitive awareness. *Instructional Science*, *26*(1–2), 113–125.

Veenman, M. V., Van Hout-Wolters, B. H., & Afflerbach, P. (2006). Metacognition and learning: Conceptual and methodological considerations. *Metacognition and Learning*, *1*(1), 3–14.

FRAMEWORKS PILLAR 4:
Finding your direction in college (and beyond)

Some students enter college with a clear idea of the work they want to do after graduating. A large number of students, however, expect to explore career paths while in school. The *Frameworks* course meets students where they are and provides opportunities for students to set goals and develop plans for attaining those goals.

In the course, students spend time identifying factors that contribute to their own goal setting and, over the course of the entire term, assess their interests, set goals, collect data relevant to their goals, and use that information to devise strategies to employ on their path to attaining those aspirations.

Students also connect with knowledgeable career advisors at the college and participate in activities structured to help them explore career areas so that they can confidently move forward in implementing their programs of study. The following articles highlight the importance of supporting students in finding their direction in college.

Zimmerman, B. J., Bandura, A., & Martinez-Pons, M. (1992). Self-motivation for academic attainment: The role of self-efficacy beliefs and personal goal setting. *American Educational Research Journal, 29*(3), 663–676.

In this seminal study of goal setting, researchers investigate the link between goal setting and self-efficacy beliefs. They build on prior research on goals, including studies demonstrating that setting proximal goals positively affects self-efficacy, achievement, and interest.

Goal setting can influence students' reactions to their successes and failures, because goals serve as a guide that indicates what individuals define as personal success. Researchers conducted a path analysis using survey and course-grade data gathered from 116 high school students and found that personal goals significantly influenced students' grades in school.

They found that students who had high confidence in their ability to monitor and regulate their behavior also had high confidence in their ability to achieve academically. This confidence about academic achievement positively affected both the grade goals that students set for themselves and their final course grade. This connection between confidence and goal setting (and ultimately achievement) underscores how important it is for students to build confidence and to set goals to shape their behavior.

The *Frameworks* course incorporates goal theory, goal setting, and long-term planning throughout, including in class discussion, individual homework, and project assignments. After guided discussion about the value of clarifying short- and long-term intentions, students work to operationalize their goals by identifying specific actions they can take to pursue them. Class discussions of other motivation-related concepts (including self-efficacy, as described in this article) directly tie into the future planning discussions in the following lessons.

- *Lesson 7: Identifying Your Impact on the World*—Activities 2 (Value of Goals) and 3 (Nine Boxes)
- *Lesson 8: Creating Motivating Goals and the Career Project*—Activities 1 (Ensuring that Your Goals Motivate You) and 2 (Introduction to the Career Project)
- *Lesson 10: Metacognition and Financial Advisor Visit*—Activity 3 (Visit from Financial Aid Office Representative)
- *Lesson 18: Midterm Exam Debrief*—Activities 1 (Design a Review Process) and 2 (Apply Your Review Process)

Additional resources:

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice Hall.

Morisano, D., Hirsh, J. B., Peterson, J. B., Pihl, R. O., & Shore, B. M. (2010). Setting, elaborating, and reflecting on personal goals improves academic performance. *Journal of Applied Psychology, 95*(2), 255–264.

The authors, industrial organizational psychologists, report findings of a yearlong randomized-control intervention on goal setting conducted with full-time college students. All participants reported experiencing academic difficulty and had either been on academic probation or had had a grade point average below 3.0.

Students who completed the intervention, a self-paced series of eight steps in which they set multiple goals in self-selected domains and determined specific strategies to achieve those goals, reported statistically significant differences from students in the control group during the post-intervention semester.

These differences included "(a) an increased GPA, (b) higher probability of maintaining a full course load, and (c) reductions in reported negative affect" (p. 260)—elements that have previously been positively linked to student persistence and completion. The *Frameworks* course builds on the concepts from this one-time intervention by engaging students throughout the semester in a series of activities focused on intentionally setting and pursuing goals.

Similarly to this described intervention, *Frameworks* students set goals for all aspects of their lives, not just the academic portion. These goal-setting activities empower them to identify and work toward outcomes they personally value. Much of this work takes place as part of the individual career project in which students identify the competencies necessary for the field they are interested in, collect data about the field, and plan for how they will strategically use their time in college to prepare for the realities of that working environment.

- *Lesson 6: Meeting an Academic Advisor and a Career Counselor*—Activities 1 (Joint "Who We Are" Introduction by Guests), 2 (Making the Most of Academic Advising), 3 (What to Expect at the Career Center), and 4 (Preparing to Visit the Career Center and Assignment)
- *Lesson 7: Identifying Your Impact on the World*—Activities 2 (Value of Goals) and 3 (Nine Boxes)
- *Lesson 8: Creating Motivating Goals and the Career Project*—Activities 1 (Ensuring that Your Goals Motivate You) and 2 (Introduction to the Career Project)
- *Lesson 23: Career Project Sharing, Course Planning, and Guest Speaker*—Activities 1 (Career Project Sharing) and 2 (Planning What Courses to Take Next Semester)

Additional resources:

Latham, G. P., & Locke, E. A. (2007). New developments in and directions for goal-setting research. *European Psychologist*, *12*(4), 290–300.

Ducote, J. M. (1984). Career indecision among adolescent/college students: A literature review and suggested interventions. Paper presented at the Annual Meeting of the Mid-South Educational Research Association, New Orleans, LA, November 14–16, 1984.

In this review of career development literature, J. M. Ducote identifies characteristics of indecisive students and discusses research that supports one of two views of career indecision: one, that it is a normal task of development and two, that indecision is related to psychological constructs including anxiety, self-perceptions, and external attributions (p. 14).

Three interventions are proposed to help indecisive students make career-related decisions. First, help students gain self-knowledge, including understanding of their cultural and family influences as well as their own confidence and fears about failure or success. Second, help students gather information about possible opportunities and careers open to them, which includes helping students identify actual and perceived barriers to entering that field. Third, help students prepare for their careers (p. 14).

Many college students enter college undecided on their major (or consider their major out of reach because of their struggles in math). Therefore, guidance on career decision-making is embedded within the *Frameworks* course. In *Frameworks,* instructors are encouraged to create a culture of growth and learning within their classes. In addition to cultivating the trust necessary for students to interact with one another and with the instructor, such a culture also helps students feel safe exploring identity issues, including their purpose in life and the effect they wish to have on their world, especially within their chosen career field. As part of their career project, students use campus resources to explore possible career fields, and they plan for how they will use their college experiences to prepare for their careers.

- *Lesson 1: Building the Foundation for Our Success*—Activity 2 (Letting Go of Fears and Anxiety About Math)
- *Lesson 7: Identifying Your Impact on the World*—Activities 2 (Value of Goals) and 3 (Nine Boxes)
- *Lesson 8: Creating Motivating Goals and the Career Project*—Activities 1 (Ensuring that Your Goals Motivate You) and 2 (Introduction to the Career Project)
- *Lesson 23: Career Project Sharing, Course Planning, and Guest Speaker*—Activities 1 (Career Project Sharing) and 2 (Planning What Courses to Take Next Semester)

Luzzo, D. A. (1999). Identifying the career decision-making needs of nontraditional college students. *Journal of Counseling & Development, 77*(2), 135–140.

Students in college classrooms bring with them a diversity of experiences, attitudes, and behaviors, some of which are specific to their career search process. The author summarizes existing research on traditional and nontraditional students' career-related needs and indicates that these groups both share some attributes related to their future careers, but also differ in key ways that need to be considered.

For example, there are studies indicating that a student's age does not impact their knowledge of their preferred occupation or their level of career indecision (p. 135). Age does, however, affect students' attitudes toward career decision making (including their own self-efficacy in such decision making) and career commitment.

Older students tend to lack the anxiety, fear, and insecurity that younger students feel about making career decisions; older students also tend to be more committed to their chosen careers and are confident in their ability to make decisions about their careers. On the other hand, older students are more likely than their younger peers to recognize that there could be barriers that prevent them from proceeding down a career path.

These comparisons suggest that all students could benefit from gathering and analyzing information about career fields and possible barriers, but that such information-gathering should be structured flexibly enough to meet the diverse needs of the students engaging in the activity. While age is the primary focus of this article, other factors influence students' career planning needs as well, only heightening the need for flexibility within a career project.

The *Frameworks* career project is constructed to meet the needs of all students in the course. It is flexible enough that students with a clear vision for what they want out of college (including older, returning students) and students (often younger students) just starting to think about their career path will benefit from the exercise. Within the project, students spend time gathering data to help them make decisions and plan for their futures.

- *Lesson 1: Building the Foundation for Our Success*—Activity 2 (Letting Go of Fears and Anxiety about Math)
- *Lesson 7: Identifying Your Impact on the World*—Activities 2 (Value of Goals) and 3 (Nine Boxes)
- *Lesson 8: Creating Motivating Goals and the Career Project*—Activities 1 (Ensuring that Your Goals Motivate You) and 2 (Introduction to the Career Project)
- *Lesson 23: Career Project Sharing, Course Planning, and Guest Speaker*—Activities 1 (Career Project Sharing) and 2 (Planning What Courses to Take Next Semester)

About this resource

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About these bibliographies

In these annotated bibliographies, we provide information on selected research underpinning the Dana Center Mathematics Pathways. These Summer 2014 bibliographies address

- The DCMP's four fundamental principles that shape the overall initiative
- The DCMP's eight curriculum design standards that inform the design of all courses developed by the DCMP

The DCMP's *Frameworks for Mathematics and Collegiate Learning* course's four pillars (or themes)

About the Dana Center

The Dana Center develops and scales math and science education innovations to support educators, administrators, and policy makers in creating seamless transitions throughout the K–14 system for all students, especially those who have historically been underserved.

We focus in particular on strategies for improving student engagement, motivation, persistence, and achievement.

The Center was founded in 1991 at The University of Texas at Austin. Our staff members have expertise in leadership, literacy, research, program evaluation, mathematics and science education, policy and systemic reform, and services to high-need populations.

For more information

- about the Dana Center Mathematics Pathways, see **www.dcmathpathways.org**
- about the Texas Association of Community Colleges, see **www.tacc.org**

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Frameworks for Mathematics And Collegiate Learning Course Outcomes

Dana Center Mathematics PATHWAYS

Build community and connect to campus resources.

Make personal connections with peers, instructors, and other campus support personnel.

- Students actively participate as members of identifiable teams throughout the term, and visit with instructors and campus resource center personnel.

Locate and use support center services.

- Students identify and take advantage of support services on campus, including academic advising, career counseling, financial aid services, libraries, disability services, and tutoring services.

Develop and maintain motivation for college success.

Develop and pursue useful goals.

- Students set, monitor, and adjust long-term personal, professional, academic, and social goals.

Apply strategies to maintain motivation.

- Students maintain their motivation by focusing on controllable academic behaviors and using strategies to monitor and manage their attitudes, emotions, and thoughts when facing challenging tasks or academic setbacks.

Develop a process for replacing negative, self-defeating habits with positive habits.

- Students identify habits and beliefs that have interfered with their success and learn to apply metacognitive awareness to plan, monitor, evaluate, and reflect on their learning and to seek and use feedback to improve performance.

Develop and use study strategies and skills.

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Demonstrate organization and management of time and study materials.

- Students create and maintain a distributed study schedule and employ time-management strategies.

Describe how to store and retrieve information from memory.

- Students investigate factors that influence memory as well as specific information-processing and organizing strategies.

Demonstrate effective reading and note-taking strategies that enhance retention and comprehension.

- Students learn and apply strategies for identifying key concepts in lectures and readings, organizing class notes, and increasing reading comprehension.

Identify and apply effective strategies to use before, during, and after taking an exam.

- Students develop strategies for preparing for exams, taking exams, and reviewing performance.

Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.

- Students develop written and oral arguments that are insightful, purposefully organized, logically supported, audience appropriate, and effectively delivered.

Use technology throughout the course.

- Students use college email to communicate, software to complete assignments, and a technology platform (such as Blackboard) to submit assignments.

Find direction in college.

Identify future college and career pathways.

- Students explore the characteristics and required skills of various career paths and consult with advisors and instructors to determine an appropriate path to follow.

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Frameworks for Mathematics and Collegiate Learning: Course Overview

Dana Center Mathematics PATHWAYS

	Lesson Title	Activity 1	Activity 2	Activity 3	Activity 4	Assignment
1	**Building the Foundation for Our Success**	My Story (10)	Letting go of fears and anxiety about math (30)	Syllabus introduction (15)		• Student information form (if not collected in class) • Collegiate learning assessment • Syllabus quiz (due: Lesson 2)
2	**Finding the Support to Be Successful**	Continuing to get to know one another (15)	More about the *Frameworks* course (20)	Introduction to the Scavenger Hunt (15)		• Complete scavenger hunt (due: lesson 7) • Read "You can grow your brain" and record three key ideas (due: Lesson 3)
3	**The Plastic Brain and Smart Thinking**	Your plastic brain (30)	Introduction to smart thinking (10)	Establishing smart habits (20)	The value of journaling (10)	• Read "Bad habits and your world" and record three key ideas (due: Lesson 4) • **Journal:** Current note-taking processes and strategies (due: Lesson 4)
4	**Getting Ahead with Better Note Taking**	Why take good notes and the note-taking process (40)	Specific note-taking methods (15)	Evaluating your math notes (10)		• Note-taking assignment (due: Lesson 6)
5	**Tackling Technology Fears and Frustrations**	Getting cozy with technology (65)				• Using technology assignment (due: Lesson 7)
6	**Meeting an Academic Advisor and a Career Counselor**	Joint "Who we are" introduction by guests (15)	Making the most of academic advising (20)	What to expect at the Career Center (20)	Preparing to visit the Career Center and assignment (10)	• Academic advising and Career Center visits (part of the individual career project) (due in 3-4 weeks)

	Lesson Title	Activity 1	Activity 2	Activity 3	Activity 4	Assignment
7	**Building Success Teams and Identifying Your Impact on the World**	Create success teams (25)	Value of goals (30)	Nine boxes (10)		• Nine boxes activity (due: Lesson 8)
8	**Creating Motivating Goals and the Career Project**	Ensuring that your goals motivate you (45)	Introduction to the career project (20)			• Read and prepare: "How to Kill Writer's Block and Become a Master Copywriter in only 3 Hours a Day" (due: Lesson 9) • **Journal**: Factors that contribute to feelings of confidence (due: Lesson 10)
9	**Managing Priorities and Time**	Where does the time go? (20)	Prioritizing, planning, and personal responsibility (25)	Creating a distributed schedule (20)		• Distributed schedule (due: Lesson 10)
10	**Metacognition; Financial Advisor Visit**	Thinking about thinking (20)	Metacognition (25)	Visit from financial aid office representative (20)		• Applying metacognition assignment (due: Lesson 11)
11	**Build A Better Memory: Part I Attention and Deep Processing**	Our complex brains (35)	The difference between deep and shallow processing (20)	Making information meaningful (10)		• **Journal**: Current strategies you use to make information meaningful to you (due: Lesson 12)

	Lesson Title	Activity 1	Activity 2	Activity 3	Activity 4	Assignment
12	**Build A Better Memory Part II: Elaboration and Organization Strategies**	Elaboration and organization strategies (40)	Practice using think-alouds (10)	Creating flash cards (15)		• Flash cards (due: Lesson 13)
13	**Identifying Important Information As You Read**	Using the SQ4R model to engage with course texts (25)	What information is important in math? (20)	Applying the SQ4R model (20)		• Create a chapter outline and corresponding flashcards (due: within the next 1-2 weeks)
14	**Critical Thinking Strategies and Questions**	Commitment issues (25)	Bloom's Taxonomy (30)	Midterm exam discussion (10)		• Read: Strategies for test-taking; create graphic organizer of information within reading (due: Lesson 16)
15	**Preparing to Do Well on Exams**	Understanding the purpose of assessments (15)	Demonstrating the process of testing (50)			• Put "before test-taking" strategies into practice: Create test questions (due: Lesson 16)
16	**Where We've Been, Where We're Going**	Connecting course concepts (40)	Reflection and strategy modification (15)	Moving ahead with the career project (10)		• Self-reflection (due: Lesson 18)
17	**Midterm Exam**	Pre-exam centering exercise (5)	Midterm exam (60)			
18	**Midterm Exam Debrief**	Design a review process (35)	Apply your review process (25–30)			• Complete a goal modification review or a revised distributed schedule. (due: Lesson 19)

	Lesson Title	Activity 1	Activity 2	Activity 3	Activity 4	Assignment
19	**Working in Groups**	Introducing the group presentation assignment (20)	Working in groups (25)	Group presentation work (20)		• Students should identify the web addresses of at least two sources related to the group's presentation topic. (due: Lesson 20)
20	**Site Visit: Library Resources**	Be careful who you listen to! (15)	Using library resources (40)	Success team work on group presentation (10)		• Identify at least one scholarly article related to your assigned topic or the subtopic for which you are responsible. (due: Lesson 21)
21	**Using Library Resources and Group Presentation Preparation**	Understanding plagiarism, citations, and supporting documentation (40–45)	Individual work on group presentation (20–25)			• Finish annotated bibliography. (due: within 1-2 weeks) •
22	**Effective Oral Communication and Using Evaluation Rubrics**	Comparing effective and ineffective presentations (20)	Using a rubric to stimulate proper planning and levels of thought (20)	Guest presentation—Making effective presentations (25)		• Meet within success teams; produce a 1-2 page general presentation outline and action plan (due: Lesson 23)
23	**Career Project Sharing, Course Planning, and Guest speaker**	Career project sharing (25)	Planning what courses to take next semester (25)	Guest presentation (15)		• Complete course planning form. (due: Lesson 24) • Success teams finalizing presentations. (due: varies by presentation date)
24	**Success Team Presentations, Day 1**	Success team presentations (40-65)	Additional activities (up to 25)			

	Lesson Title	Activity 1	Activity 2	Activity 3	Activity 4	Assignment
25	**Success Team Presentations, Day 2**	Success team presentations (40-65)	Additional activities (up to 25)			
26	**Success Team Presentations, Day 3**	Success team presentations (40-65)	Additional activities (up to 25)			• Review course materials, assignments – including journal entries and class notes - reflecting in preparation for an in-class activity (due: Lesson 27)
27	**Dear Frameworks**	Dear Frameworks (60)	Final exam question and answer (10)			• Prepare for final exam.
28	**Final Exam**	Pre-exam centering exercise (5)	Final exam (60)			
29	**Final Exam Debrief**	Recap the review process (30)	Apply your review process (25)			• Exam debrief report (due: Lesson 30)
30	**Where Will You Be In 10 Years?**	Let's party like our (successful) future is now: The 10-year class reunion (50)				

Frameworks for Mathematics and Collegiate Learning

Course Essentials

Dana Center Mathematics PATHWAYS

For faculty using the DCMP *Frameworks* materials **June 2014**

The *Frameworks for Mathematics and Collegiate Learning* course curricular materials are intended as a tool for faculty members implementing a learning frameworks course at their institution, especially faculty implementing the Dana Center Mathematics Pathways. DCMP *Frameworks* authors developed this *Course essentials* resource to support instructors as they modify or deepen activities to meet the needs of their students.

The *Frameworks* course is designed to meet the following criteria set forth in the Texas *Academic Course Guide Manual* (ACGM) for the cross-listed Psychology 1300 and Education 1300 course:

> A study of the 1) research and theory in the psychology of learning, cognition, and motivation, 2) factors that impact learning, and 3) application of learning strategies. Theoretical models of strategic learning, cognition, and motivation serve as the conceptual basis for the introduction of college-level student academic strategies.
>
> Students use assessment instruments (e.g., learning inventories) to help them identify their own strengths and weaknesses as strategic learners. Students are ultimately expected to integrate and apply the learning skills discussed across their own academic programs and become effective and efficient learners. Students developing these skills should be able to continually draw from the theoretical models they have learned.

This course is designed to provide faculty with flexibility regarding what to teach and when. Several of its components, however, are crucial to ensuring the course still meets the ACGM criteria for a college-credit-level course. And some components are integral to supporting students who are pursuing an academic pathway in the Dana Center Mathematics Pathways curricular model.

These two criteria—meeting the ACGM requirements and speaking to the needs of the students enrolled in developmental math—inform the guiding questions addressed by this *Course essentials* resource:

- **Which *Frameworks* course components support the defining features of a learning frameworks course?**
- **Which *Frameworks* course components are essential in light of the role the course plays in the DCMP curricular model?**

We hope that this resource, in conjunction with other DCMP curricular resources, will help you personalize the course as you use these materials with your own students.

Additional DCMP materials and resources (available on the Dana Center Mathematics Pathways Resource Site) that provide context for this *Essentials* resource include

- The DCMP's four guiding principles[1]
- The DCMP curriculum design standards[2]
- *Frameworks for Mathematics and Collegiate Learning* pillars[3]
- *Frameworks for Mathematics and Collegiate Learning* course introduction, learning outcomes, course overview, and annotated bibliography of selected research that informs the course.[4]

This resource includes selected quotations from experienced *Frameworks* course instructors who shared their thoughts on ways to improve the materials and support instructors using these materials for the first time.

We hope that their thoughts, extensions, and modifications of the activities—as reflected in their comments—are useful to you as you make your own modifications based on your students' needs.

Which *Frameworks* course components support the defining features of a learning frameworks course?

What are the defining features of a learning frameworks course?

The *Frameworks* course meets the Texas ACGM criteria for a learning frameworks course (PSYC 1300/EDUC 1300).

In an important piece on learning frameworks courses, Greg Hodges, Carol Dochen, and De Sellers (2001) note that other student success courses focus on orienting students to campus resources and services, adjusting to college life, or building study skills, but **learning frameworks courses engage students in a study of the theoretical perspectives on knowledge acquisition**.

They go on to describe some distinguishing characteristics of learning frameworks courses, including the following:

- Course material is grounded in research and theory from psychology and the learning sciences.
- Study of learning theory is a basis for the development of individual learning strategies.
- Integration of skills and knowledge from cognitive, affective, and behavioral psychology helps students develop strategies for persisting in their coursework and adapt those strategies as appropriate for different contexts.

[1] The DCMP's four guiding principles are described here: https://dcmathpathways.org/resources/dcmps-four-guiding-principles-selected-supporting-research-annotated-bibliography.

[2] The DCMP's eight curriculum design standards are described here: https://dcmathpathways.org/resources/dcmp-curriculum-design-standards.

[3] The DCMP's *Frameworks for Mathematics and Collegiate Learning* course's four pillars (or themes) are described here: https://dcmathpathways.org/resources/dcmps-four-guiding-principles-selected-supporting-research-annotated-bibliography and in more detail in the introduction to the Frameworks 2.0 course (https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-introduction).

[4] These *Frameworks* course materials can be accessed here https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-materials

How are these defining features represented in Frameworks?

The following activities represent the lessons in which specific theories are discussed and opportunities to apply that theory are provided. Since theory and application are critical elements of a frameworks course, both are included here. Specific theories include:

- Carol Dweck's[5] theory of intelligence
- Albert Bandura's social learning theory (including self-efficacy)
- Bernard Weiner's attribution theory of motivation and emotion
- Paul Pintrich's and Barry Zimmerman's models of self-regulation, including John Flavell's work on metacognition
- The information processing model (IPM) of learning influenced by George Miller and others.

Naturally, you may choose to integrate an additional learning theory; removing or resequencing one of the following activities, however, could disrupt the coherent flow of the core material. The course is structured to follow Kurt Lewin's model of change. That is, early lessons focus on helping students "unfreeze" any existing beliefs and behaviors that could hinder their learning. The course then moves on to building student understanding and providing opportunities for them to apply new learning, and then on to helping them deepen understanding and solidify connections by engaging with the course content in new ways that helps the new learning "stick."

Based on these learning theories and the requirements for a learning frameworks course as laid out in the ACGM, these lessons and activities are not about memorizing lists of techniques or study skills; rather, they are explicitly designed first to support *Frameworks* students' intellectual engagement with theories (e.g. how the brain stores understanding into long-term memory) and second to identify and practice strategies that leverage this understanding.

For greatest fidelity to the *Frameworks* course design, we recommend that the following lessons be implemented in the order they appear in the course materials. These lessons cover the theoretical contexts for the course and are designed to dovetail together.

Lesson	Why it's essential	Veteran *Frameworks* faculty say
Lesson 3: The plastic brain and smart thinking	Lesson immediately challenges long-held beliefs (e.g., "I'm not smart enough to succeed in math") by demystifying intelligence. Lesson then begins the study of how the brain changes during learning.	*Students were amazed at what they learned about the brain. "Your plastic brain" was extremely beneficial along with the discussion about "fixed intelligence." I think it set the stage for alleviating some of their "self-fulfilled prophesies" about their abilities and capabilities to conquer math!"* *This lesson is an essential one, one that must not be rushed through … There were a lot of group discussions with this lesson.*

[5] For related citations, see the reference list at the end of this resource.

Lesson	Why it's essential	Veteran *Frameworks* faculty say
Lesson 7:[6] **Building success teams and identifying your impact on the world**	The creation of success teams is critical for students' sense of belonging and mutual support in this course. Goal setting is a key component of learning and motivation theory. These lessons look at theories of motivation, including beliefs, values, interests, efficacy, attributions, and orientation toward mastery. The launching of the career project provides an appropriate application of the theories of goal setting and motivation that students are learning.	*The flow was great! Discussing self-efficacy and confidence after their first exam was very beneficial. They could then transition into setting achievable goals. Without confidence in themselves and their abilities and capabilities, they would be unable to really internalize and visualize the value of goal-setting.*
Lesson 8: Creating motivating goals and the career project		*The exercise with "Herman" and revising the goal based on the SMART goal model was right on point. They were then able to conduct their own expansion goal activity more seriously.* *Establishing long-term goals and SMART goals are essential to building an effective framework for success. Activity 1 was one of my favorite activities! It really helps the student begin to identify what their purpose is.*
Lesson 9: Managing priorities and time	Although time management is a typical "study skill," the *Frameworks* course makes a strong connection between time management and students' personal goals and aspirations.	*Managing priorities and time are essential to college success. This is a very important Lesson and should not be ignored. Activity 1 and 2 (where does the time go and prioritizing, planning, and personal responsibility) are easy to explain to students, and they should not have any problems understanding.* *Activity 3 was a little different. The idea seems simple, but students cannot begin to do this until they can identify where they are losing time. This was a very strong lesson.*

[6] Note: Lesson 7 should take place just as students are taking their first exam in the DCMP's co-requisite *Foundations of Mathematical Reasoning* course.

Lesson	Why it's essential	Veteran *Frameworks* faculty say
Lesson 10: Metacognition and financial advisor visit[7]	*Metacognition* is a key idea in learning theory and self-regulation. This lesson provides practical applications in which students can use metacognitive self-regulation.	*Students benefitted from the metacognition regulation process; they referred to this throughout the semester.* *The students had different reactions to the coin challenge. Some loved it. Some hated it. Some solved it quickly, some gave up.*
Lesson 11: Build a better memory, part I: Attention and deep processing **Lesson 12: Build a better memory, part II: Elaboration and organization strategies**	Students explore cognition and relate various specific study strategies to each strategy's potential to enhance understanding. These activities include specific extensions to connect to students' study of mathematics.	*Activity 2 definitely didn't turn out the way it was supposed to. The "constructing the story" group had the lowest average. But the group with "counting letters and capital letters" actually rewrote the words in order of the number of letters and this help them remember the words better. Made for great discussion.* *I did make a graph of their averages with 3 trials on the horizontal axis and the number of correct words on the vertical axis. They were amazed at how much those averages rose by adding context. I had the students figure out the average number of correct words within their groups and then they calculated the class averages as well. I did this to make an explicit connection to math content and frameworks concepts.*
Lesson 14: Critical thinking strategies and questions	The course is structured and assessed such that students are required to think and respond at high levels of cognition (as defined in, for example, Bloom's Taxonomy). This lesson provides key support while also connecting back directly to the metacognitive strategies discussed in Lesson 10.	*The most important concept that was introduced in this lesson was Bloom's Taxonomy. We referred to Bloom's throughout the course since its introduction in Lesson 14. Very important piece of the pie!*

[7] The financial advisor visit should not be considered an essential part of this specific lesson.

Lesson	Why it's essential	Veteran *Frameworks* faculty say
Lesson 18: Midterm exam debrief	Students lead the whole-class construction of a plan to review and reflect upon their performance on an assignment.	*Relating the debriefing activity to [practices in] other organizations, such as the military or athletic teams, and events helped to personalize this process. I think that the important part of this for students was that we are not assigning blame, we are learning from the experience.*

What about topics that aren't included in the Frameworks *materials?*

You may notice that some topics typically associated with student success courses (e.g., a discussion of learning styles[8]) are not explicitly included within this curriculum. The topics included in the curriculum

- are grounded in empirical evidence for their effectiveness
- are the most critical to the overall course objectives and corresponding pacing
- support the other topics

That said, there are many empirically supported theories that are not included in the *Frameworks* course curriculum due to time constraints.

For example, while *Frameworks* includes many motivational concepts (e.g., discussion of *beliefs* and *mindsets*, *interests*, *self-efficacy*, *locus of control*, *mastery goals*, *attributions*), there are other theories of motivation that you could add to meet the needs of your students. Such additions would fit within the DCMP model, as long as the additions are supported by a valid empirical evidence base.

[8] See Pashler, McDaniel, Rohrer, and Bjork (2008) for a review of the literature on the empirical basis for learning styles.

Which Frameworks course components are essential in light of the role the course plays in the DCMP curricular model?

In the DCMP curricular model, students complete a common foundational mathematics course before moving on to a college level mathematics course that is aligned to their program of study. Because the *Frameworks* course was designed to support this model, certain of its elements are essential to implementing this model. These elements include:

- Use pedagogical theories that align with the DCMP curriculum design standards
- Target the needs of developmental math students enrolled in DCMP courses
- Build a sense of community within the classroom and across campus
- Support students as they gather evidence to support their mathematics pathway decision

Use pedagogical theories that align with the DCMP curriculum design standards.	**Veteran *Frameworks* faculty say**
Context: In designing the Dana Center Mathematics Pathways courses, we were motivated by the empirical evidence that learning is a social endeavor and that it involves the development of understanding by connecting new knowledge to currently held knowledge. We also believe that students must be provided a supportive learning community in which discussion, sense-making, and reflection—with classmates and individually—are central features. So we don't believe that teaching is telling nor do we believe that students benefit from a series of lessons that help them catalog discrete facts and "tricks" for succeeding in college. These beliefs are guided by current recommendations of professional mathematics associations and leading education researchers. They have been codified in the DCMP's curriculum design standards.[9] **Key:** Use student-centered instructional practices aligned with the DCMP curriculum design standards. As these design standards represent current best practices in teaching and learning, we encourage you to use them for guidance as you modify activities to ensure they support your students.	*My learning was challenged as I found myself teaching the concepts of cooperative learning … Although I had many, many, many, many sleepless nights and weekends, I found teaching DCMP to be a very rewarding experience.* *** *The DCMP curriculum and pedagogy has made me an advocate of cooperative learning—*

[9] While *Frameworks* is not a mathematics content course, these pedagogical approaches and standards are used in all DCMP courses.

For many instructors, teaching with these design standards in mind may constitute a shift in approach, since the "control" of the learning is placed in the hands of the student, with the instructor serving as facilitator, rather than as the sole source of knowledge.

Using this *Frameworks* curriculum, your classroom will be noisy, with talking, processing, creating, and other audible (and visible!) signs of student collaboration. The ratio of instructor voice to student voices is reversed from traditional lecture-based courses.

For a detailed discussion of the following DCMP curriculum design standards, please see the DCMP Resource Site:[10]

Standard I: Structure and Organization of Curricular Materials
Standard II: Active Learning
Standard III: Constructive Perseverance
Standard IV: Problem Solving
Standard V: Context and Interdisciplinary Connections
Standard VI: Use of Terminology
Standard VII: Reading and Writing
Standard VIII: Technology

How:

While every *Frameworks* lesson contains some of these elements, the following activities are good examples to reference:

- ☐ Lesson 1: Building the foundation for our success; Activity 2: Letting go of fears and anxiety about math
- ☐ Lesson 9: Metacognition; Activity 1: Thinking about thinking
- ☐ Lesson 14: Critical thinking strategies and questions; Activity 3: Bloom's Taxonomy
- ☐ Lesson 16: Where we've been, Where we're going; Activity 1: Connecting course concepts.

getting students to explain concepts to the others in their group and to the class, promoting positive interdependence yet impressing upon students that they have an individual accountability for learning as well, and promoting interactivity.

Target the needs of developmental math students enrolled in DCMP courses.

Context:

Students enrolled in DCMP, itself a targeted math intervention, tend to enter the classroom with preconceived (and often negative) beliefs about their own capabilities.

Research shows that these negative beliefs in turn negatively affect student academic success and persistence.

[10] The DCMP's eight curriculum design standards are described here: https://dcmathpathways.org/resources/curriculum-design-standards-selected-supporting-research-annotated-bibliography.

Research also shows, however, that given the right environment and instruction, students can reevaluate their self-perceptions and begin to change them.

To construct positive self-perceptions, though, students need a supportive environment in which to redefine this part of their identity, opportunities to reflect on their beliefs, and opportunities to construct new beliefs about their capabilities.

Key:

Specifically address beliefs about mathematics on the first day of class, acknowledging students' past struggles and successes with math. Discuss how this course will support them as they grow as learners and especially as mathematics learners.

How:

The following *Frameworks* activities are good examples to reference:

☐ Lesson 1: Building the foundation for our success; Activity 2: Letting go of fears and anxiety about math

Context:

The co-requisite *Foundations of Mathematical Reasoning* course is unlike traditional math courses and the difference is evident on Day 1. Students collaborate with each other and the instructor, use real-world data, and are encouraged to see the many possible ways of thinking mathematically, rather than just to apply memorized formulas to solve for "the answer." This environment, a significant shift from their previous experiences, may seem overwhelmingly challenging to students unfamiliar with how to navigate this kind of environment.

Key:

Acknowledge the atypical classroom environment early in the semester as you engage with the *Frameworks* content.

Use specific mathematics references and examples within the *Frameworks* course that support the ways of thinking (not necessarily the mathematical content) that students are learning in the *Foundations* course.

How:

The following *Frameworks* activities are good examples to reference:

☐ Lesson 4: Getting ahead with better note taking: all activities

☐ Lesson 11: Build a better memory part 1: Attention and deep processing; activities 1 (our complex brains), 2 (the difference between deep and shallow processing) and 3 (making information meaningful)

☐ Lesson 12: Build a better memory part 2: Elaboration and organization strategies; activities 1 (elaboration and organization strategies), 2 (practice using think-alouds), and 3 (creating flash cards)

Build a sense of community within the classroom and across campus	**Veteran *Frameworks* faculty say**
Context: Learning is a social endeavor. Thus, high-quality interactions among members of the learning community across campus are essential to helping students learn. There is a growing body of evidence demonstrating the effects that other campus community members have on students' persistence and academic achievement in college. For example, student persistence is related to the extent to which students interact with supportive adults on campus, both inside and outside the classroom (Kuh, 2003). Thus, the *Frameworks* curricular materials encourage the fostering of trusting relationships between students and faculty—and with campus personnel outside the classroom. **Key:** Plan for a combination of informal (e.g., visiting offices across campus very briefly to get a feel for the resources available on campus) and formal (e.g., presentations from the academic advisor, career counselor, research librarian) inclusion of specific campus personnel in class activities over the course of the semester. **How:** The *Frameworks* lessons include multiple opportunities for students to engage with faculty and staff from across campus. Some opportunities are more informal (e.g., visiting offices across campus very briefly to get a feel for the resources available on campus) and some are extended work sessions with individuals with whom students should continue working throughout their college careers (e.g. academic advisors, career counselors, research librarians). Experienced *Frameworks* instructors report customizing the following lessons by having some of the interaction via video presentations and some interactions via in-class presentations. ☐ Lesson 2: Finding the support to be successful: activity 3 (Introduction to the scavenger hunt) ☐ Lesson 6: Meeting an academic advisor and a career counselor: activities 1 – 4	*I shortened the scavenger hunt. Our campus is not that big and too much was spent on it.* *** *Instructors must customize the scavenger hunt to those resources available on the individual campus. Students respond positively to visits from campus personnel.* *** *The most beneficial activity was an actual visit to the Career Center and combined presentation from an advisor and a career counselor. Students were confused about their respective roles (advisor and counselor) so this was great! Unfortunately, not all campuses have an actual Career Center. I think it was extremely beneficial for my one class that is held on a campus with a fully functional Center.*

☐ Lesson 10: Metacognition and financial advisor visit; activity 3 (Visit from financial aid office representative) ☐ Lesson 20: Site visit: Library Resources; activities 1-3 ☐ Lesson 21: Using library resources and group presentation preparation: activities 1-2	

Support students as they gather evidence to support their mathematics pathway decision

Context:

A defining feature of the DCMP model is that all students enroll in and complete a common developmental-level mathematics course (*Foundations of Mathematical Reasoning*) and subsequently enroll in a college-level mathematics course that best serves their career goals.

During this crucial first semester, then, DCMP students will register for a college-level mathematics course. As research shows, students often need help identifying their career goals and gathering information to inform their choices so that they progress in a pathway aligned with their program of study.

Key:

Provide opportunities for students to set goals and gather data about themselves and about possible career paths to inform their pathway selection. And it is essential that *Frameworks* students complete a career project.

How:

Some of this discussion happens within the *Foundations of Mathematical Reasoning* mathematics course, but the *Frameworks* course provides many activities to help students identify and become really specific about their beliefs and goal. *Frameworks* also includes activities in which students gather information about academic major and career options.

Specifically, these activities happen in the following *Frameworks* lessons:

- ☐ Lesson 7: Identifying your impact on the world; activities 2 (Value of goals) and 3 (Nine boxes)
- ☐ Lesson 8: Creating motivating goals and the career project; activities 1 (ensuring that your goals motivate you) and 2 (introduction to the career project)
- ☐ Lesson 23: Career Project Sharing, Course Planning, And Guest speaker: Activity 2: Planning what courses to take next semester
- ☐ Career Project*

* In a survey of veteran *Frameworks* faculty, the career project was reported to be one of the most beneficial activities of the course.

Faculty members have expanded components of the career project to include campus-specific resources (e.g. career-finder applications available for student use).

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About this resource

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About the Dana Center

The Dana Center develops and scales math and science education innovations to support educators, administrators, and policy makers in creating seamless transitions throughout the K–14 system for all students, especially those who have historically been underserved.

We focus in particular on strategies for improving student engagement, motivation, persistence, and achievement.

The Center was founded in 1991 at The University of Texas at Austin. Our staff members have expertise in leadership, literacy, research, program evaluation, mathematics and science education, policy and systemic reform, and services to high-need populations.

For more information

- about the Dana Center Mathematics Pathways, see **www.dcmathpathways.org**
- about the Texas Association of Community Colleges, see **www.tacc.org**

About this *Essentials* document

This Essentials document is designed as an additional tool for faculty teaching theDana Center Mathematics Pathways *Frameworks for Mathematics and Collegiate Learning* course.

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Lesson 1 Update
Building the Foundation for Our Success

Update note

See ***Frameworks Course Essentials***[1] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Activity 1: My story

Facilitation note

- In sharing with students our academic journey, including its struggles, we walk a fine line. On one hand, we want to get rid of any student preconceptions that we have never struggled academically. On the other hand, we do not want to inadvertently reinforce any stereotypes about learning mathematics. Here are some resources that may be useful in informing your approach to telling your story.
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[1]The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Activity 2: Letting go of fears and anxiety about math

Facilitation note

- Faculty who've taught this activity report that it can be quite chaotic and stress that thorough preparation is necessary for good facilitation. Two ideas:
    - read through the entire activity first to get a sense of the movement that will be happening within the room
    - practice the activity with colleagues in the space you will use with your students.

Activity 3: Syllabus introduction

Facilitation note

- Lesson 2 includes an activity that addresses the syllabus. As you modify, consider this lesson 2 activity and this idea from an instructor:

Faculty voices: Activity variation

- "In past courses, I have cut my syllabus into pieces and passed those pieces out to students for them to read and share in their own words what the section is saying. The other students find the section on their copies of the syllabus. When we have gone through all the sections, each student has spoken in front of the class and everyone has read the syllabus."

Appendix 1-C: Student information sheet

Facilitation note

- This student information sheet is provided as an example of the types of information you may want to ask for. It is not intended to be comprehensive and should be modified to fit your classroom needs. For example, if your campus has mandatory supplemental instruction for a specific group of students, it would make sense that you ask students to share if they are participating in any of these groups. Institutional policies, as well as federal Family Educational Rights and Privacy Act (FERPA) guidelines, should be considered when modifying this resource.

Lesson 1
Building the Foundation for Our Success

Overview

Week: 1 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 1-A through 1-D

From the beginning of the first class period, students should see that the *Frameworks for Mathematics and Collegiate Learning* course is a different experience from what they may have had in other courses. The intention of this lesson is to expose students to some of the core ideas of the course, including

- a welcoming environment,
- a strong community-building component—including establishing trust with the instructor and clarifying course expectations in a fun, inclusive way,
- stimulating motivation for attendance and participation,
- connecting the purpose of this course (math success and overall success in college) with students' personal interests and future direction.

Often our inclination is to jump straight into presenting specific course material on Day 1. However, both research and practice show that, for developmental students in particular, moving at a slower pace initially, building strong connections among students (and between students and the instructor), and establishing the right mindset early in college lay the foundation for a high level of student engagement that is maintained throughout college.

This lesson begins with you sharing your personal story, followed by an activity designed to help students understand they can overcome anxiety by identifying and using available resources and support in stressful times. The activity is a starting point for helping students reduce anxiety and increase self-efficacy. Students will also receive the course syllabus and their first assignments.

Key Concepts

Attributions: The reasons people give for their successes and failures. People give reasons that are either controllable or uncontrollable—that is, people cite reasons that are within their control (studying hard or not studying enough) or not within their control (my teacher is mean; she doesn't explain things very well; I made some lucky guesses on the test). Students who attribute their successes and failures to things that are within their control have a greater sense of self-efficacy; they understand that they can take action to overcome setbacks. Students who attribute their successes and failures to things beyond their control are typically more helpless and less likely to take action after a setback.

Trait anxiety: The tendency to be chronically fearful/nervous/anxious in certain situations, such as always feeling fearful about math courses or feeling anxious when taking exams. This tends to be a stable, ongoing condition.

State anxiety: A temporary condition brought about by occasional stimuli—for example, when taking a class with a particular instructor or when working on particular kinds of math problems.

Student Objectives

Make personal connections with peers, instructors, and other campus support personnel.

- Students actively participate as members of identifiable teams throughout the term, and visit with instructors and campus resource center personnel.

Resources and Preparation

1. **Read background materials on building trust and the need to establish a positive, success-focused environment for this course overall.**
2. **Entry logistics**
   - Select and decide how to showcase positive affirmations and quotes related to success that students will see when they enter the classroom. Success and inspiration quotes can be found online by searching for "success" on these websites:
     - www.brainyquote.com/quotes/topics/topic_success.html
     - www.goodreads.com/quotes/tag/success
     - http://under30ceo.com/50-best-success-quotes-of-all-time/
   - Prepare the student attendance sheet for the week.
3. **Make copies of the following materials for students:**
   - Course Syllabus + Student Contract
   - Student Information Sheet (Appendix 1-C).
   - Successful Students—The Difference That Makes the Difference (Appendix 1-D)

Materials and Technology Required

- Four different kinds of candy (enough for each student to have one piece), each kind in its own bowl
- Several packets of balloons (enough for each student to have one, plus a few extras in case some burst)
- Thick, dark-colored markers (for writing on the balloons)
- A display of the success quotes and positive affirmations, either printed out and stuck to the walls (so students can see them as soon as they enter the room) ***or*** shown as a revolving series of quotes on an overhead projector

4. **Activity 1: Preliminaries and My Story/get to know me**

    - Prepare cards or small pieces of paper with questions that you are willing to answer about yourself. Use the sample List of Personal Questions (Appendix 1-A) to guide you, adding or eliminating questions as you see fit. Include one question on each card or pieces of paper, making sure to have more questions prepared than you have students registered for the class.
    - Gather chart paper and markers.
    - Prepare notes for your own math story, based on the My Story sample (Appendix 1-B).

5. **Activity 2: Letting go of fears and anxiety about math**

    - Blow up a few balloons before students arrive.
    - Gather markers.
    - Warn colleagues (especially those teaching in classrooms nearby) that there is likely to be considerable noise, including loud popping sounds (balloons bursting), coming from your classroom during the first part of the class period.

6. **Confirm the process that your institution will use to administer the Collegiate Learning Assessment.**

7. **For the next class period**

    - Ensure you have a list of all the key places that students need to visit for the Scavenger Hunt (Lesson 2) and inform the relevant offices that your students will be stopping by.

8. **For future class periods**

    - Lesson 5—Book a computer lab for the technology lesson.
    - Lesson 6—Arrange for an academic advisor and career center counselor to make presentations to the class; each should be prepared to share their career stories and other personal information, if possible.
    - Lesson 10—Arrange for a visit from a representative of the Financial Aid Office.
    - Group project lessons: Identify and connect with suitable presenters (community members or other individuals who can speak about their careers and how math has been important to them—see course outline).

Instructional Plan

Preliminaries[1]

(10 minutes)

1. **Greet students.**
    - There is no one right way to greet your students on the first day, but you do want to foster a feeling of belonging in the classroom. One way to do this is to smile and say hello as each student enters. This is also a good time to start learning and using your students' names—a gesture that helps them feel valued within your class.
    - Introduce yourself to students—be sure to use the name or title you would like your students to use throughout the semester.
    - Help students confirm they are in the correct class by displaying the course title and number, as well as your name and contact information, in a prominent place.
    - Consider asking students to read the success quotes and positive affirmations you have displayed and discuss which ones they already know or like best.
2. **Distribute Student Information Sheet (Appendix 1-C)**
    - Give one to each student. If time permits, students can complete the form in class and return it to you then. Otherwise, ask them to return it at the start of the next class period.
3. **Invite each student to select one piece of candy (but not to eat it yet!) and one balloon.**
    - For Activity 2, students will get into groups based on the candy they selected.
    - Students should blow up their balloon before the start of Activity 2. [*Note*: If any students are allergic to latex, they can be part of the observer group during the balloon activity and will be able to make unique contributions to the debrief of that activity since they won't be caught up in the middle of it.]
4. **Circulate the attendance sheet.**
    - Establish the sign-in routine you would like students to follow. You could pass around the attendance sheet at the start of class, or you could leave it on a table near the entry door and have students sign in as they enter class. Determine what works best for you and have students get into the habit of signing in from day one.
5. **Briefly introduce yourself and the course.**
    - Students will want to know how they should address you—do you prefer to go by Dr., Mr., or Ms.? Are you okay being called by your first name? If you have a preference, be sure to clearly communicate this at the onset.

[1] In general, the first five minutes of class are allocated for you to cover preliminaries. Similarly, five minutes at the end of class are set aside for wrap-up and final instructions. More time will be allocated to these sections as needed.

- Encourage students to get in contact with you outside of the classroom. Make sure students know when and where you hold office hours and, if you're willing, give them your cell number. Be sure to outline what is/is not acceptable to you in terms of times of calls and texts, etc.
- Outline the purpose of the course based on the course description in the syllabus. This is a good way to help students identify if they are in the right place. You can never be too careful with this on the first day of class!

Activity 1: My Story

(10 minutes)

Objectives

Students

- Experience a positive and welcoming atmosphere on their first day of this course.
- Begin to build a relationship with their instructor through hearing her or his story.
- Experience the use of success quotes or positive affirmations to inspire and motivate.

1. **My Story**

    - Ask students to listen to your story and, if they feel so moved, to write down their own question(s) that they would like you to answer.
    - Share your own perspectives on and experiences with success at math by telling a personal story. This serves not only to introduce you to the students, but also helps to establish a common understanding that struggle and effective effort are expected of college students on your campus. Use the My Story sample (Appendix 1-B) as a guide and ensure that your own story embeds similar key themes (personal choice and motivation to succeed, effort over natural ability, making a plan, finding resources, keeping the big picture in mind, etc.).
    - Bring students' attention to the success quotes and positive affirmations in the room and invite them to contribute additional affirmative quotes throughout the semester. Reinforce your commitment to making this a fun, satisfying, and valuable course for your students and state your expectations for their participation.

Activity 2: Letting go of fears and anxiety about math

(30 minutes)

Objectives

Students

- Discuss the many things that college students must juggle.
- Discuss the many challenges that college students may face.
- Discuss the many resources that students can use or rely upon to help them overcome challenges.
- Engage in a fun activity to understand that all college students have a lot to juggle and face many challenges, but have a variety of resources to help them persist.
- Begin to examine and let go of anxieties about college and math in particular.

Note: *In this demonstration activity, balloons will represent the many things that students must juggle (e.g., roles they must play, emotional ups and downs, academic demands, anxiety about math). Each student will play a role in the activity—as students, challenges, resources, or observers. The objective is for the "students" to keep the balloons in the air while "challenges" try to knock the balloons down, "resources" help to keep the balloons aloft, and "observers" keep a record of process.*

1. **Arrange students into four groups according to the type of candy they selected.**
    - Talk briefly about how group work will evolve throughout the semester. This informal group will not be the same group students will do the majority of work with this term—but they will spend a lot of time working in groups. They will also have the opportunity to work with other students throughout the term, so they should expect class discussions like this regularly. The *Foundations for Mathematical Reasoning* course they are taking also has this kind of engagement.
2. **Have students blow up their balloons.**
    - If they have not already done so, have students blow up their balloons.
3. **Assign roles to each group of students.**
    - Students: Their task is to "be students" trying to keep all of the balloons in the air for as long as possible. The balloons will represent all the things that students juggle; therefore, keeping the balloons in the air represents students' successfully making it through the semester.
    - Challenges: Their task is to represent the things that interfere with the students' obligations by trying to knock all the balloons to the ground.
    - Resources: Their task is to represent all of the resources available on and off campus that can support students by helping to keep the balloons in the air.

- Observers: Their task is to record the challenges and solutions they hear and see during the activity; this group will help lead the debrief portion of the activity.

4. **Have students write answers to the question "What are the things that you juggle in your life?" on the balloons.**
    - Write one answer per balloon; students will need to share markers and you will need to make sure that everyone does not record the same answer on their balloon.
    - The following questions can help your students to identify more specifics of what they juggle:
        - What roles do you play in your life? (e.g., student, employee, parent, sibling, roommate, caregiver, friend)
        - What classes are you taking this semester? (e.g,. *Frameworks*, math, English, reading.
        - What are some of your feelings about studying math?

          It may help to offer students some prompts—words that represent the consequences of anxiety, categorized[2] according to emotions (*frustrated, unhappy*), physical sensations (*sweaty, feeling sickly*), actions (*lashing out, avoidance*), or thoughts (*can't think, unable to make a decision*). Students may use words such as *fearful, hatred, anxious, worried, tearful, emotional, sick, desire to escape, threatened, can't think, hopeless, stupid,* or *useless*. Join in the game by writing a few of your own adjectives, especially around a category of consequences that may not be given much coverage by students themselves.
5. **Have students in the other groups give their blown-up balloons to the group representing students.**
6. **Have the students group stand up, toss the balloons up into the air, and try to keep them there.**
7. **As the students group works, ask the challenges and resources groups to brainstorm in preparation for entering the demonstration.**
    - Challenges: What in your lives (consider family and work, motivation, bad habits, stressors, and unexpected road bumps such as illness or loss of income) can affect your ability to meet your commitment to doing well in college?
    - Resources: What resources are available to help you overcome challenges? Consider people and services available through the college as well as personal resources such as family and friends.

2 These categories were informed by the author's review of the Anxiety Centre's "Anxiety Symptoms, Anxiety Attack Symptoms (Panic Attack Symptoms), Symptoms of Anxiety," retrieved December 19, 2012, from www.anxietycentre.com/anxiety-symptoms.shtml, and additional materials shared by University of Texas educational psychology instructors.

8. **After the students group has a chance to get all the balloons up in the air and the challenges and resources groups have brainstormed, invite the challenges and resources groups to join in and try to keep up/knock down the balloons**.
    - Challenges and resources should state the challenge or resource they are representing as they knock down or prop up balloons.
    - If students in the challenges group are each representing a specific challenge, they do not need to try to knock down a balloon that matches up with their challenge. If they do, it's fine, but trying to be that specific during this activity could become cumbersome and distracting.
    - However, the members of the resources group *should* identify a specific challenge that matches up with the specific resource they represent, and they should focus on keeping aloft the balloon the challenge is trying to knock down. For example, if a balloon has been knocked to the ground by the challenge "I've never been very good at math," the resource could be "Visit the tutoring center." For the challenge "my car breaks down on my way to the math exam," the resource could be "talk with the instructor as soon as there is a problem. Work with her to come up with a solution."
9. **Debrief with a whole-class discussion**
    - Ask the group of observers to discuss what they noted about the activity.
        - What combination of challenge/resource did they think is most helpful?
        - Did their perception of what was happening change as the demonstration went along?
    - Ask participants in the students, challenges, and resources groups to discuss their experience during the activity.
        - How did you feel as you were trying to juggle all of your responsibilities?

It is easy to get overwhelmed and struggle to keep things afloat when there are so many things going on—like trying to keep too many balloons to keep in the air at once. No single student could have kept so many balloons in the air—the class needed to work together to be as successful as it was. The same is true for college success—everyone will need to identify resources they can use when they feel overwhelmed.

You do have control over what you think and feel. Any time you find yourself obsessively worrying or anxious during the semester, reflect on the balloon activity and the resources and solutions you and your classmates generated. The challenges themselves are not the issue; rather, it is our beliefs about what those challenges represent that can contribute to anxiety and fear OR propel us to take action and meet the challenge head on. We will work this semester to better understand our beliefs and build smart habits to help us use our resources wisely and persist through college.

Activity 3: Syllabus Introduction

(15 minutes)

Objectives

Students

- Begin to understand course expectations.
- Use the syllabus and syllabus quiz to engage with key information and supports that are described in the course syllabus.
- Use the Difference That Makes a Difference handout as a tool for exploring the course syllabus and for understanding attitudes and actions toward which to aspire as a college student.

1. **Keep students in their informal groups.**
2. **Distribute the following to each student:**
    - One copy of the syllabus.
    - The Difference That Makes a Difference handout (Appendix 1-D). Refer to the last activity, as many of the items on this handout will have been mentioned in the last activity.
3. **Outline the purpose for the activity.**
    - Tell students that they will work in their groups to identify information provided on the syllabus they can use to help them succeed throughout the semester. Encourage students to mark up their syllabus as they identify (a) the topics that will be covered throughout the course, (b) class policies and procedures, and (c) the main assignments of the course and how they will be graded.
    - Encourage students to use the Difference That Makes a Difference handout as a reference for things to identify in the syllabus. For example, "I make it a priority to attend all my classes" on the handout matches up with the attendance requirement and tardy policy on the syllabus.
4. **Allow about 10 minutes for students to begin work on the Syllabus Quiz.**
    - They will complete the quiz for homework.
5. **Debrief with a whole-class discussion**.
    - One debrief strategy could be to ask each group to share one thing they noted in their group discussions.
    - Alternatively, you could select several high-level course topics from the syllabus (e.g., time management, organizing study groups, goal setting) and ask groups to share what they discussed about how those topics can help students succeed.
    - This is also a good time to have students really think about areas they think they need to focus on throughout the semester.

Students should leave this discussion understanding the key topics in the course, how they are expected to prepare for class, and the key assignments they will complete throughout the semester. You are trying to foster a sense of belonging in the class, helping students see that this is a space for exploring new ideas, where no one has everything perfectly figured out—but they are expected to put forth effort to increase their skills and create positive mindsets toward academic and life tasks.

Wrap-Up

(10 minutes)

Recap the three most important ideas from this lesson with your students:

- This course supports you in taking personal responsibility for your success in college by helping you identify and use key strategies and resources.
- In this course, everyone is part of a supportive learning community where it is okay to make mistakes and ask for help.
- The instructors of this course have high expectations and are committed to supporting you in meeting them.

Assign the following:

- **Student Information Form**: If students have not turned in this form before leaving on the first class day, they should turn it in at the start of the second day.
- **Assessment:** Students should complete the Collegiate Learning Assessment before the second week of class. Tell students that the purpose of this assessment is for them to get a baseline idea of their motivation and use of learning strategies. Encourage students to be honest in completing the assessment and not just choose the responses that seem to be what a good student would choose or what they wish they were like. There is no grade associated with answering these questions "correctly" as there are no right or wrong answers. The results of this assessment will help students target their energies this semester and work on those areas that need improvement. Tell students they will complete this assessment again at the end of the semester, after which they will have an opportunity to analyze how their scores changed during the semester, reflecting on their growth as a result of this course.
- **Syllabus Quiz:** Tell students to complete the syllabus quiz (see course packet) on their own before the next class.
    - Confirm that every student has a copy of the syllabus quiz and remind them to carefully read and sign the contract that is part of the quiz.

Preview what will be covered in the next lesson:

- Students will participate in a scavenger hunt on campus, with the aim of having them physically locate the resources that are available to help them succeed.

Appendix 1-A: List of Personal Questions[3]

- How many brothers or sisters do you have, if any?
- What's your favorite food?
- Do you have a pet and, if so, what kind is it and what's its name and age?
- Who is your best friend?
- Within your family, who is your favorite relative?
- What month is your birthday?
- What are your favorite TV shows?
- What's your favorite ice cream flavor?
- What subject did you enjoy most at school?
- What was your easiest subject at school?
- What kind of car do you drive?
- If you didn't drive the car that you have, what car would you want to own and drive?
- What's your favorite book?
- If money were no object, where would you spend your next vacation?
- What did you like most about school?
- What gives you the most satisfaction from being a teacher?
- Did you always want to be a teacher and, if not, what other jobs have you had since college?
- If you could live anywhere in the world, where would it be and why?
- Who do you admire most—someone living today or someone in history?
- If you could change one thing about yourself, what would it be?
- What one thing do you like most about yourself?
- What's been the best thing that's happened to you in the past month/week?
- What's your favorite time of year?
- What kind of music do you listen to?
- What's your favorite song?
- What kind of pizza do you most typically order?
- Do you like sports and, if so, which one and why?
- Which sports hero do you most admire and why?
- What's the worst vacation memory you have?
- If you won the lottery tomorrow, what would be the first thing you'd do?
- What qualities do you admire most in your best friend?
- Did you have a favorite toy when you were a child and, if so, what was it?
- What's the one thing you own that you treasure the most?

[3]Special thanks to our Development Team members for contributing ideas for these questions.

Appendix 1-B: My Story Example

It had been at least 20 years since I'd been in a classroom environment so I was understandably nervous about going back to school to get my PhD. My degree is in Educational Psychology and I discovered (only after I'd registered and was totally committed to the program) that each semester I had to take at least one statistics course.

I'd never taken a statistics class before (and it was years since I'd done math), but it sounded fun and I knew it was going to be essential to my success in my new field. I mean, if I wanted to graduate, then there was no way I could avoid stats!

The first day of my first statistics class, the instructor walked in, turned on the projector and began talking over his slides. It all sounded like a foreign language to me. I looked around to see if anyone else looked as terrified as I felt, but everyone just had their heads down, taking notes.

Have you heard the expression, "a deer caught in the headlights"? Well, that was how I felt that day. I really wondered what I had let myself in for and seriously questioned whether going back to school had been a good idea. I tried to take good notes, but because I didn't know what I was supposed to be doing, what information was most important, or how I was supposed to understand what the instructor was talking about, I felt completely lost. I remember being grateful that we were seated in a large auditorium with the lights dimmed, because I could feel my eyes welling up. I was really embarrassed!

After the time was up, the instructor simply shut off the projector, gathered his papers, and left the room. I didn't know any of the other students, and everyone else seemed as if they knew what they were doing. For the first time in my life, I felt completely helpless—and hopeless.

The thing was, it was really important to me to get my degree. After the shock subsided I began to feel angry. And when I get angry, then I get very stubborn indeed! I told myself I was going to pass that darned statistics class, come hell or high water. I just needed to figure out how I was going to do it … especially as the first test was coming up in just a few weeks' time and I needed to do well so I didn't fall behind. I also knew that doing poorly would be a blow to my self-confidence, which was already getting close to the floor!

As luck would have it, one of my other courses was called Human Learning, and the assigned textbook was really readable and interesting. In fact, it's been the only book I've ever kept from my time at college; I still refer to it today. I knew that there were chapters that talked about things like self-regulated learning, goal setting, and lots of psychological jargon like "attributions" and "self-efficacy," which simply mean the reasons we give for why we succeed or fail. So, before doing anything else, I dug into that book.

I found out a lot of interesting things reading those chapters, such as that success in college has very little to do with luck and a lot to do with effort and persistence. I knew I couldn't do anything about the way the statistics instructor taught us—that was out of my control. But I did know, because I'd experienced this myself in other situations, that when I put my mind to it, when I carved out the time and really worked hard, I could get a passing grade.

One of the best discoveries to come out of the latest research into how the brain works is discovering that our brains are "plastic." We used to think that intelligence was fixed and that you were either born smart—or you weren't. But that's been proven to be completely wrong by any number of scientists. In fact, we can set ourselves up for success by thinking more positively, finding reasons for doing whatever we find hard, and adopting some key learning strategies. This knowledge helped convince me that my inability to get statistics was only temporary. It certainly wasn't helped by the couldn't-care-less attitude of the instructor, but I wasn't going to give him power over my college experience and possibly my career by flunking his course.

I made a choice then and there that I was going to ace that course . . . and that's exactly what I did. Even though, that very first day, such an achievement seemed a million miles away.

Everything I learned that helped me be successful in my statistics courses and throughout my studies are things that you will have a chance to experience during this course. In a moment you'll be able to see what those topics are when we go through the syllabus together, and to talk about them in your small groups.

But let me end with the highlights of what I did to succeed at statistics:

- I made a **conscious choice** that I would **not** be a victim—just because the instructor was difficult didn't mean I had to join him and give up at the first hurdle! I determined instead to be a champion . . . I would succeed despite him—because it was my life and my career that was at stake and I wasn't going to let anyone spoil that for me.
- I set some pretty **ambitious goals** for myself—which meant a certain amount of sacrifice in terms of the time I dedicated to learning the material for this statistics course. I just kept my eye on the big picture: This course was just a small part of what was really important to me.
- But I also figured out how to **work smarter** as well as harder. I learned what successful students do that unsuccessful students don't do—in particular, how to be a good learning advocate for myself. I went to see the instructor and the teaching assistant in office hours when I couldn't understand something; I jumped on my challenges immediately, rather than letting them build up; I talked to other students who found statistics a lot easier than I did and asked if I could buddy up with them; I organized study groups and learned how to run them effectively so they didn't deteriorate into social events where no work got done.
- But perhaps what I learned that was most important of all was that **I wasn't alone.** Everyone looked as if they knew what they were doing, but we were all terrified . . . and as we became friends, we found it helped to talk things through, ask each other questions, and actively take control of our learning.

Honestly? I can't say I ever loved statistics—just like I'd never really warmed to math when I took it in high school—but I knew it was an important means to an end for me, so that made it

important for me to succeed. And you know what I think? In that way it's a bit like being at work. Sometimes you have to work with someone you don't especially like, but you know that you need to get along with that colleague in order to succeed at something that is important—like your job or the chance of getting promoted.

Statistics helped me get my degree and gave me a sense that although it's not a subject that I find easy or enjoyable, it's something I can be good at when I really try. That's the kind of experience I want for you and why we have designed this course to help you pass your math courses—not just the one you're currently registered for, but all the others you may need to take to get you through college and into the career you want.

Appendix 1-C: Student Information Sheet

Personal

Full Name:

Current Address:

Ways to contact you (complete as applicable):

- Home phone:
- Cell phone:
- Work phone (give best hours to reach):
- Email:
- Other:

Do you work? Yes / No

- If Yes: Full time or Part-Time?
- How many hours?

Academic

What is your major? (put "undeclared" if you haven't declared a major yet)

Where did you go to high school?

In what year did you graduate from high school?

Do you plan to transfer from this college? Yes / No

- If yes, to which institution do you plan to transfer?

What other colleges or universities (if any) have you attended?

Course Specific

List the courses in which you are enrolled in this semester.

What are you most hoping to gain from this course?

What grade do you intend to earn in this course?

What challenges could prevent you from earning your goal grade in this course?

Appendix 1-D: Successful Students: The Difference That Makes the Difference

Beliefs (opinions/confidence/trust in)

- College experiences and a degree help me achieve bigger career and life goals.
- It is up to me to take responsibility for my own learning.
- Resources are available to me on campus; I need to find out what they are and use them.
- Earning the grades I want this semester will require more than the minimum amount of work.
- During my journey through college, it is not what happens to me that matters, but how I react to challenges along the way.
- When I am in a new environment and stretching myself, I do not expect instant results; I know that good things come to me with time and patience.
- Success is a process, not a destination.
- I am fully supported!

Attitudes and emotions (feelings about)

- I want more than just a grade—I get a bigger sense of accomplishment when I understand and can apply what I learn in college.
- I know that if I treat my instructors with respect, they are more likely to want to help me succeed.
- I help myself feel in control of my time and on top of my work by creating a study schedule—and sticking to it.
- I quickly recognize when I start to feel lost or unhappy about my academic progress; I speak to my instructor or advisors about why and what I can do to feel more in control.
- I like to show initiative.
- I do whatever I can to feel part of the college community.

Thoughts (consideration/reflection)

- I think about how to connect new course material to what I already know and/or have learned in other courses.
- I give considerable thought to what courses I need to take in the future to help me achieve my academic and career goals.
- When something negative happens, I consider what I did to contribute to that outcome and how I might do things differently next time.
- I know that feedback from my instructors is an opportunity for learning and improving.

Behaviors (actions/reactions)

- I keep a calendar of all my commitments (academic and otherwise) to help me stay organized.
- I make it a priority to attend all my classes.
- I do what is necessary so I can pay attention and focus in class (including getting enough sleep and eating well).
- I speak up in class and show myself to be an active, engaged member of that community.
- I ask for advice and guidance from academic advisors, career counselors, tutors/mentors, financial aid staff, etc., to help me make good choices and decisions.
- I complete all my assignments, taking care to present neat, accurate work.

Lesson 2 Update
Finding the Support to Be Successful

Update note

See ***Frameworks Course Essentials***[3] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Activity 3: Introduction to the scavenger hunt

Faculty voices: Activity implementation

- "I shortened the scavenger hunt. Our campus is not that big, and too much was spent on it."
- "Instructors must customize the scavenger hunt to those resources available on the individual campus. Students respond positively to visits from campus personnel."

Wrap-up

Link update for homework assignment

- Here is an updated citation for the article about the brain being like a muscle:

  Mindset Works. (2013). "You can grow your intelligence: New research shows the brain can be developed like a muscle." Part of "Introductory Unit: Mindset Survey and Reflection: Reading for Activity Option 1 or 2." Pages 17–22 in *Brainology® Curriculum Guide for Teachers: Introductory Unit*. Walnut, CA: Mindset Works. Retrieved June 15, 2014, from http://www.brainology.us/websitemedia/youcangrowyourintelligence.pdf

[3] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Appendix 2-A: Campus scavenger hunt

Facilitation note

- The prompts included in this document are provided as examples of the types of questions you may pose to your students. Feel free to modify the document to fit your classroom and campus needs.

Lesson 2
Finding the Support to Be Successful

Overview

The activities in this lesson continue to promote a sense of community among students and to set a positive and supportive tone. Any lingering questions about course expectations will be addressed during a brief discussion. Students will also participate in a scavenger hunt designed to help them identify and learn about campus resources.

Week: 1 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendix 2-A

Student Objectives

Locate and use support center services.

- Students identify and take advantage of support services on campus, including academic advising, career counseling, financial aid services, libraries, disability services, and tutoring services.

Resources and Preparation

1. **Read background materials to familiarize yourself with why and how anxiety interferes with students' memory and their ability to learn and impedes academic performance**.
2. **Entry logistics**
   - Select the new success quotes and positive affirmations that students see when they enter the classroom.
   - Have the student attendance sheet for the week prepared.
3. **Make copies of the following materials for students:**
   - Campus Scavenger Hunt guidelines and questions (Appendix 2-A)—1 per student.
   - A campus map that identifies the locations students will visit during this exercise.

Materials and Technology Required

- *For the Scavenger Hunt:* Campus maps showing offices and other areas that students are required to visit and the Scavenger Hunt handout (Appendix 2-A)

4. **Activity 3:**
    - Inform all the relevant offices and locations that students from your course will be descending on them in the coming week.
5. **For the next class period:**
    - Preview web articles to familiarize yourself with the background information on the ideas of Arthur Markman.

Instructional Plan

Preliminaries
(5 minutes)

1. Collect
    - Student Information Form
    - Contract from the Syllabus Quiz (Students turn in the quiz itself during Activity 2.)
2. Discuss outstanding work.
    - Collegiate Learning Assessment (Students should complete this within 1 week.)

Activity 1: Continuing to get to know one another
(15 minutes)

Objective
Students

- Continue to get to know classmates and the instructor.

1. **Continue getting to know one another.**
    - During these first few lessons, continue to build a sense of community and encourage students to get to know one another and you. You can do this however you choose. Some ideas include having students write down on a slip of paper one interesting thing about themselves that others could not know just by looking at them (e.g., I rode in the MS 150 bicycle tour fundraiser last year; I have eight siblings). Then draw and read one or two cards each day and encourage students to guess who it might be. Likewise, you could encourage students to submit index cards with questions they have about you, then draw and respond to one or two cards each day.

Activity 2: More about the Frameworks course

(20 minutes)

Objectives

Students

- Review the syllabus and resolve any lingering questions about the course requirements.
- Understand key course policies such as attendance requirements and expected study time outside of class.
  - Begin to understand that, as college students, they will have greater autonomy and responsibility.

1. **Review the syllabus.**
    - Ask students to take out the syllabus and their completed syllabus quiz. Have them jot down the three most important things they learned by completing the syllabus quiz.
    - Then ask students to discuss, in pairs or trios, the similarities and differences among the things they deemed important. As students are sharing, listen for any comments that may be appropriate to share with the whole group.
    - Briefly share your observations from the small group discussion and then answer any lingering questions students may have about the syllabus or the syllabus quiz.
    - Carefully review the key policies in the syllabus, emphasizing that all college students should expect to spend two to three hours studying outside of class for every hour they spend in class.
    - Collect the syllabus quiz.
2. **Paired discussion**
    - Ask students to turn to a partner and discuss their responses to these questions:
        - In what ways is this course different from high school courses or other college courses you have taken?
        - As a college student, what are some things that you have more control over?
    - After four or five minutes of paired discussion, promote a deepening of the discussion by encouraging a few pairs of students to share what they discussed and to identify commonalities and differences among their perspectives.
    - Wrap up the discussion by reminding students to contact you if they have concerns or additional questions about the course expectations.

Activity 3: Introduction to the Scavenger Hunt

(15 minutes)

Objectives

Students

- Engage in a scavenger hunt to explore campus resources.
- Discuss the importance of asking for help and knowing where to find it.

1. **Distribute campus maps, if available, and the Scavenger Hunt handout with instructions and questions for students to answer.**[1]
2. **Discuss the purpose of this lesson.**
    - Seeking help is an important yet often overlooked way to begin reducing the anxiety and stress you may feel in college. Seeking and taking advantage of help offered on campus can make you feel less alone, and, in taking the action to find help, you also reassert a sense of control over your life. One characteristic of successful college students is that they act as learning advocates for themselves. This means that they have developed the ability to identify early on when they feel lost or do not know something and, rather than struggle unnecessarily, they choose to ask for help. To be able to act as your own learning advocate, however, you first need to know what kind of assistance is available and where it is located. The scavenger hunt is intended to provide this knowledge.
3. **Have students self-select into groups of two or three for the scavenger hunt**.
    - Hand out the Campus Scavenger Hunt (Appendix 2-A) and ask students to review it. Students will complete the table. Some questions also require students to collect a brochure or other print material; they should attach those materials to the completed Scavenger Hunt handout that they will turn in during Lesson 7.
4. **Model how to respond to one of the questions.**
    - Point out to students that there will be some questions they can answer simply by looking online or visiting the center, office, library, etc., and picking up relevant literature. (For questions students can answer by going online, tell them to record the URL of the web page that provided the answer in the "Location Visited" blank on the Scavenger Hunt handout.) However, there will be some questions that only a human being can answer. (This is a good place to begin introducing the language you will use for critical thinking exercises later in the semester.)

[1] This activity was inspired by and with permission adapted from some of the items used by Brazosport College instructors.

- For example, at the Academic Advising Center, students can find out what the center's hours are or how to go about making an appointment by looking online or at available printed materials. However, they will probably need to speak to someone to find out the least busy times of the week (or semester) to make an appointment so they can spend more time with an advisor.

5. **Release the student groups to begin the scavenger hunt.**
    - If time allows, tell students they will be released early to begin the hunt, and make sure they understand that this is their main assignment for this lesson. Suggest that each team identify all of the places on their maps **before** setting out. Remind students that they don't have to make all the visits in a single day.
    - Make sure students understand the assignment. Ask them to quickly get into their pairs or threesomes; be sure that all students have partners. If there is a single student who does not have a group, have him or her join one of the other groups.

Wrap-Up

(10 minutes—allows 20 minutes for students to leave early for the scavenger hunt)

Summarize the key ideas of this lesson:

- The course syllabus provides critical information about grading, attendance, and course requirements.
- College students have greater autonomy and responsibility than high school students.
- The scavenger hunt requires students to determine where they can get help when they need it.

Assign the following:

- Scavenger Hunt: Student groups should complete the Scavenger Hunt prior to Lesson 7. They should be prepared to share the coolest information they discovered on the hunt, the most surprising/fascinating fact, or something they learned that they felt was very important for them to know personally.
- Read "You can grow your brain." (available here: http://seattlecentral.edu/faculty/ jwright/ math91/Assignments/due_10_03/ YouCanGrowYourBrainArticle.pdf). Write down and be prepared to share the three most important ideas from the article.

Preview what will be covered in the next lesson:

- The next lesson will explore smart thinking and smart habits, the value of journaling, and brain changes that occur while learning.

Appendix 2-A: Campus Scavenger Hunt

Name: _____

Instructions

Note that for this activity you need to do two things:

1. Identify *where* to find the relevant information (and there is not a single correct answer, as the information may be available in multiple locations across campus).
2. Supply the correct answer to the question.

For questions with an asterisk (*), provide physical evidence (in the form of brochures, newsletters, handouts, etc.) that you visited the location, and attach the evidence securely to this handout.

Prompt	Location visited (where did you find the answer?	Answer
1. Who is the president of the college?		
2. What are the responsibilities of an academic dean?		
3.* What types of tutoring are available on campus and where can you find tutors?		
4.* Does the college provide counseling and advising? Name three places where this kind of assistance is available.		
5. When does registration for the next semester begin?		
6.* Name three campus clubs that you might be interested in joining.		
7.* What are the weekday and weekend library hours?		
8.* How do you make an appointment with academic advising staff? What are the best times to make appointments (so you get to visit longer with an advisor)?		
9. What is the meaning of the word *plagiarism*? Provide an example.		

Prompt	Location visited (where did you find the answer?	Answer
10. Where is the computer lab on campus and what are its hours? (If there's more than one, list all of them and their hours.)		
11. What are the office hours of your instructor for this course, and where do they take place?		
12. What is the name of the teaching assistant for this course, where is her or his office, and what are her or his office hours?		
13.* Where is the health center located? Name three services offered by the health center.		
14.* How many career advisors work in the Career Center?		
15. Name four locations on campus where you can get a full meal (i.e., not just snacks).		
16.* What is the current annual membership fee for the campus gym?		
17. What is the phone number for the campus police?		
18.* List the headline of one article in the current issue of the campus newspaper/magazine.		
19.* Where can you find a map of campus parking locations?		
20.* What do you have to provide to get a permit to park in spaces reserved for people with disabilities?		

Lesson 3 Update
The Plastic Brain and Smart Thinking

Update note

There is a tremendous amount of content to cover in this lesson. You may find yourself needing to spend extra time digging into the activities. It will be time well spent, as students have reported that this lesson, more than any other, resonated with them and motivated them to actually try changing their learning habits.

After this lesson, students felt more confident that they, too, could change their brains and become more strategic learners even if they had previously struggled. Students will have time in future lessons (10, 11, 12) to study how the brain works and to develop learning strategies that capitalize on these processes.

See Frameworks Course Essentials[4] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Faculty voices: Lesson impact

- "Students were amazed at what they learned about the brain. 'Your plastic brain' was extremely beneficial along with the discussion about 'fixed intelligence.' I think it set the stage for alleviating some of their 'self-fulfilled prophesies' about their abilities and capabilities to conquer math!"
- "This lesson is an essential one, one that must not be rushed through … There were a lot of group discussions with this lesson."

[4] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Activity 1: Your plastic brain

Link update

- The video referenced during the "What happens in extreme cases?" prompt (http://www.youtube.com/watch?v=TSu9HGnlMV0) is no longer available on this specific YouTube channel, nor is it available on the Discovery Channel website.

  The subject of this video, Jody Miller, had the right hemisphere of her brain removed when she was nine years old. Through intense rehabilitation, her left hemisphere compensated and created new neural pathways to help her regain function previously controlled by the now removed portion of her brain. Here are some alternate sources of videos and information about Jody:

  - "Brain Plasticity – the story of Jody" available at https://www.youtube.com/watch?v=VaDlLD97CLM
  - Stress Free Life's YouTube post, "The Phenomenon of Neuroplasticity" (at 2:05) available at https://www.youtube.com/watch?v=rDTiZpPyqRk

Facilitation note: Connection to Foundations *course*

- In the first *Foundations* class, students construct an understanding of the enormity of large numbers in an activity titled "How Big is a Billion?" You may want to have them share in your classroom what they know about such a large number as you build understanding around the brain containing 100 billion neurons. Students built a data table using multiple processes similar to that discussed in the link provided in this *Frameworks* lesson (http://faculty.washington.edu/chudler/what.html). You may consider tying that activity back into this lesson.

Lesson 3
The Plastic Brain and Smart Thinking

Overview

Week: 2 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 4

Supplementary Materials: None

Many students believe that they come to school with a fixed amount of intelligence—that they're either smart or they're not. And if they believe (or have been told by others) that they are *not* especially intelligent, then it's not surprising that many give a limited amount of attention and effort to learning.

The goal of this lesson is let students in on an important scientific discovery: Recent advances in a field of brain science known as *neuroplasticity* show that many of our prior notions about the brain—such as that we're born with a certain number of neurons and these die off and diminish as we age—are false. The brain is a remarkably adaptable, or *plastic*, organ that can change, grow, and improve throughout our lives. And the plasticity of the brain is enhanced by challenge and learning!

This lesson introduces students to some basic brain anatomy. They learn how new synapses are formed when we learn new things and how neural connections are strengthened with persistence and practice. Students then consider some of the strongest neural connections in their brains—those associated with habits—and discuss how habits are formed and how they can be broken. Students reflect on current habits both good and bad and identify an unproductive habit they will work toward breaking over the next five weeks.

The final activity is a discussion of the value of journaling that introduces students to their first journal assignment, which focuses on students' current note-taking habits.

Key Concepts

Neuroplasticity: The brain's ability to reorganize itself by forming new neural connections throughout life.

Entity view of intelligence (also referred to as fixed view of intelligence): The view that you are born with a certain amount of intelligence that never changes and that there is nothing you can do to change how smart you are.

Incremental view of intelligence (also referred to as malleable or growth view of intelligence): The view that intelligence is malleable and can be grown through effective effort and persistent practice.

Habit: Any acquired behavior pattern that has been practiced so regularly that is has become almost automatic.

Student Objectives

Apply strategies to maintain motivation.

- Students maintain their motivation by focusing on controllable academic behaviors and using strategies to monitor and manage their attitudes, emotions, and thoughts when facing challenging tasks or academic setbacks.

Develop a process for replacing negative, self-defeating habits with positive habits.

- Students identify habits and beliefs that have interfered with their success and learn to apply metacognitive awareness to plan, monitor, evaluate, and reflect on their learning and to seek and use feedback to improve performance.

Resources and Preparation

Materials and Technology Required

- Projector, internet access

1. **Review the following short articles:**
   - "Habits: How They Form and How to Break Them," National Public Radio 3/5/2012: http://www.npr.org/2012/03/05/147192599/habits-how-they-form-and-how-to-break-them.
   - "Good Habits," by Arthur Markman: http://drphil.com/articles/article/540/
   - "Bad Habits and Your World," by Arthur Markman http://drphil.com/articles/article/548
2. **Entry logistics**
   - Select the new success quotes and positive affirmations that students will see when they enter the classroom.
   - Prepare the student attendance sheet for the week.
3. **Prepare for the first three activities (Your plastic brain, Introduction to smart thinking, Establishing smart habits).**
   - Make sure that the links to the videos and articles needed for these activities work.
4. **Prepare for Activity 4: The Value of Journaling.**
   - Be prepared to share your own journaling journey.
5. **For the next class period:**
   - Confirm that the computer lab has been booked for the next lesson and that there are enough working terminals for each student to have one. Identify whom to contact should there be any technological issues on the day. Also speak to the IT department to find out what materials, if any, are available for helping students navigate the Blackboard (or equivalent) system, campus email, and the college website generally.

Instructional Plan

Preliminaries
(5 minutes)

- Students should sit in groups of two or three.

Activity 1: Your plastic brain
(30 minutes)

Objectives
Students

- Explore introductory information about the brain, neurons, and synapses.
- Understand how purposeful engagement, persistence, and intelligence are related.

1. **Group discussion**: Have students sit in groups of two or three. Ask them to discuss the three most important ideas from the "You can grow your brain" article.
    - Allow students about five minutes to discuss the article, its most important ideas, and their reactions to it. Ask each group to identify one member who can summarize the group's discussion. Promote further discussion by selecting two or three groups to share their summaries.
2. **Introduce brain plasticity.**
    - Show a short YouTube video (http://www.youtube.com/watch?v=BEwg8TeipfQ) to introduce the main topic of brain plasticity. You can set the stage for this video by telling students that it is part of an award-winning documentary produced by the BBC called The Human Body (http://en.wikipedia.org/wiki/The_Human_Body_%28TV_series%29).
        - **Takeaway:** Make sure students understand that the important point in this YouTube clip is that the first time we learn something new, it is difficult for the signal to get across the synapse. Over time, these connections are strengthened and the brain becomes more efficient. Once we have learned something, the crossing of the synaptic gap is effortless.
    - Pose the following questions to the class: What happens in extreme cases? What if half of our brain was removed because of a debilitating disease? How much can the brain rewire itself when a major part of it is missing? Show this YouTube clip from the Discovery Channel: http://www.youtube.com/watch?v=TSu9HGnlMV0. Ask students to focus on the extent to which the brain physically rearranged itself in the little girl who had the right side of her brain completely removed.

There are some brain functions that cannot be reprogrammed; we are not focusing our efforts on these areas. We are focusing on what we can control, and in this case, we can control the amount of productive effort we put into creating new connections in our brains.

3. **Group discussion**: What surprises you about what you have learned about the brain? How is the bridge or pathway metaphor helpful in understanding how our brains change when we learn?
    - Ask students to discuss their reactions to both videos within their groups. Prompting questions could include: How many of you thought, or have been told, that you couldn't change your brain and that your level of intelligence was fixed, hardwired, unchangeable? What surprised you the most?
    - To erase any remaining skepticism about the brain's ability not only to create new neurons (the brain's nerve cells) but also to continuously make new connections among those neurons, cite some of the prestigious institutions that engage in neuroplasticity research, such as The National Institutes of Health, the University of California at Irvine, the University of Wisconsin-Madison, Baylor College of Medicine, the University of Texas Health Science Center, and Rice University. You can also mention books like Scientific American's *Brave New Brain.* Be sure, before attempting to move forward, that students are on board with the fact that the concept of the plastic or malleable brain is scientifically proven and not something you or educators have made up!
    - Introduce *purposeful engagement*. Purposeful engagement means choosing to change your brain in the same way that people choose to change their muscle strength or overall physical fitness by going to the gym or participating in sports: by making a choice, making an effort, and persisting in that effort over time.
    - Reassure students at this point that this isn't a lesson about the brain per se, but an illustration of how—with purposeful engagement—they will be smarter at the end of this course (and when they graduate college) than they were at the beginning. In fact, they will be smarter at the end of this lesson than they were when they came in the door!
4. **Group discussion:** What are our brains capable of anyway?
    - Pose the following question to the class: How many neurons or nerve cells are there in the brain? The answer is 100 billion (100,000,000,000). This is such a big number that it's likely to be hard for them to get their heads around it.
        - Making it more concrete: If you take 1 second to count each neuron, and there are 100 billion of them to count, how long would you be counting for? How long is 100 billion seconds? Give students a few minutes to attempt to calculate this themselves or, if you don't have time for the students to do the math, have them work through how they would begin to solve the problem

(e.g., move from seconds to minutes by dividing by 60, from minutes to hours by again dividing the number of minutes by 60, then move from hours to days by dividing by 24, then from days to years by dividing by 365. The answer (found here: http://faculty.washington.edu/ chudler/what.html) is roughly **3,171 years—**not counting leap years, which have an extra day!

- Dispel the myth that we use only 10% of our brains. Additional information about this can be found here: http://www.scientificamerican.com/article.cfm?id=people-only-use-10-percent-of-brain.

5. **Computer analogy and example**
    - Scientists have often used the analogy of a computer to describe the brain—in fact, the concept of the brain as machine has pervaded scientific thinking for centuries. Nowadays, scientists understand that the brain works more like the Internet and it's the *connections* among the nerve cells in the brain (neurons) that help to boost intelligence.
        - Example: London taxi drivers whose brains were studied by neuroscientists were found to have a larger hippocampus—an area of the brain responsible (among other things) for organizing and stories memories—than London bus drivers. Ask if any student can explain why that might be. [Answer: *London bus drivers maintain established routes. They don't need to use their memories to do this; they just drive the same routes over and over. London taxi drivers, however, never know when they pick up a fare which route they need to take to get that person to their destination. They learn the streets of London like the backs of their hands by going through years of extensive training. This learning needs to be stored in their memories so that it can be accessed for every unique driving challenge they are faced with.*]
6. **Wrap-up**
    - Transition to the next activity by asking, "How can knowledge about our brains help us as college students?"

People used to believe that everyone had a certain amount of intelligence and it could not be changed. This is a myth that science has disproved. In fact, anyone can get smarter with persistence and purposeful engagement.

Activity 2: Introduction to smart thinking

(10 minutes)

Objectives

Students

- Understand how neuroscience and cognitive psychology are related.
- Discuss Arthur Markman's framework for smart thinking.

1. **Introduce smart thinking.**
    - Briefly define and introduce the field of cognitive psychology and how it is related to neuroscience. Then provide some background information on Dr. Arthur Markman and his book *Smart Thinking*.[1]
    - Show the video in which Dr. Markman briefly introduces his formula for smart thinking: http://www.youtube.com/watch?v=trJ9Una2Q7w. If you are short on time, start at 1:12. Pause at 2:26.
    - Recap his formula:
        - Develop smart habits.
        - Acquire high-quality knowledge.
        - Apply high-quality knowledge.
    - Let students know they will be learning more about this formula as they proceed through this course. They will start by thinking about what it means to develop smart habits.

Activity 3: Establishing Smart Habits

(20 minutes)

Objectives

Students

- Reflect on personal habits.
- Understand how habits are formed by the neural connections in the brain.
- Investigate strategies for establishing smart habits or changing unproductive habits.
- Discuss unproductive academic habits to target with the habit-changing process.

[1] See http://careersinpsychology.org/becoming-a-cognitive-psychologist/ and http://careersinpsychology.org/interview/dr-art-markman/.

1. **Individual reflection on habits**
    - Have students reflect on some of their strongest neural connections—those associated with habits and routines. What are your morning routines? Which are so automatic that you don't even really have to think about them? How are these routines disrupted when you move to a new home or stay in an unfamiliar home or hotel?
    - Then ask students to reflect on their academic habits. What are some academic routines that are so automatic that you don't have to think about them? How do these habits help you as a student?
2. **Summarize how habits are formed and broken.**
    - Habits are actions that you perform automatically without having to think about it. The mind is designed for maximum efficiency and to think as little as possible. It is a "habit-making machine." Without habits, we'd have to think too hard—imagine having to think about what route to take to get home every day. Good habits are a crucial component of what Art Markman describes as "smart thinking." Habits help you avoid spending valuable time and energy on tasks that can be automatic. However, because they are automatic, they are difficult to alter.
    - A habit is formed "any time there is a consistent and repeated mapping between your physical and mental world and some behavior" (Markman, 2012, p. 55)[2]. They are driven by the environment. At first, forming a new habit requires effort—each time you pursue a given goal (e.g., taking a new route home), your brain stores a memory; eventually there are enough memories stored that the behavior is automatic.
    - There are many books and articles that discuss habit formation and the breaking of bad habits. Two prominent examples in recent years are Arthur Markman's *Smart Thinking* and Charles Duhigg's *The Power of Habit*. Both authors focus on the neuroscience of habit formation and how understanding how our brains work can help people form good habits and break bad ones.
    - There are two critical components to changing habits: 1) Stop the old behavior. 2) Replace the old behavior with new behavior. Since every habit is associated with a goal (e.g., the most efficient route home, coping with stress), the new habit's goal competes with the old habit's goal.
3. **Show the rest of the video interview with Dr. Markman in which he discusses how to change a bad habit:** http://www.youtube.com/watch?v=trJ9Una2Q7w. Start at 2:25 if you have to reload the page.
    - Markman discusses habits from the perspective of New Year's resolutions, which are nearly always about changing bad habits. He has five recommendations for

[2] Markman, Arthur. (2012). Smart thinking: Three essential keys to solve problems, innovate, and get things done. Perigee: New York.

changing a bad habit into a good habit: know thyself, start small, don't replace something with nothing, plan to fail, and be kind to yourself. For more on this topic, see http://www.myhealthnewsdaily.com/2048-years-resolutions-5-tips-changing-habits.html

4. **Group discussion:** What is a habit you want to break?
    - Have each student record a habit that they want to break. This can be a personal habit or an academic habit. Suggest that students target a habit that may be interfering with their success in school. Ask two or three volunteers to share the habit they want to change (e.g., biting their nails, skipping lunch, only looking over class notes right before a test, eating while reading or watching TV).
    - Engage students in the habit diary process. Ask them to think of the last time they engaged in the habit they want to break and then have them record their responses to the habit diary questions: What time was it? Where were you? How were you feeling? What were you doing? What were you thinking? Connect these questions to the habit-formation process, emphasizing the connection to a particular environment or state of mind.
    - Discuss the importance of the habit diary in the overall set of recommendations for habit breaking: know thyself, start small, don't replace something with nothing, plan to fail, and be kind to yourself.
    - Strongly recommend to students that over the next week, they identify an unproductive academic habit they want to break and over the next month, they keep a habit journal of their efforts to break that unproductive academic habit.
    - As time permits, encourage pairs or small groups of students to discuss possible academic habits they would like to target for this process. As you wrap up this activity, ask that a few students share their initial ideas for an unproductive academic habit they would like to break.

Changing a habit, like changing your brain, requires planning and persistence—which is why for their next assignment, students will practice breaking a bad habit over the next week.

Activity 4: The value of journaling

(10 minutes)

Objectives

Students

- Learn about the instructor's personal journey with using a journal.
- Discuss the benefits of journaling.

1. **You might choose to begin this activity by sharing your own experience of journaling and/or keeping a diary and the personal benefits you have gained by doing so.**
2. **Move into a whole-class discussion by asking who among the students keeps a journal or diary (outside of this class) and why?**
    - Ask students to identify some of the reasons they keep a journal. Responses might include:
        - Unloading emotional baggage—the written equivalent of a rant or confiding in a close friend.
        - Keeping a record of my progress and personal development over time.
        - Identifying what's important to me.
        - Gaining perspective on a problem or unhappy situation.
        - Stimulating creativity (helps generate "aha" moments to solve problems).
        - Recording my life story.
        - Practicing writing to get better at it and feel more comfortable with it.
        - Exploring thoughts to know myself better.
3. **Discuss with students what the advantages—physical, emotional, intellectual, psychological—of keeping a journal or diary might be.**
    - A number of psychological studies (see Resources) have shown that *expressive writing*—that is, writing about experiences or feelings—can have a positive effect on mind and body.
        - One Belgian study revealed that participants who spent just a few minutes a day writing about their thoughts and feelings concerning a traumatic event lowered their levels of stress and boosted their self-esteem and happiness—more so than by talking about it.[3]

[3]Wiseman, R. (2009). "Creating the Perfect Diary," in *59 Seconds: Think a little, Change a Lot.* New York: Alfred A. Knopf, pp. 14–16.

  - Another study showed that the health of participants with chronic illnesses improved when they wrote about their thoughts and feelings.[4]
  - University of Texas at Austin Professor James W. Pennebaker has conducted studies that show that journaling boosts the immune system.[5]
- **Discussion point:** Considering what we've discussed about the value of expressive writing so far, in what ways can journaling support success in this course or other college courses?
- Let students know that many of their homework assignments in this course will require that they journal. Make connections to yesterday's discussion about the course syllabus, clarifying that responses to journal assignments must be between 250 and 500 words long, focused on the assigned topic, and free of spelling and grammar errors.

Journaling is an important tool for self-regulation. Having a system for reflecting on your thoughts and behaviors can help you begin analyzing them for patterns or themes that could be affecting your ability to be successful.

Wrap-Up

(5 minutes)

Recap the three most important ideas from today's lesson:

- People used to believe that everyone had a certain amount of intelligence that could not be changed. This is a myth; science has proven it's not true and that, in fact, anyone can get smarter with persistence and purposeful engagement.
- Changing a habit, like changing your brain, requires planning and persistence, which is why for your next assignment you will practice with a habit you want to break.
- Having a system for reflecting on your thoughts and behaviors can help you begin analyzing them for patterns or themes that could be affecting your ability to be successful.

Reminder:

- Remind students to complete the scavenger hunt. They need to know the location of the computer lab for Lesson 5 and will need to bring the completed scavenger hunt handout to Lesson 7.

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[4]Smithy, J. M., Stone, A. A., Hurewitz, A., & Kaell, A. (1999). Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis: A randomized trial. *Journal of the American Medical Association, 28*(14), 1304-1309. doi: 10.1001/jama.281.14.1304.

[5]More information about the health benefits of writing can be found in Maud Purcell's 2006 online article on PsychNet titled *The Health Benefits of Journaling* and in James Pennebaker's 1997 *Opening up: The healing power of expressing emotion.* New York: Guilford Press. Additionally, see Pennebaker, J.W. (1997), Writing about emotional experiences as a therapeutic process. *Psychologial Science 8*, 162-166.

Bring to the next lesson:

- Students will need to bring notes they have taken in their math class and one other class.

Assign the following:

- Read this article about breaking bad habits: http://www.drphil.com/articles/article/548. Students should record and be prepared to discuss the three key ideas presented in the article during the next lesson.
- Write a journal entry reflecting on your current note-taking habits. How do you prepare to take notes? What process or format do you use for taking notes? What process do you use to review and revise your notes? Which of these steps in the note-taking process is working well for you and why? Which of these steps in the note-taking process needs improvement and why?

Preview what will be covered in the next lesson:

- Let students know that the next lesson will discuss the smart habit of taking good notes.

Lesson 4 Update
Getting Ahead with Better Note Taking

Update note

Note taking is a skill typically covered in traditional study skills courses. Within a learning frameworks course context, however, the development of note taking strategies should be tied back into the learning theories that guide the course content.

Most often within *Frameworks*, students will engage with the theory before they develop strategies to implement that theory. Learning note taking skills is an exception, advocated for by faculty members who wanted students to begin establishing note taking habits early in the semester. Cognition and the role that organizing and elaborating on ideas plays in learning information (see Lessons 11 and 12) are important theories to connect with note taking. Foreshadowing these ideas can help students better appreciate and internalize the connections between theories and strategies.

Because effective note taking is a process that evolves over time, there is not one "right" way to take notes. And since note taking is largely dependent on the context in which one is taking notes, you may find it appropriate to revisit this topic periodically over the course of the semester to help students construct a note taking process that meets their own needs and preferences. Students will have the opportunity to practice annotating reading materials in Lesson 19.

See ***Frameworks Course Essentials***[5] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

[5] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Activity 2: Specific note-taking methods

Content note

- The curricular materials include a focus on just two ideas for note taking: *Cornell notes* and *concept mapping*. The Cornell note method is also emphasized as an option that *Foundations* instructors can promote for their students. Sharing too many methods can actually muddy the water and overwhelm students—and could lead them to thinking that there is a "right way" to take notes and thus possibly discourage them from even trying.

Facilitation note

- If you do choose to introduce additional note taking methods, consider how to introduce them using an active, collaborative, student-centered approach.

Activity 3: Evaluating your math notes

Facilitation note

- By this point in the semester, students enrolled in both *Foundations* and *Frameworks* will have plenty of examples of the notes they have taken during class. They will also have work they completed for "preview" and "homework" assignments.

  You will see that their notes do not look like traditional math class notes. This is because the *Foundations* course focuses on developing mathematical thinking rather than doing rote process practice.

  The goal of this activity is to call attention to this distinction and to have students brainstorm strategies that could help them capture the important information needed for them to be successful in the *Foundations* course.

Lesson 4
Getting Ahead with Better Note Taking

Overview

This lesson provides an opportunity for students to explore a general process for note taking and experience the benefits of taking good notes. Students also learn some specific note-organizing strategies, and they engage in discussion about which strategies are most useful in which contexts (such as various courses and class topics).

The lesson begins with a discussion about why it is important to take good notes. After discussing a general process for note taking, students work in groups to flesh out strategies to use in implementing the process. Students will then explore specific note-organizing methods (Cornell Note-Taking Method and concept mapping).

Week: 2 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 4-A–4-F

Key Concepts

Cornell Note-Taking Method: A system for note taking originally developed by Cornell University professor Walter Pauk.[1] This system provides students with a structure for capturing notes in class, summarizing the material in their own words, and conducting essential review that helps embed the material in memory and facilitates predicting future test questions. The Cornell method is widely used in education, business, and personal settings and exists in countless variations.

Concept map, mind map: Methods for visually representing the connections and associations among concepts in which branches from a central idea or concept (written in a circle or box) are used to organize ideas and show relationships. A mind map is similar to a concept map, except that mind maps tend to be created around a single topic.

Student Objectives

Develop a process for replacing negative, self-defeating habits with positive habits.

- Students identify habits and beliefs that have interfered with their success and learn to apply metacognitive awareness to plan, monitor, evaluate, and reflect on their learning and to seek and use feedback to improve performance.

[1] For one source of information on the origin of the Cornell Note-Taking Method, see Walter Pauk's *How to Study in College*. The 7th edition of this text was published by Houghton Mifflin (Boston, MA) in 2000.

Demonstrate effective reading and note-taking strategies that enhance retention and comprehension.

- Students learn and apply strategies for identifying key concepts in lectures and readings, organizing class notes, and increasing reading comprehension.

Resources and Preparation

Materials and Technology Required

- Handouts (Appendices 4-A, 4-C, 4-D, 4-E, and 4-F)

1. **Entry logistics**
   - Prepare the student attendance sheet for the day.
   - Have students sit in groups of three or four.
2. **Make copies of the following materials for students:**
   - Appendices 4-A, 4-C, 4-D, 4-E, and 4-F
3. **Activity 1: Why take good notes and the note-taking process**
   - You could ask students to bring in examples of the notes they have taken for other courses this semester. Students could then reflect on these concrete examples throughout the discussion.
4. **Activity 2: Specific note-taking methods**
   - If you would like to create a specific concept map for your course material, Activity 2 provides an opportunity for you to share such a map as a specific example.
   - You may want to create a set of notes of your lecture using the Cornell method to have on hand for the group discussion portion of this activity.
5. **Activity 3: Evaluating your math notes**
   - Have students bring in their notes from their Foundations of Mathematical Reasoning course for the past week.
6. **For the next class period:**
   - Confirm that the computer lab has been booked for Lesson 5 and that there are enough working terminals for each student to have one. Identify whom to contact should there be any technological issues on the day. Also speak to the IT department to find out what materials, if any, are available for helping students navigate the Blackboard (or equivalent) system, campus email, and the college website generally.

Instructional Plan

Preliminaries

(5 minutes)

- Have students sit in groups of three or four.

Activity 1: Why take good notes and the note-taking process

(40 minutes)

Objectives

Students

- Discuss the three big ideas from the note-taking article assigned for homework with Lesson 4.
- Discuss benefits and characteristics of good note-taking habits and behaviors.

1. **Have students take out the three big ideas they recorded about the article they read for homework and their journal entry about their current note-taking habits.**
    - Allow them about five minutes to compare their current note-taking processes within their groups.
2. **Recap what you heard discussed as some of the note-taking habits and behaviors students shared.**
    - Highlight what you heard with respect to:
        - Do students take notes? Why? Why not?
        - Is their note taking consistent across courses? Do they use the same note-taking strategies for each class?
        - Do they take notes in class? On their readings? As they are studying in groups?
        - What are their biggest challenges in taking notes?
        - *Very briefly (as this is the bulk of the next activity in this lesson):* What have you found helpful?
3. **Pose the following questions to the whole class:**
    - Did you take notes on the reading assignment about habits and record the three key ideas?
    - In what ways was that helpful in remembering the content of the assignment?
    - In what ways did taking notes help you identify when you were having difficulty understanding the content of the article?

In addition to helping you remember the content of the assignment, good note-taking habits can help you improve your concentration, organize all of the important content-and-process information in one place, stay up to date with the material, and identify gaps in knowledge and understanding that could be addressed later (when working with a study buddy or study group, visiting office hours, asking questions in class for clarification, and so on).

There are many methods you can use to record the important points during a lecture or as you read. Effectively preparing to take these notes and actively processing them afterward ensures you are extracting the most critical information.

4. **Ask students to take notes using the method they are comfortable with for the next part of this exercise.**
    - You should simulate a lecture-type environment that students will commonly experience in college.
    - Students will have an opportunity to review and reflect on their notes at the end of the activity.
5. **Distribute Appendix 4-A: The Note-Taking Process.**
6. **Explain the three general parts of the process:**
    - Prepare to take good notes.
    - Take good notes (whether in class or while reading).
    - Review, reflect on and revise your notes after the learning activity.
7. **Explain specific note-taking tips to accompany each of the three parts of the process.**
    - Suggested topics for discussion are included in Appendix 4-B: Suggested Note-Taking Concepts for Lecture.
    - As time permits, include additional tips you would like to share with students.
8. **When the lecture is over, ask students to look at their notes and (briefly, as a group) answer the following questions:**
    - Which of the tips are you already using?
    - Did you start using any of the tips as the lecture continued?
    - If the lecture were repeated, how might your note-taking strategy change based on what you've learned?

9. **You may also want students to hold up their notes at the end of the discussion to demonstrate how there are many ways to organize information.**
    - This will help you segue into the next activity, which focuses on specific ways to organize notes while engaged in the note-taking process.

Activity 2: Specific note-taking methods

(15 minutes)

Objectives

Students

- Learn about specific note-taking methods.
- Discuss when and how to apply different note-taking methods for different contexts.

1. **Distribute Appendix 4-C: Template for Cornell Note-Taking Method and Appendix 4-D: Concept Map of Concept Mapping.**
2. **Briefly explain the two approaches.**
    - These approaches offer additional note-taking methods that build upon the skills discussed in the previous activity. The benefit from these approaches is that they give structure to the notes—each is a way of using space to help represent ideas.
3. **Partner work: Compare and contrast the note-taking approaches.**
    - For 5 minutes, have students:
        - Identify similarities and differences among the approaches.
        - Discuss for which courses each of these methods would be suitable or not suitable.
        - Draft a concept map with "note-taking methods" at the top and capture some initial brainstorming.
4. **Whole-class debrief discussion**
    - What are the pros and cons of each note-taking approach? If you have students creating their own concept map, they can fill in their concept maps with thoughts and ideas they hadn't previously considered but that come up during discussion.

Effective note taking incorporates many of the strategies that help solidify learning in our memory, which we will explore in future lessons. Actively engaging with course material—prereading before class, organizing your notes afterward, and making connections using concept maps—supports the deep processing necessary for learning, remembering, and applying new material.

Activity 3: Evaluating your math notes
(10 minutes)

Objectives
Students

- Extend their understanding of note-taking strategies by discussing how to apply the Cornell Note-Taking Method in a mathematics class.
- Evaluate their own math notes based on what they have learned about the characteristics of quality note-taking habits.
- Determine next steps for improving note-taking habits in mathematics classes.

1. **Students will continue to work in small groups.**
2. **Distribute Appendix 4-E: Math Notes Example** for students to use as a reference point in understanding how the Cornell Note-Taking Method can be applied in mathematics classes.
3. **Evaluate math notes.**
    - Ask students to take out the math notes they brought with them and complete a notes self-evaluation. Given what was discussed in class today, how effective are these notes? Are these polished? Are they the raw notes you took in class?
    - Have students switch their notes with someone in the group. Have the pairs of students give each other feedback on things they like about the notes and aspects they might want to change for next time.
4. **Brief reflection**
    - What are two things you plan to do differently as you take notes next time in your math class?

Wrap-Up
(5 minutes)

Summarize the key ideas of this lesson:

- Encourage students to apply the smart habit of leveraging the Rule of 3 by asking them to quickly record the three main points of today's lesson. Encourage them to consider how each main point is connected to their current knowledge.

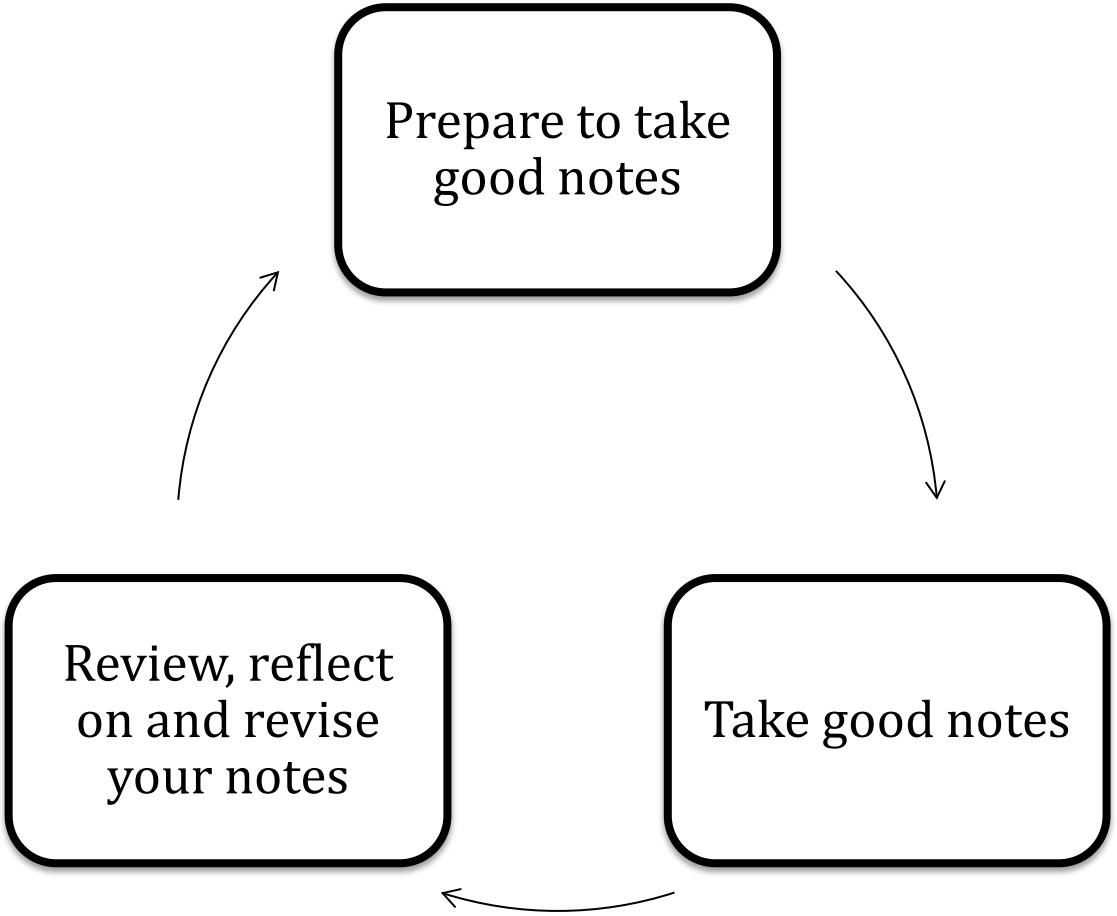
Assign the following:

- Students should complete the note-taking homework in Appendix 4-F. It is recommended that you give students one week to complete this assignment.

Preview what will be covered in the next lesson:

- Confirm that everyone found the computer lab during the scavenger hunt (started in Lesson 2). Inform students that the computer lab will be the meeting place for the next lesson—they should go directly there, where you will meet them.
- Let students know that during the next lesson, they will have an opportunity to practice all the online tools they will use in this course. They will take part in activities that will help them feel more confident about using the college's the online management system(s) and other technological assets linked to their courses. They will learn about Blackboard, D2L (or equivalent) and how to access and contribute to discussion board threads, find an electronic copy of the syllabus, access course-related email, and much more. They should bring their student login information with them to class.

Appendix 4.A: The Note Taking Process



Appendix 4-B: Suggested Note-Taking Concepts for Lecture

Prepare to take good notes.

- Complete assigned reading before class; having this prior knowledge makes it easier to follow along during lectures and discussions and can help you identify the important points to record. You can create a skeleton outline for the upcoming lecture based on the reading you do beforehand.
- Arrive to class early, choose the best seat in the room (for you!), and get situated before lecture or discussion begins. Come mentally prepared and ready to take notes. It is important to have a few consistent ways of taking notes and to match the note-taking method with the content being learned.
    - Some students prefer to write on loose-leaf lined paper, but plain white paper is another option. In your mathematics and science classes, you may need graphing paper for some topics. Some students prefer to dedicate one spiral notebook to each class. Some students feel comfortable writing everything in pencil; others prefer to write in pen and even color code as they go along. Whatever your method, you should come to each class ready to record notes using that method.
    - You may not use the same note-taking style for every class. You want to find the best method for each situation. There will be some trial and error—thinking about your note-taking strategy at the beginning of the semester can help you be organized right from the start.
    - Make sure that your note-taking method is not distracting—if remembering how to color code something in your notes during class is taking up some of your mental energy, switch to a method that lets you focus more on the class material.
- Some students like to record voice (or even video) of their lectures and discussions. Be sure to ask your instructor if that is permitted in your particular class. Your instructor may even have audio files of previous lectures or discussions that you could access.
    - As with any method, there are pros and cons. While the device can help you get lots of information down quickly (if you are a fast typist), it may introduce other distractions (such as surfing the internet). Also check to see whether instructors will allow you to use such a device in class.
    - Some benefits of recording the lecture include that you can replay the recording as you process your notes to fill in any gaps, share it with a classmate who missed class, and listen to the material as you commute or exercise.
    - Some pitfalls of recording the lecture are that you may over-rely on the technology and it could fail, or you may find it too time-consuming to play back, so you may never use the recordings to flesh out your notes. Also, audio files take up a lot of space on your device.
    - If you are going to use technology in note taking, make sure the battery is fully charged and that you have a backup method (paper and pen) if technology breaks down.

Take good notes.

- Use consistent identifiers (such as headings) for your notes.
  - Some people like to use a fresh page in their notebooks for each new lecture or discussion section. Others prefer to continue where they left off with their last set of notes. Whatever your preference, you should have an easy system for identifying which notes go with which lecture. One way to do this is by using a consistent heading for all notes and reviews you do.
  - Common identifiers to include in your notes are class, date, time, location, lecturer, lecture objectives, and topic.
- Notes should capture the most useful, important information in a concise way.
  - Notes should be written as phrases or key words rather than full sentences; you can go back later and fill in missing words and clarify points that are unclear. During class, time is short and you need to get the essential information down quickly.
  - Do not try to record class content word for word. Studies demonstrate that students who try to record word for word are not able to attend to the big ideas of the material presented since they are too focused on capturing minute details.
- Use abbreviations and symbols, and be consistent in how you use abbreviations and symbols.
  - Illustration: Have students list some of their own short forms of writing. Make sure math-specific symbols are included on this list.
- Effective note taking depends on good listening. Take cues from the instructor as to what is most essential (cues include when the instructor repeats material several times, summarizes, lists, provides examples on the board, discusses "key concepts," suggests that the material might be or will be on the test, and so on).
- Capture general facts, ideas, concepts, and so on. In mathematics classes, you also need to capture specific material such as step-by-step guidelines for handling math problems. Additionally, as your math instructor is working through a problem, it may be beneficial to *listen* to her description of what is happening in the problem before you begin copying what she is writing down. It is much easier to go back later to fill in what she is writing than it is to re-create what she is saying! Be sure to include illustrations and examples.
- Even if you think you already know something, write it down! Your notes will be incomplete without the information and it is likely that, even though you feel like you know it in class, you will have difficulty remembering the fact or process when you are out of class later. Memories are stored as interconnected webs. You will always remember things better if you can connect new knowledge to existing knowledge.
- If you are using technology (e.g., voice recorder, laptop, tablet) remember to have a backup method (paper and pencil or additional device) in case the technology fails.
- Notes are not restricted to in-class sessions. You can apply good note-taking habits while engaged in reading for class or during study sessions.

Review, reflect on, and revise your notes.

- The Rule of 3: In general our memory of a particular experience is limited by the Rule of 3, which states that typically, people can remember only three distinct things about an experience. Leverage that aspect of your memory by writing down the three most important points. If you can't write them down because you are rushing to another class, rehearse them in your head or record them with your phone. This is why the assignments from the last two lessons required that you think about the three main points.
- Class notes will not look perfect as you write them. And that is okay! During revision time after class, your goal is to review your notes, reorganize them (often by rewriting them), cluster important information in the same space, and use your own words to record key concepts and ideas. You may misinterpret something your instructor says or make a mistake while solving a problem during class—these are points for learning, but they can also be confusing if you don't do anything to clarify your notes after class.
- Within 24 hours of class, read and review your notes, actively engaging with them to fill in any gaps, rewrite in your own words, delete unnecessary information, revise drawings and charts, and so on.
    - Get in the habit of summarizing the gist of the lecture immediately after class to help with your recall later. As you will learn in the lessons on memory, we forget 90% of what we hear within 24 hours if we do not do something to make it meaningful for us. Using elaboration and organization strategies during a review of your notes after class helps make the information meaningful.
    - Often our understanding of specific terminology gets more sophisticated as a lesson goes on. The notes taken at the beginning of class might not be as rich as they should be given your understanding at the end of class. Reviewing and revising notes is essential to making sure that your understanding is clear.
- It is a valuable after-class exercise to compare your notes with those of classmates. By doing so, you will be able to fill in content that you didn't capture and also identify concepts that you may have missed completely. Catching misunderstandings early saves you time in the long run!
    - Never just copy and use another student's notes! Of course, if you miss class and need to catch up, a classmate's notes are a good place to start. But there may be problems with those notes: They may inaccurate, incomplete, or not meaningful to you, especially if the notes use unfamiliar phrases and abbreviations. You should always go through the notes and ask questions as you process the information recorded in them.

Appendix 4-C: Template for Cornell Note-Taking Method

Key Ideas

Use this space after class.

Pull out key ideas (e.g., definitions, processes, main ideas) as well as questions you may have.

This is also a good place to note when your instructor gives you hints that something is important!

Notes

Use this space to take notes during class.

Because you will be writing quickly, anticipate that it will look messy. This is okay—you will present the ideas more coherently in the *Key Ideas* section after class.

Things to include in your notes:

- Key terminology and definitions
- Important events, dates, and people
- Formulas
- Examples and other notes written on the board
- Pictures/diagrams/graphic organizers
- Information that is repeated or stressed by your instructor
- Material that you're confused about (Perhaps use an asterisk or a question mark to remind yourself to follow up later.)
- Page numbers where more information can be found
- Other resources your instructor references

If you are using new abbreviations, be sure to make a note of them in this area.

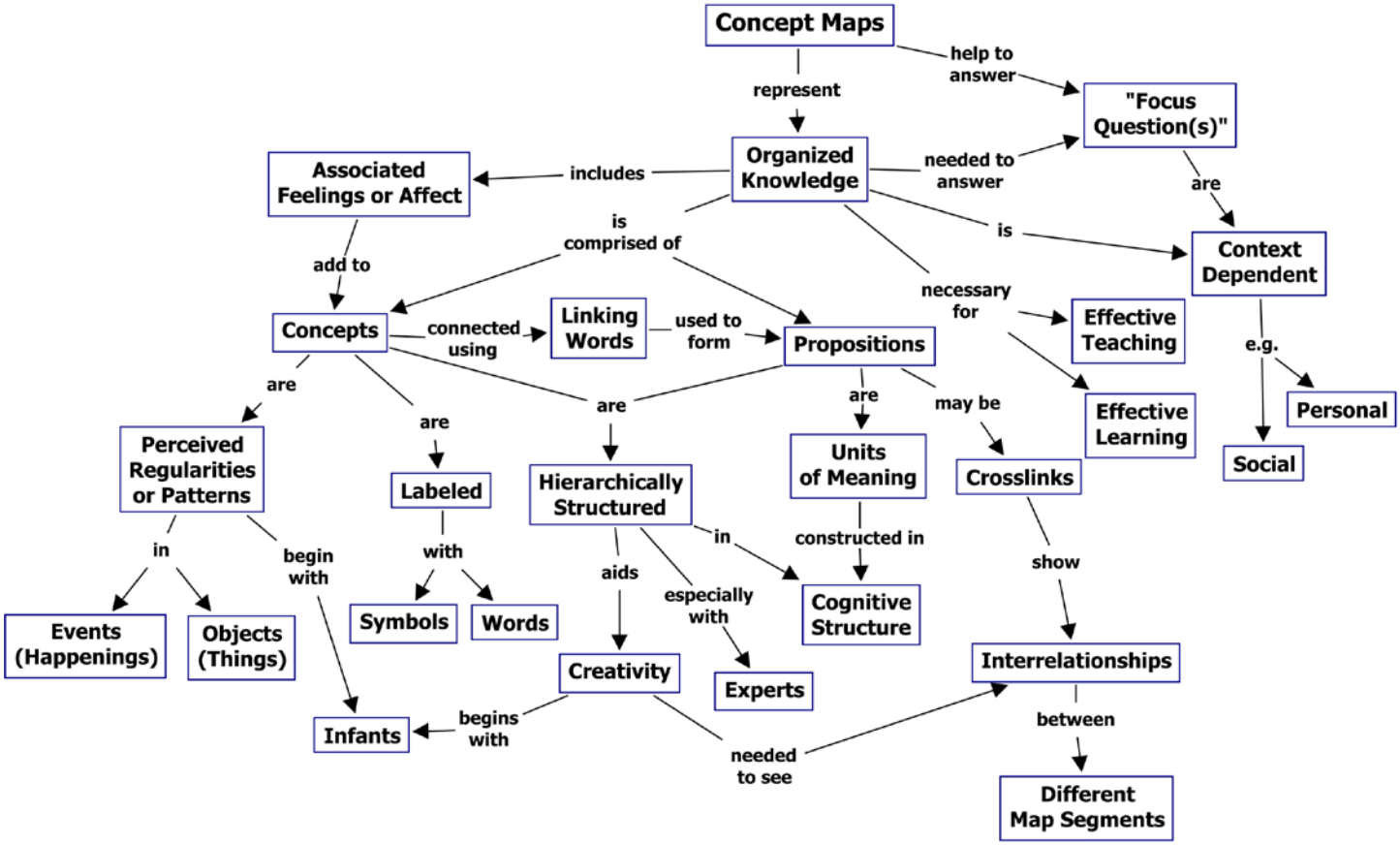
Summary

Use this space immediately after class and in the days following class.

In your own words, summarize what you have just taken notes on. Be sure to include the high-level information (general topics) as well as the main ideas.

If you will end up using these notes to answer short-answer or essay questions or to write a paper, this area could also be used for storing your overall thoughts/opinions about the topic for that use later in the semester.

Appendix 4-D: Concept Map of Concept Mapping

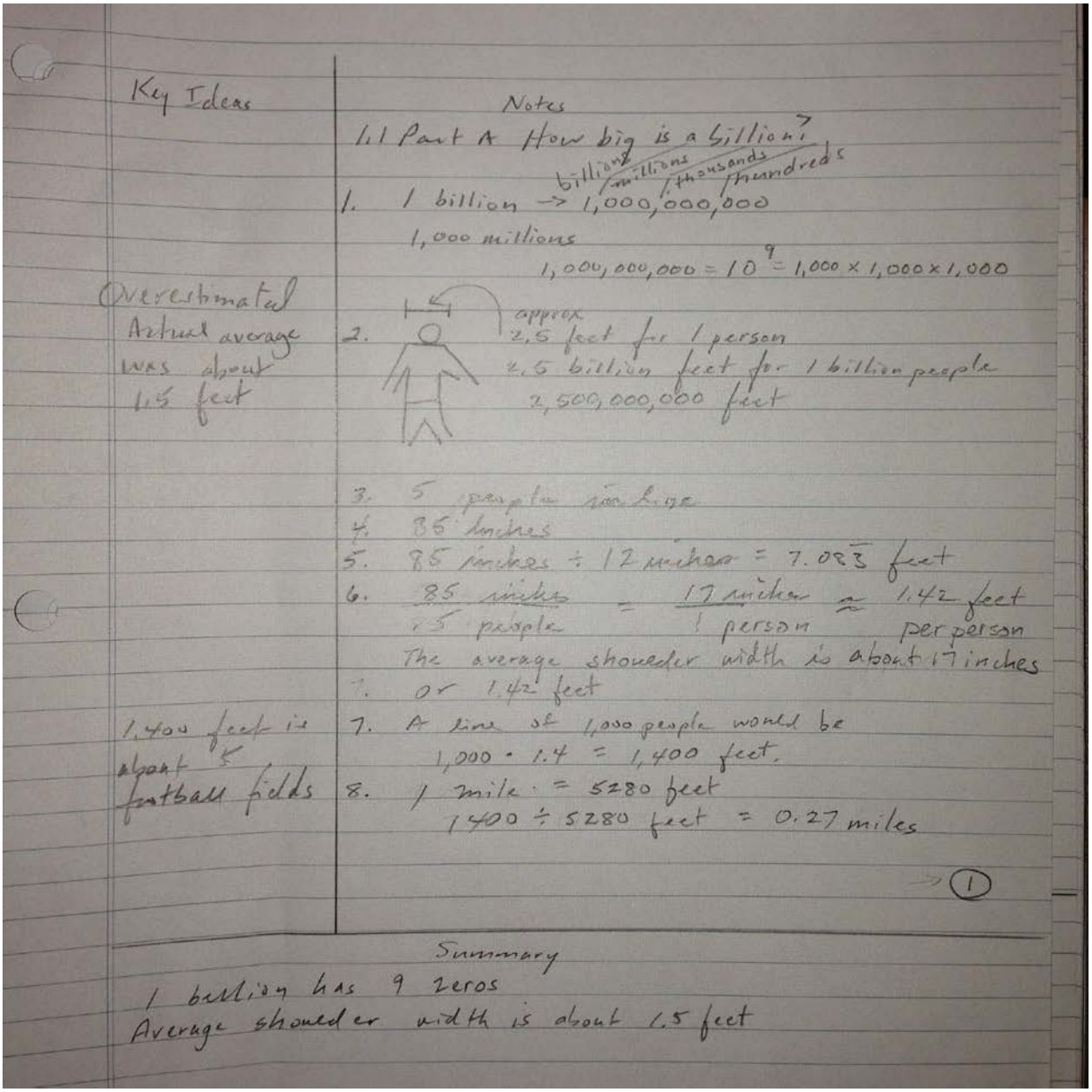


This concept map is from Joseph D. Novak and Alberto J. Cañas. (2008, January 22). The Theory Underlying Concept Maps and How to Construct and Use Them. Technical Report IHMC CmapTools 2006-01 Rev 01-2008, Florida Institute for Human and Machine Cognition. Retrieved January 24, 2013, from cmap.ihmc.us/publications/researchpapers/theorycmaps/theoryunderlyingconceptmaps.htm.

How to Construct a Good Concept Map

1. Begin with a question (in this example, it might be "What is a concept map?").
2. Brainstorm everything you know about the topic. If you are working with a group, include everyone's ideas. Either make a list on a separate sheet of paper or use one small sticky note for each idea.
3. Once you have come up with an exhaustive list, begin arranging those recorded ideas into groups. Look for hierarchies. In the above example, note that the second level of thoughts includes Organized Knowledge and "Focus Question(s)," both of which are *advantages* of using concept mapping for note taking. Once you have found main themes, link them to more detailed ideas. Identify what kind of relationships you have found, using lines with arrows to indicate these relationships.
4. Review what the concept map looks like with the sticky notes rearranged and lines connecting them.
5. Once you (or the group) feel that you have captured everything, create a hand-drawn (or computer-generated) version of your concept map. Give it a title.
6. Set aside and, after a day or so, review to check:
    - Did you miss any important concepts?
    - Does it look like the relationships—the lines/words between boxes—are mapped correctly?
    - Is your map organized hierarchically, with higher order concepts at the top and more detailed ideas lower down?
    - How neatly have you drawn your concept map? Is it easy to read? Can you instantly see the connections among concepts?
    - What other features might you include in the next draft? (e.g., using color to show different groupings of ideas, drawing diagrams or minigraphs, making other kinds visual representations)
7. Your concept maps should be works in progress. Take them with you to class and add new information and flesh out incomplete thoughts.

Appendix 4-E: Math Notes Example



Key Ideas

Notes

1.1 Part A How big is a billion?

billions / millions / thousands / hundreds

1. 1 billion → 1,000,000,000

1,000 millions

$1{,}000{,}000{,}000 = 10^9 = 1{,}000 \times 1{,}000 \times 1{,}000$

Overestimated
Actual average was about 1.5 feet

2.

approx
2.5 feet for 1 person
2.5 billion feet for 1 billion people
2,500,000,000 feet

3. 5 people in Line
4. 85 inches
5. 85 inches ÷ 12 inches = $7.08\overline{3}$ feet
6. $\frac{85 \text{ inches}}{5 \text{ people}} = \frac{17 \text{ inches}}{1 \text{ person}} \approx 1.42 \text{ feet per person}$

The average shoulder width is about 17 inches
7. or 1.42 feet

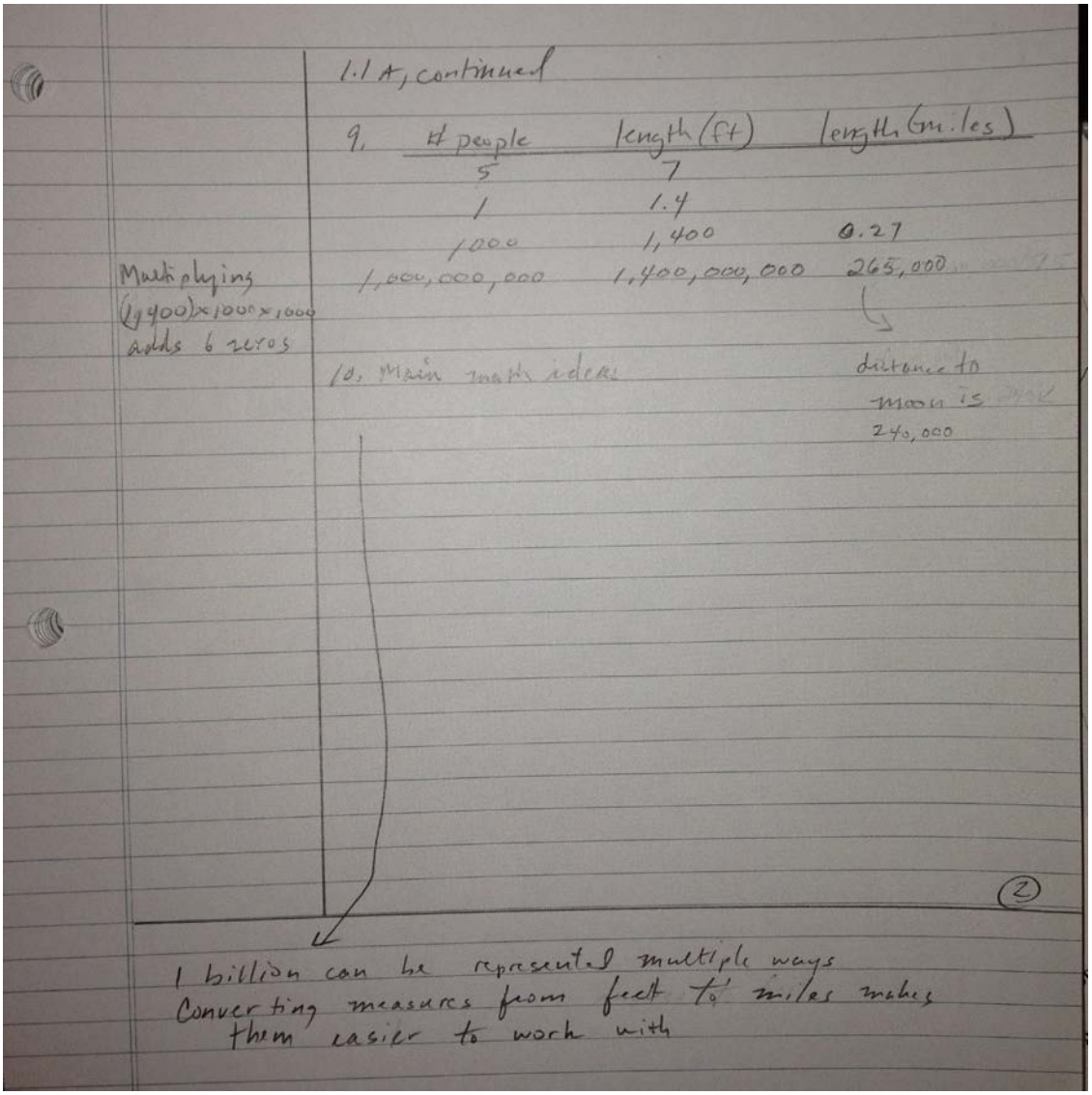
1,400 feet is about 5 football fields

7. A line of 1,000 people would be
1,000 · 1.4 = 1,400 feet.
8. 1 mile = 5280 feet
1400 ÷ 5280 feet = 0.27 miles

→ (1)

Summary

1 billion has 9 zeros
Average shoulder width is about 1.5 feet


1.1 A, continued
9.
people
length (ft)
length (miles)
5
7
1
1.4
1000
1,400
0.27
1,000,000,000
1,400,000,000
265,000
Multiplying
(1.4)×1000×1000
adds 6 zeros
10. Main math ideas
distance to
moon is
240,000
2
1 billion can be represented multiple ways
Converting measures from feet to miles makes
them easier to work with

Appendix 4-F: Note-Taking Homework

Name: _____ Due date: _____

Try out one or more of the note-taking approaches in an upcoming class (preferably mathematics, but other courses, such as English or social sciences, are acceptable). Then write about the experience and attach to the report a copy of the notes with your name and the course clearly marked at the top.

In your report, discuss

- The challenges, successes, insights, and feelings you experienced when you devoted a certain amount of time every day to reading, reviewing, revising, and rewriting your notes. Include any questions that arose as well.
- Are there any adjustments you need to make in order for this new style of organizing your notes to work for you?

Lesson 5 Update
Tackling Technology Fears and Frustrations

Update note

If your institution provides early opportunities for students to become proficient with the technology resources used across campus, consider replacing activity 1 with another activity. Students will use technology within the Foundations of Mathematical Reasoning course, so focusing some of this lesson time on helping them navigate the technology platform used in Foundations could benefit some—or most—of your students.

If you do elect to replace activities in this lesson, be mindful that the "Using Technology Assignment" (see Wrap-up and Appendix 5-B) includes elements that will be used in Lesson 7. Eliminating the homework assignment will affect activities within Lesson 7.

See *Frameworks Course Essentials*[6] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Activity 1: Getting cozy with technology

Facilitation note

- Experienced *Frameworks* faculty suggest the following ideas to differentiate this lesson to meet your students' particular needs:
    - Consider taking a quick inventory of students' technology skills prior to this lesson to ensure the activities address what they need to learn.
    - Create roles for the more tech-savvy students so they can more purposefully support their classmates.
    - Create a short quiz in your school's learning management system for students to respond to. This would be especially important if you intend to use the LMS for similar quiz-like tasks in the future.

[6] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Wrap-up

Facilitation note

- When assigning the "Using Technology" assignment (Appendix 5-B), be sure to emphasize that you want students to focus on making connections between the "famous" subjects' prior experiences and those people's successes in their careers.
- An updated version of Appendix 5-B is included on the next page.

Appendix 5-B

Using Technology Assignment

Due date(s): _____

For this assignment, you will contribute to an online discussion board and send an email to your instructor.

1. Contribute to one discussion board thread.
    - Answer this question on the discussion board: "How did you feel about using online college resources before and after working in the computer lab today?"
    - Respond (respectfully!) to the posts of at least two other students.
2. Email your instructor with your response to the following:
    - Investigate the backstories of two or three famous people you admire and answer the following two questions. Focus most of your attention on the second question.
        - What jobs did each person hold before they became famous? (You can typically find interviews online, and you can use the links below to get started.)
        - How did each person's early job experiences contribute to his or her success—either personally or professionally?

      Helpful websites include:

        - "Hardly Famous: What they did before they were famous!" http://www.hardlyfamous.com/stars
        - Before They Were Famous: Celebrities' Jobs http://www.universitylanguage.com/blog/11/before-they-were-famous-celebrities-jobs

Lesson 5
Tackling Technology Fears and Frustrations

Overview

Often students' frustrations and lack of confidence in their self-efficacy are exacerbated by a poor command of how to use required technological tools. Many students may avoid completing online assignments because they've never been shown how to log into and navigate an online system such as Blackboard. They may feel too embarrassed to ask for help—believing that they should already know how to do this—or not know where to find help in the first place.

Today's lesson helps students overcome those fears and frustrations by giving them opportunities to practice using online tools in a safe group environment. This lesson consists of interactive exercises that give students hands-on experience sending and receiving emails, logging onto Blackboard (or your college's equivalent online platform), and using other technologies. The lesson also promotes students' productive attributions since the technology tools are within their control.

Week: 3 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 1

Supplementary Materials: Appendices 5-A and 5-B. Also see the IT department, Blackboard online for handouts, or your own handouts.

This lesson also provides an opportunity for you to clearly communicate expectations regarding how technology is to be used in a college setting. This communication can help you reinforce earlier discussions about the differences between high school and college and can set the tone for the level of work and the methods of communication expected of your students.

Throughout this lesson, the aim is to demonstrate to students that with clear instructions, opportunities for trial and error, and persistent effort, they can successfully manage certain practical aspects of college life. In this lesson, you are seeking to help students understand that technological literacy is not something people are born with—it's an acquired ability.

Key Concepts

Attributions: The reasons people give for their successes and failures. People give reasons that are either controllable or uncontrollable—that is, people cite reasons that are within their control (studying hard or not studying enough) or not within their control (my teacher is mean; she doesn't explain things very well; I made some lucky guesses on the test). Students who attribute their successes and failures to things that are within their control have a greater sense of self-efficacy; they understand that they can take action to overcome setbacks. Students who attribute their successes and failures to things beyond their control are typically more helpless and less likely to take action after a setback.

Entity view of intelligence (also referred to as fixed view of intelligence): The view that you are born with a certain amount of intelligence that never changes and that there is nothing you can do to change how smart you are.

Incremental view of intelligence (also referred to as malleable or growth view of intelligence): The view that intelligence is malleable and can be grown through effective effort and persistent practice.

Student Objectives

Use technology throughout the course.

- Students use college email to communicate, software to complete assignments, and a technology platform (such as Blackboard) to submit assignments.

Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.

- Students develop written and oral arguments that are insightful, purposefully organized, logically supported, audience appropriate, and effectively delivered.

Resources and Preparation

Materials and Technology Required

- Computer terminal access for each student
- Appendices 5-A–5-B

1. **Identify tutorials created by your college to help students develop proficiency with technology.**
    - If these tutorials do not exist, you will need to create a How-To handout using Appendix 5-A as a guide. Topics to be covered include:
        - Logging into and using the college email system
        - Logging into Blackboard (or similar online systems used on your campus)
        - Navigating the Blackboard (or other system) portal
        - Accessing any online course schedules and registrar information
    - More detail about these topics can be found in Appendix 5-A.
2. **Entry logistics**
    - Prepare the student attendance sheet for the day.
    - Encourage students to sit in small groups. There are many opportunities written into this lesson for groups to work together, but if the computer lab doesn't support small-group work, students can work on their own.

3. **Make copies of the following materials for students:**
    - How-To tutorials (Use Appendix 5-A as a guide for creating this handout.)
    - Using technology assignment (Appendix 5-B)
4. **Activity 1: Getting cozy with technology**
    - Have all activities set up within your Blackboard site and establish an organized structure for what students need to navigate to and complete as part of these exercises.
    - Prepare the discussion board thread "How I felt about using online college resources before and after working in the computer lab during today's lesson."
5. **For the next class period**
    - Confirm that the academic advisor and career counselor will be able to attend the class. Check whether they will require audiovisual equipment, access to the Internet, or other technology and materials.

Instructional Plan

Preliminaries
(5 minutes)

- If possible, each student should have their own device; if not, students can work in pairs, but they should take turns individually logging in to the various sites.

Activity 1: Getting cozy with technology
(65 minutes)

Objectives

Students

- Use technology throughout the course.
- Use college email to communicate, software to complete assignments, and a technology platform (e.g., Blackboard) to submit assignments.
- Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.
- Develop written and oral arguments that are insightful, purposefully organized, logically supported, audience-appropriate, and effectively delivered.

1. **Introduce purpose.**
    - Begin the lesson by telling a story about your own nervousness around technology (preferably something amusing that happened to you that is suitably self-effacing).

- Remind students about the balloon exercise in Lesson 1 and emphasize that the aim today is to support each other. Tell students that if they are comfortable and have completed their own exercise, look to another student nearby to see if they need help.
- Allow two or three minutes for students to prepare themselves for taking notes and remind them to apply one of their new note-taking methods during this lesson.

2. **Demonstrate access.**
    - If possible, use the computer lab's large screen to show students what you are doing, so they can model and follow along.
    - Begin by accessing the online course-management tool (Blackboard or other) that your college uses. Demonstrate how students should log in to the system. Confirm that everyone has logged in successfully and knows his or her login ID and password.
    - Indicate the various modules set up in the system, paying particular attention to the main ones (tools, courses, email). Give students a few minutes to explore the site, either individually or with a partner.
3. **Bring students' attention back to you, then work through each of the practical exercises (see Appendix 5-A) as follows:**
    - Ensure that every student has accessed the relevant page.
    - Demonstrate the exercise on the computer lab's large screen, if possible.
    - Give students time to complete the activities, varying the times according to each activity's complexity and length (e.g., a minute or so to find and review the syllabus; five minutes or more to submit a brief assignment).
    - As students work on their own, stroll around the room and offer assistance to any students who need it. When you hear a good question you think is relevant to everyone, share it with the class as a great question you think they would all be interested in hearing the answer to.
4. **Pause to reflect.**
    - After students have checked their grades and are about to move to the email activity (see Appendix 5-A), ask how they are feeling about using the system and what questions or concerns they have *as a class* (versus individually). Encourage other students to offer guidance or answers.
5. **Take a few minutes to clearly communicate your email policy for this class.**
    - Stress that no matter how many separate email accounts (e.g., Yahoo, Gmail) students already have, *the course requirement is that they check emails via the college system or Blackboard,* as this will be the only way you will communicate with them outside of class, unless you have opted to accept text messages. Please check with your administration on institutional rules regarding text messaging and other forms of communication with students.

- Review the written communication etiquette you want students to follow for this course. Some information could include how you wish to be addressed, what your turnaround time for answering emails is, what students should include in an email subject line, what your biggest pet peeve in student emails is, etc.

Wrap-Up

(5 minutes)

Summarize the key ideas of this lesson:

- Encourage students to apply the smart habit of leveraging the Rule of 3: Ask them to quickly record the three main points of today's lesson. Encourage them to consider how each main point is connected to their current knowledge.

Preview what will be covered in the next lesson:

- An academic advisor and a career counselor will visit. Encourage students to make a list of questions that they have for each of these visitors and, if possible provide a few minutes for students to do this during class on this day.
- Remind students that the note-taking assignment is due at the next class meeting and that they need to complete the scavenger hunt by Lesson 7.

Assign the following:

- Students will complete the Using Technology Assignment described in Appendix 5-B. It is recommended that students this assignment by Lesson 7.

Appendix 5-A: Tips for Creating a Technology How-To Guide

1. **Create a step-by-step guide that shows students how they can:**
    - Log on to and use the college email system.
    - Log on to Blackboard or similar online system(s).
    - Students may need help identifying or remembering their student ID or username login.
    - This is a good time to go over the rules for creating good passwords (i.e., easy to remember but not predictable; unique to each system or site that requires a password; routinely changed to protect privacy; composed of letters, numbers, and symbols; and other elements of good passwords).
    - Explain how to navigate the Blackboard portal, highlighting the features that they will need to use for your course (e.g., Tools, Links, Announcements, Calendar, Tasks)
    - Access online course schedules and registrar information.
2. **To prepare for the next part of the activity, load the following onto Blackboard (or equivalent system):**
    - Upload the course syllabus.
    - Create a mini-assignment that students can download onto their desktop, view, and possibly print out.
    - Upload several discussion topics.
    - Have one of the previous handouts available as a downloadable file.
    - Make sure the online course grade book is up to date so that checking grades is a real experience for students.
3. **Devise practical exercises for the activities listed.**
    - These exercises are intended to familiarize students with the different features of the technologies they will be using in your course. It's recommended that you follow the order given here.

      Within the Course Pages menu:
        - Accessing the syllabus
        - Finding and downloading an assignment
        - Submitting an assignment
        - Have students complete a short reflection assignment—for example, on how they feel about technology, how familiar they are with it, and what goals they have for becoming more comfortable using the online tools necessary for college. Alternatively, you might ask them to upload all or part of the journal exercise they completed for their last assignment.
        - Accessing and navigating the discussion board

- Creating a new thread within a discussion board post
- Replying to an existing post
- Searching for a forum
- Be sure your instructions for this exercise use the terminology that students will find in the system.
- Taking an online test
- Downloading a file
- Checking their grades
- Sending email
- Using this system
- Using a separate (e.g., generic) college email system

Within the Tools menu (if time allows)

- Show students how to add new contacts to the address book and have them send a group email to these contacts.

Appendix 5-B

Using Technology Assignment

Due date(s): _____

For this assignment, you will contribute to an online discussion board and send an email to your instructor.

1. Contribute to one discussion board thread.
    - Answer this question on the discussion board: "How did you feel about using online college resources before and after working in the computer lab today?"
    - Respond (respectfully!) to the posts of at least two other students.
2. Email your instructor with your responses to the following:
    - Investigate the backstories of two or three famous people you admire. Determine what jobs each person held before they became famous. You can typically find interviews online, and you can use the links below to get started.
    - How did each person's early job experiences contribute to their success either personally or professionally?

      Helpful websites:

        - Hardly Famous: What they did before they were famous! www.hardlyfamous.com/stars
        - Before They Were Famous: Celebrities' Jobs www.universitylanguage.com/blog/11/before-they-were-famous-celebrities-jobs/

Lesson 6 Update
Meeting an Academic Advisor and a Career Counselor

Update note

A growing body of evidence demonstrates the positive effects that student relationships with other campus community members have on student persistence and achievement. While this lesson gives students the opportunity to engage with other campus personnel, in future lessons, additional personnel can be invited to engage with your students (Lessons 10, 20, and 21).

If your institution has a mandatory process for students to meet with academic advisors and career counselors, you may find that this Lesson 6 activity can be modified. For institutions without such structured advising or where students may not interact with these campus staff, this lesson provides an opportunity to initiate those conversations to begin relationship building.

Due to scheduling and other logistical issues, you may need to teach this lesson out of sequence with the other *Frameworks* lessons. This lesson is included early on in the semester so students can begin meeting with campus personnel to plan their programs of study and decide which next mathematics course is the best fit for their major.

See ***Frameworks Course Essentials***[7] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Faculty voices: Activity impact

- "The most beneficial activity was an actual visit to the Career Center and combined presentation from an advisor and a career counselor. Students were confused about their respective roles (advisor and counselor) so this was great! Unfortunately, not all campuses have an actual Career Center. I think it was extremely beneficial for my one class that is held on a campus with a fully functional Center."

Content note: Activity extensions

- Have the advisor or career counselor highlight online tools that students can use in career planning. Using online resources can be especially helpful as students complete the Individual Career Project in this course.
- Consider having students write thank-you notes to both the academic counselor and career service counselor—and any other campus personnel who visit your classroom.

[7] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Lesson 6
Meeting an Academic Advisor and a Career Counselor

Overview

Instilling in students the habit of visiting and making best use of academic advisors and career counselors involves planning. This lesson begins that process by having members of the academic advising and career counseling staffs visit with students in the classroom.

In the spirit of community building—a core theme of this course overall—we want students to connect with these vital staff members on a human level, not just in relation to the roles they play in their respective offices. For that reason (and to inject some level of unexpectedness, which can help messages "stick"), these guest presenters begin by recounting their own career paths, what they remember about their college experience with math, and how even basic math understanding has played some part in their ability to do their jobs (current or previous) successfully.

Week: 3 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 4

Supplementary Materials: Appendices 6-A–6-E

Following the initial "get to know us as people" section, each guest has the opportunity to outline what his or her office does, explain the services and resources that are available for students, and answer students' questions.

Student Objectives

Make personal connections with peers, their instructor, and other campus support personnel.

- Students visit with campus resource center personnel and their instructors, and actively participate as members of identifiable teams throughout the term.

Locate and use support center services.

- Students identify and take advantage of support services on campus, including academic advising, career counseling, financial aid services, libraries, disability services, and tutoring services.

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Resources and Preparation

Materials and Technology Required

- Any equipment requested by guest presenters

1. **Entry logistics**
   - Select the new success quotes and positive affirmations that students see when they enter the classroom, potentially linked to one of today's themes: the indirect way most people find their careers.
   - Have the student attendance sheet prepared for the day.
2. **Make copies of the following materials for students:**
   - Any materials the academic advisor and career counselor ask you to provide
   - Appendix 6-E, Academic Advising and Career Center Visits Assignment
3. **Activity 1: Joint "Who We Are" introduction by guests**
   - Share with both guests the sample personal story and list of personal questions to consider using as part of their personal introductions (Appendices 6-A and 6-B). Let them know they will each have 5 minutes for a personal introduction.
4. **Activity 2: Making the most of academic advising**
   - Confirm the time and class location with the academic advisor visiting your class. Confirm how much time you have set aside for each of these presentations and check that this is agreeable. Adjust timing if necessary.
   - Share the Guidelines for Guidelines for Academic Advising Presentation (Appendix 6-C) to provide the advisor with suggestions for important topics to cover.
5. **Activity 3: Making the most of career counseling**
   - Confirm the time and class location with the career counselor visiting your class. Confirm how much time you have set aside for each of these presentations and check that this is agreeable. Adjust timing if necessary.
   - Share the Guidelines for Guidelines for Career Counseling Presentation (Appendix 6-D) to provide the counselor with suggestions for important topics to cover.
6. **For the next class period:**
   - You will need to create the success teams at the start of the next lesson. Students also need to have completed the Using Technology Assignment, in which they began researching the careers and backgrounds of famous people they admire.

Instructional Plan

Preliminaries
(5 minutes)

- Have students sit in groups of three or four.
- Collect the note-taking assignment from Lesson 4.

Activity 1: Joint "Who We Are" introductions by guests
(15 minutes)

Objectives

Students

- Apply quality note-taking strategies as they listen to presentations from campus support staff.
- Learn about the personal stories of campus support staff.

1. **Prepare for taking notes.**

    - Ask students to take out any questions they have for the visitors and to prepare to take good notes. Ask them to evaluate their questions as the guests make their presentations, so that they don't end up asking questions about issues that have already been covered. Encourage students to jot down new questions that arise during the presentations.

2. **Introduce the guests and have them share their personal stories.**

    - Invite the guests to share their stories—something personal about themselves, a little about how they achieved the careers they have today, what they remember about their experience with math in college, and the extent to which math plays even a minor role in their work at the university or in previous jobs they have held.

Activity 2: Making the most of academic advising
(20 minutes)

Objective

Students

- Learn about the services that are available in the Academic Advising office.

1. **Academic advisor presentation**.
    - Suggest to the academic advisor that her/his presentation be broken down into a 10–15 minute discussion of what the advising office does and how it serves students and a 5–10 minute question-and-answer period. Distribute relevant handouts. Keep additional copies for students who are absent.
2. **Discuss next steps**.
    - Address next steps by having the advisor discuss when students should visit their academic advisor for the first time and how many visits they should make per semester.
    - Students will be required to meet with their academic advisor twice this semester: once within a few weeks of this visit and a second time during the registration period.

Activity 3: What to expect at the Career Center
(20 minutes)

Objective

Students

- Learn about the services that are available in the Career Center.

1. **Career counselor presentation**
    - Suggest to the career counselor that his or her presentation be broken down into a 10-15 minute discussion of what the Career Center does and how it serves students and a 5-10 minute question-and-answer period. Distribute relevant handouts. Keep additional copies for students who are absent.
2. **Discuss next steps**.
    - Address next steps by having the advisor discuss when students should visit their academic advisor for the first time and how many visits they should make per semester.

Activity 4: Preparing to visit the Career Center and assignment

(10 minutes)

Objectives

Students

- Understand the assignments related to visiting the campus support services
- Discuss with a small group the questions they plan to ask during their visits to campus support services.

1. **Distribute copies of Appendix 6-E**.
    - Appendix 6-E outlines the assignments related to visiting the Career Center and the Academic Advising office. Allow students a minute or so to preview the assignment.
2. **Small-group discussion**
    - Ask students to work together in small groups to compare and contrast the questions each of them plans to ask the academic advisor and career center staff during their upcoming visits. Suggest they start making a list of these questions (i.e., write them down) rather than just keeping them in their heads.

Wrap-Up

(5 minutes)

Remind students that the following assignments are due at the next class meeting:

- The completed Scavenger Hunt form and related evidence
- The Using Technology Assignment

Assign the following:

- Academic Advising and Career Center Visits Assignment (Appendix 6-E)

Preview what will be covered in the next lesson:

- Lesson 7 covers goal setting. Even if students already set goals for themselves, they will learn how to improve upon their current goal-setting process by discovering the different kinds of goals, how to establish SMART goals, and the simple reason that their efforts to achieve their goals may have failed in the past.

Appendix 6-A: Sample Personal Story

It had been at least 20 years since I'd been in a classroom environment so I was understandably nervous about going back to school to get my PhD. My degree is in Educational Psychology and I discovered (only after I'd registered and was totally committed to the program) that each semester I had to take at least one statistics course.

I'd never taken a statistics class before (and it was years since I'd done math), but it sounded fun and I knew it was going to be essential to my success in my new field. I mean, if I wanted to graduate, then there was no way I could avoid stats!

The first day of my first statistics class, the instructor walked in, turned on the projector and began talking over his slides. It all sounded like a foreign language to me. I looked around to see if anyone else looked as terrified as I felt, but everyone just had their heads down, taking notes.

Have you heard the expression, "a deer caught in the headlights"? Well, that was how I felt that day. I really wondered what I had let myself in for and seriously questioned whether going back to school had been a good idea. I tried to take good notes, but because I didn't know what I was supposed to be doing, what information was most important, or how I was supposed to understand what the instructor was talking about, I felt completely lost. I remember being grateful that we were seated in a large auditorium with the lights dimmed, because I could feel my eyes welling up. I was really embarrassed!

After the time was up, the instructor simply shut off the projector, gathered his papers, and left the room. I didn't know any of the other students, and everyone else seemed as if they knew what they were doing. For the first time in my life, I felt completely helpless—and hopeless.

The thing was, it was really important to me to get my degree. After the shock subsided I began to feel angry. And when I get angry, then I get very stubborn indeed! I told myself I was going to pass that darned statistics class, come hell or high water. I just needed to figure out how I was going to do it … especially as the first test was coming up in just a few weeks' time and I needed to do well so I didn't fall behind. I also knew that doing poorly would be a blow to my self-confidence, which was already getting close to the floor!

As luck would have it, one of my other courses was called Human Learning, and the assigned textbook was really readable and interesting. In fact, it's been the only book I've ever kept from my time at college; I still refer to it today. I knew that there were chapters that talked about things like self-regulated learning, goal setting, and lots of psychological jargon like "attributions" and "self-efficacy," which simply mean the reasons we give for why we succeed or fail. So, before doing anything else, I dug into that book.

I found out a lot of interesting things reading those chapters, such as that success in college has very little to do with luck and a lot to do with effort and persistence. I knew I couldn't do anything about the way the statistics instructor taught us—that was out of my control. But I did

know, because I'd experienced this myself in other situations, that when I put my mind to it, when I carved out the time and really worked hard, I could get a passing grade.

One of the best discoveries to come out of the latest research into how the brain works is discovering that our brains are "plastic." We used to think that intelligence was fixed and that you were either born smart—or you weren't. But that's been proven to be completely wrong by any number of scientists. In fact, we can set ourselves up for success by thinking more positively, finding reasons for doing whatever we find hard, and adopting some key learning strategies. This knowledge helped convince me that my inability to get statistics was only temporary. It certainly wasn't helped by the couldn't-care-less attitude of the instructor, but I wasn't going to give him power over my college experience and possibly my career by flunking his course.

I made a choice then and there that I was going to ace that course . . . and that's exactly what I did. Even though, that very first day, such an achievement seemed a million miles away.

Everything I learned that helped me be successful in my statistics courses and throughout my studies are things that you will have a chance to experience during this course. In a moment you'll be able to see what those topics are when we go through the syllabus together, and to talk about them in your small groups.

But let me end with the highlights of what I did to succeed at statistics:

- I made a **conscious choice** that I would **not** be a victim—just because the instructor was difficult didn't mean I had to join him and give up at the first hurdle! I determined instead to be a champion . . . I would succeed despite him—because it was my life and my career that was at stake and I wasn't going to let anyone spoil that for me.

- I set some pretty **ambitious goals** for myself—which meant a certain amount of sacrifice in terms of the time I dedicated to learning the material for this statistics course. I just kept my eye on the big picture: This course was just a small part of what was really important to me.

- But I also figured out how to **work smarter** as well as harder. I learned what successful students do that unsuccessful students don't do—in particular, how to be a good learning advocate for myself. I went to see the instructor and the teaching assistant in office hours when I couldn't understand something; I jumped on my challenges immediately, rather than letting them build up; I talked to other students who found statistics a lot easier than I did and asked if I could buddy up with them; I organized study groups and learned how to run them effectively so they didn't deteriorate into social events where no work got done.

- But perhaps what I learned that was most important of all was that **I wasn't alone.** Everyone looked as if they knew what they were doing, but we were all terrified . . . and

> as we became friends, we found it helped to talk things through, ask each other questions, and actively take control of our learning.

Honestly? I can't say I ever loved statistics—just like I'd never really warmed to math when I took it in high school—but I knew it was an important means to an end for me, so that made it important for me to succeed. And you know what I think? In that way it's a bit like being at work. Sometimes you have to work with someone you don't especially like, but you know that you need to get along with that colleague in order to succeed at something that is important—like your job or the chance of getting promoted.

Statistics helped me get my degree and gave me a sense that although it's not a subject that I find easy or enjoyable, it's something I can be good at when I really try. That's the kind of experience I want for you and why we have designed this course to help you pass your math courses—not just the one you're currently registered for, but all the others you may need to take to get you through college and into the career you want.

Appendix 6-B: Sample List of Personal Questions

- How many brothers or sisters do you have, if any?
- What's your favorite food?
- Do you have a pet and, if so, what kind is it and what's its name and age?
- Who is your best friend?
- Within your family, who is your favorite relative?
- What month is your birthday?
- What are your favorite TV shows?
- What's your favorite ice cream flavor?
- What subject did you enjoy most at school?
- What was your easiest subject at school?
- What kind of car do you drive?
- If you didn't drive the car that you have, what car would you want to own and drive?
- What's your favorite book?
- If money were no object, where would you spend your next vacation?
- What did you like most about school?
- What gives you the most satisfaction from being an advisor/counselor?
- Did you always want to be an advisor/counselor and, if not, what other jobs have you had since college?
- If you could live anywhere in the world, where would it be and why?
- Who do you admire most—someone living today or someone in history?
- If you could change one thing about yourself, what would it be?
- What one thing do you like most about yourself?
- What's been the best thing that's happened to you in the past month/week?
- What's your favorite time of year?
- What kind of music do you listen to?
- What's your favorite song?
- What kind of pizza do you most typically order?
- Do you like sports and, if so, which one and why?
- What sports hero do you most admire and why?
- What's the worst vacation memory you have?
- If you won the lottery tomorrow, what would be the first thing you'd do?
- What qualities do you admire most in your best friend?
- Did you have a favorite toy when you were a child and, if so, what was it?
- What's the one thing you own that you treasure the most?

Appendix 6-C: Guidelines for Academic Advising Presentation

Below are topics for discussion, provided here for guidance.

- What is the purpose of academic advising?
- How many academic advisors are there? Will students be assigned to a particular advisor who will see them throughout their college career?
- What typically happens during an academic advising session? How long does a session typically last?
- How can students prepare for their first advising session so that they get the most possible benefit from it? How can they prepare for subsequent advising sessions?
- What are some important advising deadlines to be aware of?
- When are your busiest times of the year?
- How soon are students expected to make a final decision about their major?
- How do you help students discover what their major should be?
- What different types of appointments are available? How do students make them? (Include a demonstration of making an online appointment, if possible.)
- What events, if any, does your department sponsor throughout the semester?
- How do academic advising and career services work together from the academic advisor's perspective?

Appendix 6-D: Guidelines for Career Counseling Presentation

Below are topics for discussion, provided here for guidance.

- What is the purpose of the college career office?
- What does the career office do, if anything, to help students find jobs?
- How many career counselors are there? How typical is it for a student to meet with the same counselor throughout the student's college career?
- What typically happens during a career counseling session? How long are most sessions?
- How can students prepare for their first career counseling session so that they get the most possible benefit from it? How can they prepare for subsequent sessions? What does the campus career services website look like? How should students best navigate it?
- What assessment tools (e.g., Strong Interest Inventory, Myers-Briggs) does the career center make available to students? Is there a fee?
- How long does it take to do these assessments?
- What events does the center sponsor throughout the year?
- How do career services and academic advising work together, from a career counselor's perspective?

Appendix 6-E:

Academic Advising and Career Center Visits Assignment

1. **Academic advising visit**: Make an appointment to visit with an academic advisor. During this initial individual meeting, you and the advisor will begin discussing majors and possible future coursework, and you will identify resources you can use in deciding what courses to take in the future. This visit should be completed within the next three weeks. You should schedule the appointment within the next few days.
2. **Thank-you mail:** Following the academic advising visit, send a thank-you email to the academic advisor you met with and cc your instructor. This message must include a brief recap of what you discussed with the advisor during the visit and what your next steps will be, including a proposed the date and time for your next academic advising visit.
3. **Career center visit:** Make an appointment to visit with a career counselor and to take one or more of the assessment tools the career center offers (e.g., Strong Interest Inventory, Self-Directed Search, Gallup StrengthsFinder). This appointment should take place within the next four weeks. You should schedule the appointment within the next few days.
4. **Discussion board thread:** Following the career center visit, respond to the thread on the class discussion board titled "What my career visit revealed about me."

Lesson 7 Update
Building Success Teams and Identifying Your Impact on the World

Update note

See ***Frameworks Course Essentials***[8] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Faculty voices: Connections between Frameworks for Mathematics and Collegiate Learning *and* Foundations of Mathematical Reasoning

- This *Frameworks* lesson is intended to coincide with students' first exam in the *Foundations* course. Faculty who have taught *Frameworks* report the following adjustments to the lesson:
    - "I deepened the self-efficacy activity due to the anxiety before their first math exam and receiving their grades afterwards. Led to review of confidence, the brain activity, and lessons learned—what changes needed to be made in their note-taking, study strategies, etc."
    - "The students were about to take their first exam and were very nervous. We continued this conversation before and after the exam, which led to a great debrief—especially for those who didn't fare so well. Not losing faith in their capabilities, reviewing the brain activity and thinking smart was extremely beneficial."

Activity 2: Value of goals

Facilitation note

- Consider using Appendix 7-A as an instructor-only resource. Students have an opportunity to read about self-efficacy in Appendix 7-C.
- An updated version of Appendix 7-A is included at the end of this Lesson 7 update.

[8] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Activity 3: Nine boxes

Facilitation note

- Encourage students to consider the connections between this activity and the balloon activity they did in Lesson 1.
- Students will do more work with these goals to make them specific and measurable (in Lesson 8), but advising them to try and make their goals specific and measurable during this step could help you deepen the activity during the next lesson.

Appendix 7-A: Sources of self-efficacy: Facilitation notes for instructors

In activity 2, students discuss the following questions:

- What activity are you most confident about doing?
- How do you feel when you do this activity?
- Why do you think you feel this way?

The following chart is a resource you can use in guiding this discussion and categorizing their responses.

Source	Explanation
Personal prior experiences with the content and/or task	• Having succeeded or failed at the same or a similar task in the past influences your confidence in the present. • This source is the most influential; if you have been successful in the past, you are more likely to feel that you can accomplish the task in the future. If a situation is completely new to you, you may feel less confident that you will be able to succeed.
Vicarious experiences	• Have you witnessed someone else you respect succeed or fail at this content or task? Do you think you will have an experience similar to theirs? • How others perform or what you believe they think influences your own decisions about your capabilities.
Social persuasions	• The messages you hear from others about your capabilities. • If you feel other people are sincere when they give you supportive, encouraging messages about your ability, you are likely to feel more confident than if you get messages that you can't do something.
Physiological factors	• Sweaty palms and a fast heartbeat often indicate that you are nervous, and you might interpret that nervousness as an indication that you are not capable of succeeding at a given task. You could also interpret the fast heartbeat as excitement for the upcoming event, indicating a high sense of self-efficacy for the task.

Lesson 7
Building Success Teams and Identifying Your Impact on the World

Overview

Following the informal large- and small-group interactions (balloon exercise, scavenger hunt) in previous lessons, the community-building aspect of this course moves up a notch with the introduction of *success teams*. Grouping students into teams consistently (on in-class activities and on a more extensive group project) helps to ensure that all students feel connected, supported, and thus more in control of their course experience. This sense of belonging will in turn affect their motivation and expectations for success.

Week: 4 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 7-A through 7-C

This lesson's introductory discussion of goal setting emphasizes the importance of doing meaningful work in all aspects of your life and lays the foundation for ongoing goals-focused work throughout the semester.

The goal-setting component introduced here also exposes students to the concept of *self-efficacy beliefs*—that is, people's beliefs about whether they can succeed in relation to the goals they set themselves—and outlines how these beliefs will affect not only the kind of goals the students set but also how much they are "stretched" by these goals.

Key Concepts

Goal setting: A "motivational technique based on the concept that the practice of setting specific goals enhances performance, and that setting difficult goals results in higher performance than does setting easier goals."[1]

Self-efficacy: A concept developed by social cognitive theorist Albert Bandura and others, concerning the beliefs we hold around how capably we can perform in certain situations (e.g., passing mathematics tests) and how likely we are to achieve certain goals (e.g., graduate college in a timely manner). Self-efficacy beliefs are the judgments we make about our capabilities.

[1] This definition is taken from www.businessdictionary.com/definition/goal-setting.html.

Student Objectives

Develop and pursue useful goals.

- Students set, monitor, and adjust long-term personal, professional, academic, and social goals.

Apply strategies to maintain motivation.

- Students maintain their motivation by focusing on controllable academic behaviors and using strategies to monitor and manage their attitudes, emotions, and thoughts when facing challenging tasks or academic setbacks.

Identify future college and career pathways.

- Students explore the characteristics and required skills of various career paths and consult with advisors and instructors to determine an appropriate path to follow.

Resources and Preparation

Materials and Technology Required

None

1. **Become acquainted with the terminology related to goals and self-efficacy, the usefulness of goals, and the career project assignment.**
    - For more information on self-efficacy beliefs, see work done by Albert Bandura, Frank Pajares, and Ellen Usher, among other researchers.
2. **Entry logistics**
    - Select the new success quotes and positive affirmations that students will see when they enter the classroom.
    - Prepare the student attendance sheet for the week.
    - Collect the Using Technology assignment (assigned in Lesson 5).
3. **Make copies of the following materials for students:**
    - Appendix 7-B: Nine Boxes handout
    - Appendix 7-C: Creating a Motivating Goal, Part 1
4. **Activity 1: Create success teams**
    - Teams should have a minimum of four students and a maximum of six (depending on total enrollment). Other instructors report that this size is large enough to include students with a variety of background and experiences, but not so large that some students may not get the opportunity to participate.

- To determine how best to form teams, you may consult students' journal entries, consider your own observations of the class, and review data on the Student Information Forms. Since one of the main purposes of these teams is to ensure that students teach and learn from one another, make sure each success team is diverse (i.e., include students of different ages, genders, anxiety levels, degrees of confidence, and other characteristics of which you are aware).
- Determine how you would like to move students into their teams at the start of class. Ideas include projecting a slide displaying the teams and their members that students will see when they enter the classroom, or having an icebreaker game in which you ask students to identify which of various possible groups they belong to.

5. **For the next class period:**
    - Determine the sample goal you want students to evaluate with a partner.
    - Finalize the career project instructions and prepare examples of any documents you will distribute with the instructions.

Instructional Plan

Preliminaries

(5 minutes)

- Students will form their success teams during Activity 1, so you can use the entry time to help situate them in their teams if you wish.

Activity 1: Create success teams

(25 minutes)

Objectives

Students

- Meet the team they will work with throughout the rest of the semester.
- Share information collected during the campus scavenger hunt.

1. **Arrange students in their success teams.**
2. **Discuss the purposes of these teams and the work teams will do.**
    - One purpose is to give you an opportunity to get to know a smaller group of students better so you have a few trusted people with whom you share your experiences and from whose experience you can learn.
    - Working in groups will be an essential component of your professional and personal lives. Learning how to work effectively in a group is therefore a skill that will be developed throughout the rest of the course. One lesson will focus

specifically on leveraging group work for success in college, and you will have plenty of opportunities to learn about your own strengths and contributions to group activities.

- What does this success team structure look like in class?
  - Students will sit with their assigned team in class most days.
  - Many group discussions in which you analyze course ideas and apply them to yourself will take place in these teams.
  - During this semester, you will complete a group presentation with your success team colleagues. More information about this assignment will be provided in future lessons.

3. **Success team bonding activities**
   - Have success teams take notes on whatever activities you have them do; reading through theses notes after class will help you learn more about the group identities.
   - The following is a sample of activities you can have students do to begin bonding with their team members.
     - Team members should introduce themselves to one another.
     - Teams can choose a success team name and a motivating metaphor.
       - To come up with a motivating metaphor, teams should develop a sense of what kind of team they intend to be. Choices could include a football/soccer team, gymnastics team, dance team, research and development team, Little League team, orchestra, church choir, or tech support team. Reflecting on these examples and choosing their team metaphor will give each success team a clearer picture of the kind of relationships they expect to build over the coming weeks.
       - Suggest to each team that they might want to continue fleshing out their intentions for their team, perhaps by choosing a mascot, team colors, team cheers, and so on. Urge students to have fun with the success team concept.
       - You could have teams create posters with their metaphor, mascot, names, etc. represented.

4. **First success team teach: Scavenger hunt debrief**
   - The goal for this portion of the activity is for students to share what they know with their peers. A few options include:
     - Students share what they learned during the scavenger hunt, responding to the following (or similar) prompts:
       - What was the coolest information you discovered on the scavenger hunt?
       - What was the most surprising/fascinating fact you discovered during the hunt?
       - What is one thing you feel is very important for your peers to know?

    - Each success team creates something visual to represent their shared understanding of the college environment, using information they collected during the scavenger hunt. For example, you could have them draw a map of the campus, filling in what they believe are the most important places.
    - Each success team creates an "Insider's Guide" to the college, suitable to share with an incoming student who needs a quick rundown of the important locations and resources available.
  - Students should also share the materials they collected at this time.
5. **Whole-class debrief: Group share**
  - If you use the above activities, ask one member of each team to share their team name and metaphor with the class. If you used alternative activities, have groups share their work product(s).
  - Share some of the things you as the instructor heard as you moved among groups. Highlight any particularly insightful observations and lessons you think need to be discussed with the whole group so no one misses out.
6. **Collect group discussion work product.**
7. **Transition to the next activity.**
  - Remind students about the takeaways from Lesson 1's balloon activity—that this team is going to be a key part of your support system to help you thrive academically and personally as you work to achieve your goals. To ensure that team members provide appropriate help as you go along, first identify what you think your own path will include.

Activity 2: Value of goals

(30 minutes)

Objectives

Students

- Identify the kind of meaningful contribution they want to make to the world around them.
- Discuss the role goals can play in keeping them on track to have the impact they desire.
- Identify the kinds of growth supported by pursuing goals.
- Discuss the sources of self-efficacy to begin to develop an understanding of their confidence in their abilities.

1. **Frame the activity: Let students know that the next two lessons will focus on the process of developing motivating goals.**

2. **Partner discussion on the following quote: "What you get by achieving your goals is not as important as what you *become* by achieving your goals."**
    - Share the following quote: "What you get by achieving your goals is not as important as what you *become* by achieving your goals."[2] Ask students to consider and discuss its meaning with a partner. Some possible responses may include:
        - The process of setting and working toward a goal is just as important as achieving it.
        - It means that you will grow, or go through a personal change, as you pursue the goal.
        - Goals can help you maintain your motivation, persist when faced with challenges, concentrate when faced with distractions, identify important information in your coursework, and even manage your time.
3. **Individual question: Given that the pursuit of goals affects who we become, think about the kind of person you want to be. What impact do you want your life to have on the world around you?**
    - Give students plenty of time to thoughtfully consider what making a meaningful contribution to the world would look like for them. If they need additional, clarifying prompts, consider:
        - What difference do you want to make in the world?
        - How do you want to leave your mark on the world around you?
        - In what ways do you hope to be of service to your family, community, or chosen career field?
    - Encourage students to think about their lives holistically—that is, consider their work lives, their inner lives, their family lives, and think about the meaning they want to make out of all those lives. To promote this broad view, suggest that students create a visual representation or graphic organizer representing the various aspects of their lives they envision in the future (family/partner, career, education, social/friends, financial).
        - This graphic organizer will serve as the initial draft of the Career Project's Possible Selves mind map.
4. **Success team discussion: Share brainstormed ideas with each other.**
    - Each student shares something that they identified as a contribution they want to make to the world.
5. **Debrief and transition: Share what you heard students identify as the impact they want to have on the world. Highlight how a clear vision and setting goals can contribute to accomplishing that impact.**
    - Psychologists have found that working toward making a contribution to society fulfills a psychological need and that having goals enhances a person's sense of

[2] Quote retrieved January 4, 2013, from Brainy Quote, www.brainyquote.com/quotes/quotes/h/henrydavid120890.html.

wellbeing, which in turn increases feelings of happiness. Psychologists have also found that the amount of effort a person puts into achieving a goal predicts how likely they are to attain it![3] Individuals with clearly articulated goals have a greater degree of control over their lives, which increases their confidence and reduces anxiety.

- If applicable, ask students to keep the graphic organizer they created, as it will form the basis for an activity in an upcoming project.

You can coordinate all aspects of your life in pursuit of making the impact you want to have. Setting goals can help you move from having an idea about what you want to do to actually accomplishing that vision.

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6. **Group discussion: What activity are you most confident about doing? How do you feel when you do this activity? Why do you think you feel this way?**
    - Give the class several minutes to discuss these questions and encourage all students to participate in the discussion.
    - As students contribute responses, categorize them into the four sources outlined in Appendix 7-A.[4]
    - As you discuss the sources of self-efficacy, the following points can be used to further clarify each source:
        - You can reflect on past successes (mastery experiences) to remind yourself that your persistence will pay off (personal prior experiences with the content and/or text).
        - You can seek out other people to determine how they were able to achieve their goals (vicarious experiences).
        - You can look to peers or mentors to help you gain a more realistic and healthy perspective on your current situation or future prospects (social persuasions).
        - You can focus on taking care of your physical and emotional needs, such as getting enough rest, eating healthy foods, and creating a better academic/personal life balance (physiological factors).
    - Use the discussion of the four sources to springboard into a formal introduction of self-efficacy.

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[3] Additional information can be found in Morisano, D., Hirsh, J.B., Peterson, J.B. Pihl, R.O., & Shore, B.M., (2010). Setting, elaborating, and reflecting on personal goals improves academic performance. *Journal of Applied Psychology, 95(*2), 255–264. doi: 10.1037/a0018478

[4] Additional information on self-efficacy can be found at Information on Self-Efficacy: A Community of Scholars, www.uky.edu/~eushe2/Pajares/self-efficacy.html. This website was created by Professor Frank Pajares and is maintained by Dr. Ellen Usher and colleagues; it provides an abundance of resources useful in understanding the influences on and of self-efficacy.

- Introduce self-efficacy as the beliefs we hold around how capably we can perform in certain situations (e.g., passing mathematics tests) and how likely we are to achieve certain goals (e.g., graduate from college in a timely manner). Self-efficacy beliefs are the judgments we make about our capabilities.
- Make sure students understand that being able to recognize when you are lacking confidence can spur you to take action to increase your confidence.

The greater your sense of self-efficacy (confidence), the more likely you are to avoid self-sabotaging study behaviors like not getting started on your work promptly and not doing extra practice problems. The more confident you are, the more likely you are to try multiple ways to solve a tricky problem, to find the research you need for a paper, and to choose to complete more challenging activities.

*It is important to recognize your current confidence level for tasks **and** to build confidence in areas that you may not yet feel you are capable but that are necessary components of your academic journey. You may not have a high sense of self-efficacy in mathematics, for example, but recognizing your confidence level is the first step in building the right skills. One way to persist when your confidence is low is to set goals to help you stay on track.*

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7. **Transition to the next activity.**
    - Now that we have some idea of what kind of contributions we want to make to the world around us, and the role that confidence and self-efficacy play, let's identify some concrete actions we can take to make these intentions come to life.

Activity 3: Nine boxes

(10 minutes)

Objectives

Students

- Create nine goals (across various aspects of their lives) to help set a direction for making the impact on the world they identified earlier as being important to them.

1. **Distribute Appendix 7-B, Nine Boxes handout.**

2. **Instruct students to complete the chart before the next lesson. This handout will be used as a starting point in a Lesson 8 activity.**

    - Students should write one goal in each box. For the two boxes that don't have a category title, students should select two categories that are important to them, then write in their goals for those categories.
    - Encourage students to consider the following as they complete this activity:
        - Think about the way you want to make an impact on the world around you: What goals are you going to set out to achieve in these listed areas that will help you move closer to making that impact?
        - Think about how your confidence level affects the goals you set for yourself. Try to push yourself just a little beyond what you are completely comfortable doing. You are capable of more than you sometimes think!
        - Put forth thoughtful effort to identify the goals you want to work toward, but don't get bogged down too much in developing goals. We will delve deeper into your responses to this assignment in a future class period. Remember that goal pursuit is iterative—that is, you keep reviewing and revising your goals as you are in the midst of pursuit. This activity provides a starting point for future work in the area.

Wrap-Up

(5 minutes)

Assign the following:

- **Nine Boxes handout (Appendix 7-B):** Finish completing the chart with nine goals. You will use the completed handout during the next lesson.
- **Developing a Motivating Goal, Part 1 (Appendix 7-C):** Students should carefully read the key questions to ask themselves when developing motivating goals.

Preview what will be covered in the next lesson:

- Let students know that the next lesson will focus on ensuring that the goals they set promote motivation and persistent effort toward their achievement. Reading Appendix 7-C, Developing Motivating Goals, Part 1, will prepare them for this work.

Appendix 7-A: Sources of Self-Efficacy

Source	Explanation
Personal prior experiences with the content and/or task	• Having succeeded or failed at the same or a similar task in the past influences your confidence in the present. • This source is the most influential; if you have been successful in the past, you are more likely to feel that you can accomplish the task in the future. If a situation is completely new to you, you may feel less confident that you will be able to do it.
Vicarious experiences	• Have you witnessed someone else you respect succeed or fail at this content or task? Do you think you will have an experience similar to theirs? • How others perform or what you believe they think influences your own decisions about your capabilities.
Social persuasions	• The messages you hear from others about your capabilities. • If you feel other people are sincere when they give you supportive, encouraging messages about your ability, you are likely to feel more confident than if you get messages that you can't do something.
Physiological factors	• Sweaty palms and a fast heartbeat often indicate that you are nervous, and you might interpret that nervousness as an indication that you are not capable of succeeding at a given task. You could also interpret the fast heartbeat as excitement for the upcoming event, indicating high self-efficacy for the task.

Appendix 7-B: Nine Boxes

Instructions: Write one goal in each box. For the two boxes that don't have a title, select two categories that are important to you and write goals for those categories.

To consider:

- Think about the way you want to make an impact on the world around you. What goals are you going to set that will help you move closer to making this impact?
- Think about how your confidence level affects the goals you set for yourself. Try to push yourself just a little beyond what you are completely comfortable doing. You are capable of more than you sometimes think!
- Don't get bogged down too much in the construction of the goals. Put forth thoughtful effort to identify goals you want to work toward. We will delve deeper into your responses in a future class period. Keep in mind that goal pursuit is iterative; you keep reviewing and revising your goals as you pursue them. This activity provides a starting point for future work in this area.

Health and Wellbeing	**Personal Relationship (Partner)**	**Work/Career**
Family Responsibilities	**Education/College Degree**	**Friends/Social Life**
	Finances	

Appendix 7-C: Creating a Motivating Goal, Part 1

The following questions are intended to guide you in developing goals that are compatible with who you are and what you want.

Is your goal rooted in your own beliefs, values, and interests?

- *Beliefs*: What you accept as true or right; your strong opinion about something.
- *Value*: A strongly held belief about what is valuable, important, or acceptable.
- *Interest*: Something you enjoy doing or want to be involved with and learn more about.

Deep, personal commitment to goals is vital. Goals are meaningful only if they are rooted in your own beliefs, values, and interests.

Goals inspired by media coverage (e.g., I want to be a forensic pathologist like Dr. Temperance Brennan in *Bones*) or parental direction (e.g., my dad wants me to be a lawyer because it's the family business) can be less motivating in the long run because they are less likely to be tied to your own personal values.

Action Item: Do a gut check. Are your goals rooted in your own beliefs, values, and interests? If not, consider making adjustments so that your goals are aligned with your beliefs, values, and interests.

How is your self-efficacy (confidence) affecting your goals?

There are four sources of self-efficacy:

- *Past experiences with similar objectives*
- *Vicarious experiences*—knowing people who have had past experiences with similar objectives
- *Social persuasions*—the messages you receive from others about your competencies
- *Physiological states*—amount of sleep, quality/quantity of meals, amount of rest, degree of nervousness, etc.

Action Item: Are you developing goals only in areas that you already feel a high degree of confidence about? Push yourself to set some goals related to a least one thing for which your self-efficacy is still emerging. For example, consider achievements you admire that other people have accomplished in areas you don't have experience with. Can you set at least one goal related to these achievements you admire?

Are you focusing on things that are within your control?

- *Controllable*: Something you have the power to change if you wish to do so.
- *Uncontrollable*: Something you are unable to easily alter.

Goals that are directly under your control (*controllable*) are more likely to be achievable than goals that require others to think, feel, or act in a certain way (*uncontrollable*). For example, you can control how much time and effort you put into working to earn good grades in your classes, graduating from college, and achieving a desired career. Similarly, you can decide where to study, how long to work on an assignment, and which jobs to apply for.

You cannot, however, control whether someone will invite you to take part in an internship program, promote you, or be proud of your achievements. You should also avoid relying on luck—an incredibly uncontrollable factor—as a primary avenue to reaching your goal.

Action Item: Identify any uncontrollable elements in your goals and work to modify the goal so it focuses more on what you can control. For example, while you cannot control whether or not you are invited to participate in an internship program, you do have control over reaching out to the person in charge of the program and making a case for why you should be offered an opportunity to be part of the program.

Are you pursuing the goal in order to master or learn something or in order to demonstrate what you know?

- *Mastery (or learning):* Pursuing the goal in order to understand the process or the concept, for self-improvement, or for increased knowledge.
- *Performance*: Pursuing the goal strictly for the end result (e.g., getting good grades so others will think you are smart and admire you) or in order to avoid a negative consequence (e.g., looking incompetent in front of others).

While studies have found that students who have mastery goals as opposed to performance-related goals are not necessarily any smarter, they do tend to do better in school, in part because they are looking to increase knowledge and skill acquisition rather than focusing on what others think of them. Therefore, they stretch themselves further and keep trying because they know that mastery does not happen instantly—it takes time and practice.

Focusing primarily on performance goals can cause you to get discouraged more easily and become frustrated because, as discussed above, there is nothing you can do about how someone thinks, feels, or acts toward you.

Action Item: Analyze whether your goals are primarily focused on understanding the process or the concept (mastery) or more on demonstrating knowledge (performance). If they are performance based, decide whether it is most strategic to keep the performance goal and, if so, plan for how you will keep going if you face a challenge in completing that goal.

How long will it take you to accomplish the goal?

- *Short-term goal*: A desired objective that you plan to achieve in the near future, such as within a few days, weeks, or months.
- *Long-term goal*: A desired objective that you plan to achieve across a longer period of time, such as within a semester, a school year, a calendar year, or a few years.
- *Enabling goal:* A special kind of intermediate goal that incrementally moves you closer to achieving a long-term goal.

Long-term goals that are too distant and are not supported by short-term or enabling goals are typically less motivating. Long-term goals may feel too far into the future, or you may become overwhelmed because of how much work will need to go into achieving the goal. It can be hard to maintain motivation and focus for a challenging, long-term goal unless you are deeply committed to it and have a specific set of enabling goals.

That is why setting enabling goals can help you maintain your motivation. Enabling goals are like pit stops you might make to fill up the gas, take a rest, and eat when going on a long journey by car. Setting goals for keeping up your GPA each semester (an enabling goal) in order to graduate on time with a specific GPA (a long-term, enabling goal) keeps you on track toward achieving your long-term career goal and gives you something measurable to work toward on a shorter term basis.

Action Item: Identify whether your goals are short-term or long-term. If a goal is short-term, does enable a long-term goal? If it is a long-term goal, does it enable another long-term goal? Try to create a shorter term, enabling goal you can pursue within the next few months to move you closer to achieving the long-term goal.

Lesson 8 Update
Creating Motivating Goals and the Career Project

Update note

See ***Frameworks Course Essentials***[1] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Activity 1: Ensuring that your goals motivate you

Faculty voices: Activity implementation

- "The exercise with 'Herman' and revising the goal based on the SMART[2] goal model was right on point. They were then able to conduct their own expansion goal activity more seriously."
- "Establishing long-term goals and SMART goals are essential to building an effective framework for success. Activity 1 was one of my favorite activities! It really helps the student begin to identify what their purpose is."

[1] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

[2] SMART goals are **s**pecific, **m**easurable, **a**ttainable, **r**elevant, and **t**imely.

Lesson 8
Creating Motivating Goals and the Career Project

Overview

This lesson on goal setting builds on the previous lesson in which students began to think about the impact they want to have on the world and created related goals for various aspects of their lives (e.g., career, family, school, social). The aim now is to prompt students to think about their goals more strategically—not as individual objectives but as an integrated whole.

Week: 4 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 2

Supplementary Materials: Appendices 8-A through 8-C

Too often students fail to accomplish their goals because they do not realize that many of them are contradictory, and they overlook the realities of a life already filled with family, social, and other commitments. In addition, many students craft goals that are not SMART (**s**pecific, **m**easurable, **a**ttainable, **r**elevant, and **t**imely).

Key Concepts

Goal setting: A "motivational technique based on the concept that the practice of setting specific goals enhances performance, and that setting difficult goals results in higher performance than setting easier goals.[1]

Belief: What you accept as true or right; your strongly held opinion about something.

Value: A strongly held belief about what is valuable, important, or acceptable.

Interest: Something you enjoy doing or want to be involved with and learn more about.

Controllable: Something you have the power to change if you wish.

Uncontrollable: Something you do not have the power to change or alter.

Mastery goals: Goals that involve ongoing *learning*, directed at *ongoing development of* competence and abilities.

Performance goals: Goals that involve demonstrating competence (in relation to others), including finding ways to mask a lack of ability (such as avoiding certain academic topics or activities).

Short-term goal: Something you can achieve in the near future—within a few days, weeks, or months.

[1] This definition is taken from the Business Dictionary, www.businessdictionary.com/definition/goal-setting.html.

Long-term goal: Something that will take a longer period of time to achieve—a semester, a school year, a calendar year, several years.

Enabling goal: A special kind of short-term goal that moves you incrementally closer to achieving a long-term goal.

SMART goals: Goals that are **s**pecific, **m**easurable, **a**ttainable, **r**elevant, and **t**imely. The SMART acronym is used widely in educational and business practices, and there are many variations on what words the letters stand for. Feel free to explore some variations (especially those for R: realistic, relevant) to get a feel for the similarities and differences among them. Remember that within this course, the following taxonomy is used: **s**pecific, **m**easurable, **a**ttainable, **r**elevant, **t**imely.

Student Objectives

Develop and pursue useful goals.

- Students set, monitor, and adjust long-term personal, professional, academic, and social goals.

Apply strategies to maintain motivation.

- Students maintain their motivation by focusing on controllable academic behaviors and using strategies to monitor and manage their attitudes, emotions, and thoughts when facing challenging tasks or academic setbacks.

Resources and Preparation

1. **Complete background reading on any of the lesson's topics that are you are not familiar with.**
2. **Entry logistics**
   - Prepare the student attendance sheet for the day.
   - Students will use the nine boxes assignment they completed for homework during Activity 1 during this lesson, so there is no need to collect it at the start of class.
3. **Make copies of the following materials for students:**
   - Appendix 8-B: Creating a Motivating Goal, Part 2
   - Appendix 8-C: Expanding Your Nine Boxes Goal Activity
   - Career project handouts

Materials and Technology Required

None

4. **Activity 1: Ensuring that your goals motivate you**
    - Formulate some questions to use as you circulate among pairs of students as they deconstruct the sample goal.
5. **Activity 2: Introduction to the career project**
    - Customize the career project information forms with specific information students need, including due dates, campus resources, and rubrics you will use to evaluate the project deliverables.
6. **For the next class period:**
    - Determine how you will facilitate the "Where does the time go?" activity and acquire the materials necessary for the activity. Additionally, you can create a distributed schedule that models how your time is allocated during a semester if you want an example other than the one provided.

Instructional Plan

Preliminaries

(5 minutes)

- Students will be working in pairs for this lesson. You can assign pairs so that they are not from the same success team if you want to mix up collaboration.

Activity 1: Ensuring that your goals motivate you

(45 minutes)

Objectives

Students

- Identify characteristics of useful and motivating goals.
- Construct useful personal, professional, academic, social, and financial goals to pursue during the semester.

1. **Frame the discussion, perhaps by asking a student to recap the key takeaways from the prior lesson.**
    - Ask students to take out their Nine Boxes handout and the Creating a Motivating Goal, Part 1 handout. (They will not use the Nine Boxes handout immediately, but they will use it within this activity.)
    - Remind students that their goals are a way for them to align the parts of their lives to ensure they are on track to make their desired impact on the world: "No matter what category goal you are working with—personal, professional,

academic, social, financial, etc.—you can construct your goal so it helps motivate you to continue pursuing it."

2. **Post the following scenario for everyone in the class to see; frame this part of the activity as an example of how students use goals.**

    - Henry is starting his second semester at the college and is enrolled in the Dana Center Mathematics Pathways *Foundations of Mathematical Reasoning* class so he can finish the mathematics requirement of his nursing program quickly. He comes to class every day, participates in the class activities, and jots down some notes. He does most of the out-of-class assignments by himself and always gives himself a 5 rating (very confident) when he completes the "Monitoring your readiness" section of the assignment. He doesn't want to bother his instructor during office hours, but he does occasionally go to the tutoring center where the tutors help him understand how to work through the problems he has trouble doing on his own. He got his first exam back and earned a lower grade than he expected.

      Henry sets the following goal to guide his work in *Foundations* going forward: "I'm going to do better in this class."

> **Facilitation note:** You can choose another scenario for the class to use. Just make sure it is tied to the *Foundations* course, that there is room for improvement in the goal setting, and that the goal is something all students can relate to. You want to create a goal that will require students to make inferences about the person setting the goal. Customizing the situation to include college- or campus-specific details may also help you make the situation more identifiable for students.

3. **Partner work: Using Appendix 7-C as a guide, deconstruct the scenario to identify how Henry's goal does or does not contain elements that make it a motivating goal.**

    - As you circulate among the pairs of students, pose questions to help you determine whether students understand these goal-related factors. The characteristics listed in Appendix 7-C are briefly summarized here: A motivating goal:
        - Is rooted in your beliefs, values, and interests.
        - Attends to self-efficacy (confidence) and its sources—personal experience, vicarious experience, influence of others, and physiological states.
        - Focuses on actions within your control.
        - Focuses more on understanding the underlying process and less on performing the process to get to the outcome.
        - Includes a mixture of short-term, long-term, and enabling goals.

- Students may also begin identifying specific activities Henry could do to achieve his goal. The next part of this activity is to have students build these kinds of activities into the goal, but as you circulate, you can question groups to make sure students are connecting the activities with the motivational concepts they read about in Appendix 7-C.
- Appendix 8-A is a student resource page from the *Foundations* course. Resource pages are informational; they are provided to students if students self-identify that they need additional information on an upcoming course topic. Since resource pages are optional (and students use them only as needed), it is possible that not every student will have reviewed this page in *Foundations* before participating in this activity in *Frameworks*. The appendix is provided here so that you can be familiar with the resource that is available to students and because it is applicable to this activity; it is not necessary to distribute this appendix each student.

4. **Distribute Appendix 8-B: Creating a Motivating Goal, Part 2, one copy per student**.
5. **Partner work: Instruct students to use Appendix 8-B as a guide to help Henry create a goal that is more motivating than "I'm going to do better in this course."**
    - One example revision: "I am committed to getting an B+ in my *Foundations* course this semester; I will earn this grade by 1) meeting weekly with my success group members outside of class to review the problems; 2) asking my instructor clarifying questions about the content during office hours once a week; 2) doing at least two additional problems similar to any I struggled with on my own; and 3) *honestly* answering the self-assessment questions and using resource pages when I need more help preparing for the next class topic."
    - This is an especially specific example; with practice, students will get to this level of detail. Moving students closer to developing goals that are concrete and descriptive and that demonstrate careful consideration of each characteristic described in the appendices is the goal of this activity.
        - SMART checklist (includes specific application to the revised goal outlined above):
            - **Specific:** Does it answer all the questions on the handout? Yes!
            - **Measurable:** Yes, because you have specified the grade you want to achieve, how many visits to office hours, and what Henry will do during those visits.
            - **Attainable:** Yes, because the word *committed* is in there, indicating attitude; also, Henry is not aiming for perfection.
            - **Relevant:** Yes. (Student responses will vary widely here, mostly based on the inferences they make about Henry's beliefs and values.)
            - **Timely:** This goal is achievable within the semester.

6. **Transition to the next part of the activity.**
    - Now that you have developed an understanding of some of the things that can influence motivation and have applied your understanding to a situation to help a fellow student, it is time to apply it to something that is personally meaningful—your own goals.
7. **Distribute Appendix 8-C: Expanding Your Nine Boxes Goals Activity.**
8. **Individual work: Take out the Nine Boxes handout you started in the last lesson and completed before class today. Use the criteria outlined in Appendix 8-B: Creating a Motivating Goal to complete the assignment.**
    - Facilitation notes:
        - If time becomes an issue, revise the number of goals you have the students work through. Instead of having them choose three goals, consider having them choose just one or two.
        - The goals you encourage students to revise is up to you. You may want everyone to work on their academic goal, or you may find that you want students to have complete autonomy in choosing which goals they analyze and revise.
        - Try to collect these completed assignments before students leave class so they are not overloaded with homework. Be sure to also collect the original Nine Boxes Handout (which they completed for homework in preparation for this class).
9. **Partner sharing: Have each student choose one goal they worked on and, with the partner they have been working with all class period, discuss the revisions made to the goal and why those revisions were made.**

Setting and using goals is a process that requires practice, but it is a valuable skill, especially since we are often pursuing multiple goals at the same time. Using the characteristics outlined here, you can be intentional in what you are setting out to accomplish and be able to evaluate the progress you have made toward achieving your goals.

Activity 2: Introduction to the career project

(20 minutes)

Objectives

Students

- Receive instructions for the career project.

1. **Distribute the Career Project packet.**
    - This packet includes instructions for the Career Project Possible Selves/Possible Lives Mind Map and the SWOT Analysis form. These forms are available in the student handout packet. Be sure to distribute and discuss any grading rubrics you intend to use to evaluate student work for this project.
2. **Introduce the purpose of the Career Project.**
    - The purpose is to learn more about a possible career direction.
        - This could be a career a student had never thought of exploring. (This might come to light after students have spoken with a career counselor and taken one of the career assessments—activities that students will find out more about in the next lesson and the assignment associated with it.) It could also be a career a student has always been interested in but hasn't fully explored and planned for, or this could be a way for a student to advance in the job or career they currently have.
    - The focus of the project will be different for each student, but all students will use the same planning tools.
3. **Discuss the major parts of the assignment and how each part relates to the overall goals for the project.**
4. **Outline due dates and assign sections as you deem appropriate for the class schedule.**
    - Discuss important information about the assignment: What is the deliverable? When does it need to be turned in? Remind students that nothing is due immediately, and so on.
    - Having an overview of this assignment early enables students to begin using the strategies we will be covering in the next few weeks to complete the project.
    - This extended window of time gives students an opportunity to plan this project into their schedules, and to set some short-term and enabling goals toward completing it.

Wrap-Up

(5 minutes)

Assign the following:

- Journal entry: How do the concepts discussed in these goal-setting lessons affect what you do in different academic situations? Choose one or two of the concepts from Appendices 7-A and 8-B and write about how they have influenced what you do when you are faced with a challenging math assignment, what you do when you don't do as well as you had expected on an assignment, and what you do when you work with a study group to prepare for an exam.
    - Due: Start of Lesson 10.
- Read and prepare: "How to Kill Writer's Block and Become a Master Copywriter in Only 3 Hours a Day." This article on renowned advertising copywriter Eugene Schwartz is available at www.copyblogger.com/schwartz-copywriting-system. Once you have read the article, write down three time-management strategies you learned from Schwartz.

Preview what will be covered in the next lesson:

- Tell students that the next lesson will be a fun exercise called "Where does the time go?" This activity will make explicit to students just how much they may be overspending the time they have available.
- Add that the next lesson will continue to help students plan for success in college by drawing their attention to things that are often overlooked but play an important part in helping them achieve their goals.

Appendix 8-A: Making the Most of Studying (Foundations Resource Page)

Making the most of your time:

- Don't study for more than 45 minutes at a time. If you want to devote a large block of time to studying, break up the time with 5–15 minute breaks.
- Recognize when you are becoming frustrated, tired, hungry, etc. There are many factors that affect how well you can tackle difficult information at a given time. But remember, taking a break isn't the same as quitting. Come back to the work while it is still fresh in your mind.
- Plan study time strategically. It is most effective to schedule some time as soon as possible after class to review notes and perhaps rework a few problems, then set a different time to actually do the assignment. Finally, do a quick review right before class, which leads to better retention and preparation for class.

The following story demonstrates these points.

Ed and Nick, two brothers studying electronics, came for study-skills help. They said they had studied electronics math for 5 hours together, and at the end of that time, they felt they knew less than they knew at the beginning of the session. I asked them to make only one change in their study habits. I still wanted them to study for 5 hours but to spread their studying into five 1-hour study periods distributed over 2 days and to interrupt their 1-hour study periods with a 5- or 10-minute break every half-hour. A few weeks later, they reported that this made all the difference.[2]

The moral of the story: Redistributing your study time can increase your learning and retention.

Making the most of getting help:

- Whether you are working in a tutoring center, visiting your instructor, or using a website, you should always prepare before you seek help by reviewing the material and attempting the work. After getting help, go back and do the problems again on your own or explain it to someone else to make sure you understand.
- Don't wait to get help.
- Don't expect someone to "just show me how to do it." This method doesn't help you learn, and if someone is doing this for you, you need to get help from somewhere else. A good tutor will help you develop your own understanding and do the problem yourself. It may be frustrating, but some level of frustration is part of learning.
- Ask about concepts and not just about the steps in a particular problem.
- Remember that there is a social and emotional side to learning. Get comfortable with the people in your class, your study group, and the tutoring center by learning their names and getting to know them a little.

[2] Arem, C. (2003). *Conquering Math Anxiety* (3rd edition). Brooks/Cole, Cengage Learning: Belmont, CA, p. 128.

Making the most of what you study:

You want to focus your study time on the concepts that you need to learn better, but you must first be able to assess your understanding. You've been doing this on the **Preparing for the next class** sections in your assignments. Using this same method will help you decide what you need to study to get ready for a test.

Self-assessment requires honesty. It is easy and tempting to fool ourselves into thinking we know more than we do. Here are some common ways we "cop out" in self-assessment. Do any of these statements sound familiar?

The "Sure, I Really Know It" Cop-Outs

- *"I got the answer wrong, but it was just a little mistake. I really know what I am doing."*
- *"I looked at the example and understood it. I don't need to actually do the problem."*
- *"I understood it when my instructor/tutor/friend explained it. So I know it now."*
- *"I did really well with it when we did it in class a couple of weeks ago, so I don't need to review it."*
- *"I got the right answer. It doesn't matter if I don't really understand it."*
- *"I did most of it myself. I just needed a little help in the beginning."*

If you were depending on someone else to do something for you, you would expect them to prove they can really do it. You have to demand the same thing from yourself. Here are some ideas to help you avoid the "cop-outs" trap.

- Just looking at a problem is never enough. Always do it yourself from start to finish.
- If you had to ask for help or look something up, do a similar problem from start to finish. Make a note of the problem, and do another one in the next few days.
- If someone explains something to you, explain it back to them in your own words.

Making the most of sleep:

Did you ever wish you could learn while you sleep? It turns out that sleep is very important in learning. Researchers have found through studies and advanced brain imaging that sleep is linked to learning and retaining new information. It is believed that deep sleep is critical in allowing the brain to "grow" the connections that create long-term memory.[3]

That does not mean you should sleep through class!

[3] Willis, J. (2006). *Research-Based Strategies to Ignite Student Learning*. Association for Supervision and Curriculum Development. Alexandria, VA.

Appendix 8-B: Creating a Motivating Goal, Part 2

This information is a continuation of the questions provided in Part 1. You should use the question to guide you in developing goals that are compatible with who you are and what you want.

Is your goal SMART?

Now that you have made some purposeful decisions about some general aspects of your goals, it is time to put that information to work in the nitty-gritty process of making your goals as clear as possible. Think of it this way: If you don't know exactly what completing your goal will look like, you won't know whether you actually achieved them. Using the SMART criteria can help you be as explicit as possible about what you aim to do.

S—Specific: *Have you included enough detail to know exactly what the outcome will be?*

Being specific with your goal helps keep you focused and narrows down what could otherwise be an overwhelming task. For example, a broad intention to "get healthier" could be narrowed down to focus just on getting more sleep. Once you have achieved this goal, you could focus on a different element of being healthy (e.g., exercise or healthy eating).

If you ask yourself "Why do I want this? What's the larger purpose that I am really after?" you can work to make sure you are being specific in the direction of the outcome you truly want.

M—Measurable: *How will I know when I have achieved this goal? What will have changed?*

Being able to measure the outcome ensures that you will know when you have reached your goal. A goal of "getting more sleep" is more measurable if you quantify it (i.e., express it with numbers), perhaps by specifying "get 7.5 hours of sleep each night." Vague terms like *more*, *less*, *greater*, and *fewer* can always be improved to be more measurable.

A—Attainable: *Do I have or can I acquire the necessary resources to reach this goal (e.g., attitude/motivation, skills, ability, money)? What am I prepared to do in order to reach it?*

As you reflect on the resources you need, consider what is within your control. Make sure you aren't setting a goal that is completely out of your grasp! If you have been averaging 5 hours of sleep a night and still feel like you don't have enough time to fulfill all your obligations, getting an extra 2.5 hours of sleep a night is unlikely to be attainable unless you make other sacrifices. For example, you may need to cut out an hour of social time or service to the community each week in order to get a little more sleep each night.

R—Relevant: *How does this goal move you closer to the larger vision you have for your life?*

How does this goal move you closer to the long-term goal you set for yourself and how does this goal align with what you want to contribute to the world over time? Using the sleep example, you could make the connection that having healthier sleep habits will help you be more alert and effective during your other activities.

T—Timely or time-bound: *Does your goal have a stated deadline? When do you want to have met this goal?*

Without having a specific time frame to work within, you could drag your feet and not make any real progress. Make sure that the time frame you set for yourself is reasonable given the other aspects of the goal. For example, increasing from 5 hours of sleep per night to 7.5 hours of sleep per night will require a few days of acclimation as your body gets used to the increased sleep and as you make adjustments to your schedule to accommodate the increased sleep time.

Action Item: Use your thoughts on the SMART information provided here to create more detailed goals.

Have you identified ways to protect your goal?

No matter how well thought out our goals are, we will always face challenges that threaten to derail our progress. Thinking ahead and planning for some of these challenges help you manage bumps in the road and avoid giving up your goal.

The following questions can help you think about different ways to protect your goals:

- *Who are some resources you will need to have as you pursue this goal? When do you need them?* Is there an expert you can all upon to give you advice or guidance? Is meeting personally with that expert required (e.g., going to the writing center as part of your assignment) or optional (e.g., meeting with a fitness trainer to improve your workout routine)?
- *When will you check in with yourself to see how much progress you've made toward your goal?* Try to find the sweet spot between giving yourself enough time to let your plan start working and letting so much time pass that you forget what goal you are working toward.
- *What will you do if you get discouraged and start to think you want to give up on this goal? Who are some allies you can turn to for help to keep you on track?* Choose friends or family who are available to encourage you and provide honest feedback on your journey. Let them know about your goals and ask them to help you; be as specific as possible in making your request.

Action Item: Identify resources you can tap into to help you stay on track. Make sure you have one specific goal in mind as you identify these resources; each goal is unique and what works in support of one goal might not be the best help when pursuing a different goal.

Appendix 8-C: Expanding Your Nine Boxes Goals Activity

Name: _____ Due date: _____

Choose **three** of the goals you created for the Nine Boxes activity you prepared for class today.

Revise these three goals to make them as motivating as possible. Use the analysis questions and the guidance provided during discussion to guide your revisions.

The attached handout provides space for you to address each topic and to keep a record of your thoughts about each goal. You should use a separate sheet for each goal.

You should be able to complete this assignment in class.

You can complete a similar analysis for the remainder of the nine boxes if you wish. Later in the semester, you will revisit this activity to check in on the progress you have made toward these expanded goals.

Expanding A Nine Boxes Goal

Original Goal:		
What beliefs, values, and interests does this goal build on?	What are the controllable elements of this goal?	Does this goal support mastery of a topic or skill or is it more performance-oriented?

If this is a short-term, enabling goal you can pursue this semester, what long-term goal does it support?	If this is a long-term goal, write a short-term, enabling goal you can pursue this semester.

Now revise the enabling goal you identify above so it reflects your beliefs, values, and interests; focuses on things within your control; contains mastery or performance elements you want to include; and contains the SMART characteristics.

Specific	
Measurable	
Attainable	
Relevant	
Timely	

What steps are you taking to protect this goal?

Lesson 9 Update
Managing Priorities and Time

Update note

See ***Frameworks Course Essentials***[1] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Facilitation note

- Consider expanding this lesson beyond one class session. The lesson is very full and instructors report that each activity is valuable. Extending into another class session would provide extra time for students to self reflect.

Activity 3: Creating a distributed schedule

Facilitation note

- Instructors report receiving a variety of calendar organizations for this activity. The activity does provide an opportunity for students to create a template that is personally meaningful for them, but if you would like to provide more standardized direction, you could use Appendix 9-E, Distributed schedule template (in next pages).

[1] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Appendix 9-E: Distributed schedule template

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7:00 AM	7:30 AM							
7:30 AM	8:00 AM							
8:00 AM	8:30 AM							
8:30 AM	9:00 AM							
9:00 AM	9:30 AM							
9:30 AM	10:00 AM							
10:00 AM	10:30 AM							
10:30 AM	11:00 AM							
11:00 AM	11:30 AM							
11:30 AM	12:00 PM							
12:00 PM	12:30 PM							
12:30 PM	1:00 PM							
1:00 PM	1:30 PM							
1:30 PM	2:00 PM							
2:00 PM	2:30 PM							
2:30 PM	3:00 PM							

Schedule page 1 of 2

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
3:00 PM	3:30 PM							
3:30 PM	4:00 PM							
4:00 PM	4:30 PM							
4:30 PM	5:00 PM							
5:00 PM	5:30 PM							
5:30 PM	6:00 PM							
6:00 PM	6:30 PM							
6:30 PM	7:00 PM							
7:00 PM	7:30 PM							
7:30 PM	8:00 PM							
8:00 PM	8:30 PM							
8:30 PM	9:00 PM							
9:00 PM	9:30 PM							
9:30 PM	10:00 PM							
10:00 PM	10:30 PM							
10:30 PM	11:00 PM							

Schedule page 2 of 2

Lesson 9
Managing Priorities and Time

Overview

One overall aim of this course is to equip students with the skills they need to succeed in college and beyond. The course's activities and assignments are intended to increase students' awareness of the support and resources available to them, while promoting students' persistence and active participation in their own learning.

This lesson advances that process by addressing time management, procrastination, organization of study materials, and schedule creation. These topics are introduced early in the course to prompt students to establish good structures to support their goal-oriented behavior.

Week: 5 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 9-A, 9-B, 9-C, and 9-D

This lesson is timed to occur during a period in the semester when students commonly report feeling some pain related to time management. Students may be feeling overwhelmed as coursework ramps up and exams are common, and they may be struggling to make school a priority. We want to remind students that these feelings and frustrations are common, but they can be overcome and do not have to have a negative effect on performance.

Key Concepts

Distributed schedule: A schedule that breaks tasks and assignments into manageable chunks to be completed over time instead of all in one sitting.

Procrastination:[1] Putting off doing something that needs to be done and focusing instead on something of lower priority.

[1] For additional background information on characteristics of and reasons for procrastination, see the *procrastination* entry in the Study Skills Library at Cal Poly University's Academic Skills Center: http://sas.calpoly.edu/ asc/ssl/procrastination.html.

Student Objectives

Develop a process for replacing negative, self-defeating habits with positive habits.

- Students identify habits and beliefs that have interfered with their success and learn to apply metacognitive awareness to plan, monitor, evaluate, and reflect on their learning and to seek and use feedback to improve performance.

Demonstrate organization and management of time and study materials.

- Students create and maintain a distributed study schedule and employ time-management strategies.

Resources and Preparation

Materials and Technology Required

None

1. **Entry logistics**
   - Have the student attendance sheet prepared for the day.
2. **Make copies of the following materials for students:**
   - Appendix 9-A: How do you typically spend your time each week?
   - Appendix 9-B: Resources for Overcoming Procrastination in an Online Environment
   - Appendix 9-C: Create a Distributed Schedule
   - Appendix 9-D: Distributed Schedule Example
3. **Activity 1: Where does the time go?**
   - Conduct the "Where does the time go?" activity on yourself to learn how well you prioritize and plan your time, and to assess your ability to successfully accomplish your highest priorities.
4. **Activity 2: Prioritizing, planning, and personal responsibility**
   - Prepare the video clip you will use to demonstrate procrastination activities.
5. **Activity 3: Creating a distributed schedule**
   - Review study schedule examples and choose one to use as a sample. Consider preparing a sample distributed schedule of your own to share with students.
6. **For the next class period**
   - Confirm that the financial aid counselor is scheduled to present during the next class

period and that he or she knows what time to arrive and where the classroom is. Discuss beforehand the material he or she intends to present, looking for ways to link it with one or more core themes of the course (community building, motivation, success strategies, career).

Instructional Plan

Preliminaries

(5 minutes)

- Remind students that the journal entry "How might mastery and performance goals and self-efficacy interact and impact your mindsets and academic behaviors?" is due at the beginning of the next lesson.
- Students will use the information they identified in the article "How to kill writer's block and become a master copywriter in only 3 hours a day" during Activity 3. You can do a quick check as they come into class to make sure they completed the assignment, but they should hold onto their notes on the article for use later in class.

Activity 1: Where does the time go?

(20 minutes)

Objectives

Students

- Identify the life activities they prioritize by analyzing the time they spend on each activity.
- Create visual representations of their time allocation using graphing or charting skills they have been developing in the *Foundations of Mathematical Reasoning* course.

1. **Popcorn discussion (very brief—less than 1 minute): In general, what are some things that take up your time?**
2. **Distribute Appendix 9-A: How Do You Typically Spend Your Time Each Week? and instruct students to work on their own to fill it out.**
    - Students should indicate how much time in a typical week they spend on each of the activities. This will provide them with a baseline for how they allocate time, which is a useful reflection that prepares them for the next part of the lesson.
    - There is room for students to add categories that may not be represented on the chart or that may have come up during the popcorn discussion.

3. **Demonstration: Provide a visual representation of how time gets spent.**
    - There are many ways to do this, but the end goal is to have the class work through a visual representation of how limited 168 hours each week is. Two examples of how you might do this in class include:
        - Using play money: Choose a volunteer and hand this student $168 in a mixture of $10, $5, and $1 bills. (You can download a template for the play money from the Internet; dollar stores often have inexpensive sets of play money you could buy for this purpose, too.)
            - Go down the list of activities from Appendix 9-A and have the student pay you back the money you handed out at the rate of one dollar for every hour spent on an activity. For example, if the student sleeps for 42 hours a week, he or she must give you back $42. Continue going down the list until the student has run out of money. Have other students follow along to keep a tally of how much money they would have given back if they were the one holding the money.
            - Periodically stop and ask whether anyone has run out of money. When the volunteer runs out of money, check where on the list (whether it is above or below where education commitments start) this happens.
            - Ask the volunteer for his or her reaction to this discovery. Extend this question to the whole class.
        - Using bar or pie graphs (on an overhead, in Excel, or on individual sheets of paper for each student): You can have each student do this individually (preferred), or you can highlight one student's experience if you choose to use a method that would be cumbersome for everyone to do individually (e.g., in Excel). The following instructions assume you are using an individual as an example.
            - Ask one student to read off the number of hours she or he spent on each activity listed in Appendix 9-A.
            - Fill in one unit of the graph for each hour they read off. (For example, if the student sleeps for 42 hours a week, fill in 42 units on whatever graph you are using). Continue going down the list until the 168 units have been accounted for. Have other students follow along to keep a tally of how many units they have accumulated after each activity.
            - Periodically stop and ask how many hours students have accounted for. When the student volunteer makes it to 168 hours, check where on the list (whether it is above or below where education commitments start) this happens.
            - Ask the volunteer student for his or her reaction to this discovery. Extend this question to the whole class.

4. **Debrief: There are not enough hours in the day to do everything we want to do, and we constantly make choices about how to allocate the precious resource of time.**

    - Help students see that they are not alone in their time management struggles. Discuss recent articles (in *The Economist* and *The Atlantic*[2]; see below) on how Americans spend their time. Consider highlighting a graph, such as the one from *The Economist Online,* that shows the correlation between how leisure time is spent and education level (less than high school diploma vs. bachelor's degree or higher).

As British Prime Minister Sir Winston Churchill famously said during World War II, "He who fails to plan is planning to fail." Everyone has the same 168-hour-week constraint. Most of us have an issue finding all the time we need for all the things we want to do. Prioritizing, planning, and a certain amount of sacrifice—including saying no to activities and people who are not on your priority list—are all important parts of using this time to its fullest. We may be sabotaging ourselves by not planning and prioritizing the activities that are most meaningful.

Activity 2: Prioritizing, planning, and personal responsibility

(25 minutes)

Objectives

Students

- Identify the aspects of their lives that they need to consciously plan, with specific emphasis on their academic lives.
- Define procrastination, identify potential causes of procrastination, and identify strategies to reduce procrastination.

1. **Popcorn discussion: What areas of your educational life need to be planned?**

    - The list should include aspects that students may not think of themselves: a quiet, supportive study environment; somewhere safe to file course materials and ways to keep documents organized; getting enough sleep (so they are fresh enough

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2 Thompson, Derek. (2012, September 25). Your day in a chart: 10 cool facts about how Americans spend our time. *The Atlantic.* www.theatlantic.com/business/archive/2012/06/your-day-in-a-chart-10-cool-facts-about-how-americans-spend-our-time/258967

The Economist Online. (2012, June 25). Accounting for time. www.economist.com/blogs/graphicdetail/2012/06/daily-chart-15

each day to pay attention in class); eating the foods that boost their energy rather than deplete it; an effective calendaring system to maintain attention on priorities, etc.

2. **Partner work (~5 minutes): How do you typically plan your study time (course reading, assignments, etc.)? Post the following questions to guide students' conversation:**
    - Where do you go to study? If you have a dedicated place to study, describe it.
    - Have you ever used a time management system?
    - Do you schedule all of your courses/activities in one place (are you using the Blackboard or similar calendaring system, for example)?
    - How do you organize your course materials?
    - When are you most likely to feel tired during the week?
    - How many hours of sleep do you typically get and what gets in the way of getting enough sleep?
    - On days when you feel most tired or sluggish, is there a connection between how you feel and certain foods or drinks you may have had, such as sodas or caffeine?
3. **Class discussion debrief: Invite pairs to share similarities and differences between the ways they plan and organize their course work.**
    - Guide the discussion to one of the biggest impediments to good time management: procrastination.
    - Highlight practices that lead to success (e.g., creating a to-do list is a good practice—a great tip is to create it the night before so you can start the day getting things done instead of trying to create the list) and practices (or aspects of practices) that might have hidden dangers (e.g., putting more items on your to-do list than you can feasibly accomplish can trigger a chain reaction of having anxious thoughts and losing sleep).
    - Reassure students that they are not alone in their procrastination. We have all been guilty of cramming—trying to do a large amount of work in a short amount of time because we did not distribute the workload evenly.
    - By nature, we do not like doing things that cause us discomfort. Starting a new task that is unfamiliar or giving up time with friends in order to complete school work may not be pleasant; therefore, we put it off and impede our own success.
4. **Video clip: Show the following clip and have students record what they observe the protagonist doing while procrastinating.**
    - "Tales of mere existence: Procrastination," by Lev Yilmaz, posted on YouTube on October 10, 2006 by AgentXPQ: www.youtube.com/watch?v=4P785j15Tzk (1:21 minutes long).
        - You can choose another appropriate clip to show here, but this clip is short, demonstrates the many different things we do while procrastinating, and

includes a convenient tag line you can repeat in future lessons to remind students about this discussion on procrastination.

- Acknowledge that some of the things the protagonist did to procrastinate are valuable; however, shopping as a way to avoid working makes it a procrastination activity.

5. **Paired discussion: Have students record all the reasons they can think of that the protagonist procrastinated.**
6. **Group debrief: Record on the board the reasons pairs give for why the protagonist procrastinated.**
    - Some of the reasons to pull out during the debrief include:
        - *Sees the job as too big*: A 10-page paper can be overwhelming, as can completing 20 practice problems.
        - *May have had bad prior experiences with the material or task*: You may have failed a test in the past or received a low grade in a math course last semester.
        - *Is unsure of what to do*: If this is the first time you have tried doing this task, you may not know what you don't know.
        - *Feels he works best at the last minute*: You have procrastinated in the past and gotten your work done; that rush of adrenaline you get when cramming makes you feel good when you are working. Even though you are completing the task, are you really doing it well?
        - *Has overcommitted his time*: You may say yes to too many extracurricular or special events. (This reason may not be evident in the clip, but it is a large contributing factor to procrastination.)
7. **Success team work: Assign each group one of the reasons for procrastinating. Ask them to write down strategies the protagonist could use to overcome this reason for procrastinating.**
8. **Group debrief: Try to draw out the following responses and strategies during the discussion; when possible, give examples applicable to your students' mathematics studies.** Students may also bring up lessons they learned when preparing the "How to kill writer's block and become a master copywriter in only 3 hours a day" article.
    - *We see the job as too big*: A 10-page paper can be overwhelming, as can completing 20 practice problems.
        - Break the job into smaller pieces. For a paper, start by creating an outline and a sentence describing the main idea of each section. For the 20 practice problems, break them into four sets of five problems each,
    - *We may have had bad prior experiences with the material or task*: You may have failed a test in the past or received a low grade in a math course last semester.
        - Remind yourself that your past experiences don't predict your future and that setbacks are great teachers. Then set a timer for 5 minutes. Work on the task for 5 minutes; if at the end of the 5 minutes you still have not made

headway, do something else and start back again. Eventually, you may find that you are engaged in the material at the end of the 5 minutes and you keep working. If you repeat this cycle a few times without becoming engaged, this is a sign that you may need to ask someone for help so you can get focused and stay engaged.

- *We are unsure of what to do*: If this is the first time you have tried doing this task, you may not know what you don't know.
  - Ask questions! Seek help! Clarify the assignment or problem early, especially if you find yourself having trouble generating an initial idea of what needs to be done. Ask peers before asking an instructor if you feel more comfortable asking them.
- *We feel we work best at the last minute*: You have procrastinated in the past and gotten your work done; that rush of adrenaline you get when cramming makes you feel good at the time. Even though you are completing the task, are you really doing it well?
  - Set a series of enabling tasks and external due dates. If you are writing a paper, make an appointment at the writing center a week before the paper is due. This way, you will have a draft complete far in advance of the deadline for turning it in to your instructor.
- *We have overcommitted our time*: You may say yes to too many extracurricular or special events.
  - Say no! Tell your friends and family that you hope they understand that you need to focus some time on academic pursuits. Get them on board with supporting you in your academic studies.

Activity 3: Creating a distributed schedule

(20 minutes)

Objectives

Students

- Describe elements of successful time management approaches.
- Create a distributed schedule that takes into account class and study time as well as other weekly priority commitments.

1. **Introduce Eugene Schwartz's time management approach.**
   - Students should have read an article about Schwartz's approach in preparation for class.
   - It might be fun to show some of Schwartz's successful ads at the following links: http://www.infomarketingblog.com/category/direct-response-copywriting-swipe-file/eugene-schwartz-copywriting-swipe-file/ and, in the realm of child

education: http://www.infomarketingblog.com/eugene-schwartz-ads-in-the-childhood-education-market/

- The goal is to quickly demonstrate how having a good system allows you to be productive and that everyone needs to find a system that works for him or her. One size does not fit all!

2. **Paired discussion: What time management lessons can we learn from Schwartz?**
3. **Group debrief: What lessons did you identify? Some of the lessons students may identify include:**
    - Schwarz distributed his time by spending just over 30 minutes on a task, followed by 10 to 15 minutes of down time.
        - Most of us have difficulty maintaining concentration and attention for more than 40 to 50 minutes at a time. This is why three to four-hour (or all-night) cramming sessions are counterproductive. Our brains struggle to retain information over such extended periods; therefore, we are unlikely to remember everything we tried to memorize or learn.

***Note**: Lessons 11 and 12 focus on helping students understand how memory works; in this lesson, only the basic idea that memory is sensitive to how long we keep it in high gear is relevant to setting up a study schedule and needs to be covered here.*

- Schwarz set limits on what he could do during his down time—he could take a mental break (e.g., sipping coffee or just staring into space) but not engage in distracting activities (e.g., surfing the Internet). He used his boredom to become productive!
    - What are your limits? What distractions do you need to limit?
    - What resources can you use to stay on task?
- Schwarz had a dedicated workspace that never changed.
    - What is your study space like? What learning resources are close at hand? Is the space well lit? Do you have room to spread out course materials? Is it quiet? Is there comfortable seating?

4. **Distribute Appendix 9-B: Resource for Overcoming Procrastination in an Online Environment and discuss how some of the external aids it lists can be used to stay on track in an online environment.** (This is not the central part of the activity, so touch on this briefly.)

Everyone has different schedule needs. The key is to identify your habits and patterns, build schedules and procedures around your preferences (e.g., early bird or night owl), and work to change current habits that are not supporting success (e.g., not having a consistent study space).

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5. **Distribute Appendix 9-C, Assignment: Create a Distributed Schedule, and Appendix 9-D, Distributed Schedule Example.**
    - If you are unable to make color copies, then project the schedule; it is important for students to see the benefit of establishing a habit of color-coding their schedules so they are easier to follow. Students who are colorblind may prefer background patterns rather than color.
    - Additional examples of color-coded schedules can be found here:
        - Handouts on budgeting your time with a weekly study schedule from the Student Development and Counseling Center at Louisiana State University, Shreveport: www.lsus.edu/Documents/Offices%20and%20Services/Student%20Development%20and%20Counseling%20Center/Weekly%20Schedule.pdf
        - Study skills handout by Andrea Kosling at Selkirk College: people.selkirk.bc.ca/akosling/Study_Skills_Webpages/weekly_schedule.html#schedule

Wrap-Up

(5 minutes)

Assign the following:

- Remind students that the journal entry "How might mastery and performance goals and self-efficacy interact and impact your mindsets and academic behaviors" is due at the beginning of Lesson 10.
- Use the instructions provided in Appendix 9-C, Create a Distributed Schedule, and Appendix 9-D, Distributed Schedule Example, to finish the work started in class to create a distributed schedule.
    - Due: Beginning of Lesson 10

Preview what will be covered in the next lesson:

- Tell students that someone from the Financial Aid Office will visit during the next class and encourage them to think about what questions they have for this person (as they did for the academic advisor and career counselor).

Appendix 9-A: How Do You Typically Spend Your Time Each Week?

Personal/family	Number of hours	Entertainment	Number of hours
Sleeping		Watching TV	
Showering/hygiene		Playing video games/being on the computer for fun	
Cooking and eating		Checking Facebook, Twitter, Pinterest, and other social media	
Cleaning (house/apartment)		Browsing the Internet generally	
Shopping (including travel time)		Making and taking phone calls	
Transporting children to and from school		Checking email	
Commitments with children (after-school events, etc.)		Playing or watching sports	
Caring for others (elderly relatives, children, etc.)		Getting ready to go out	
Relaxing and thinking (not doing anything in particular)		Socializing with friends (visiting, going to movies, etc.)	
Work	**Number of hours**	**School**	**Number of hours**
Working (part time, full time)		Attending class	
Traveling to and from work		Reading for school/assignments	
		Studying with a classmate/group	
		Independent study	
Other	**Number of hours**	Visiting with instructors (office hours, etc.)	
Lawn and yard care		Traveling to and from school	
Church			
Other regular community activities?			

Appendix 9-B: Resources for Overcoming Procrastination in an Online Environment

When the Mind Wanders, Happiness Also Strays

- www.nytimes.com/2010/11/16/science/16tier.html?_r=1ref=homepage&

Self-Control (PC)

- http://visitsteve.com/made/selfcontrol

FocusBooster

- www.focusboosterapp.com

Think (Mac)

- http://freeverse.com/mac/product/?id=7013

FocusWriter

- http://gotcode.org/focuswriter

AntiSocial (Mac) (costs $15)

- http://anti-social.cc

Vialogues

- https://vialogues.com

Comicmaster

- www.comicmaster.org.uk

Inanimate Alice

- http://www.inanimatealice.com

Celly

- http://cel.ly/school

Learn It in 5

- http://learnitin5.com

Study Blue

- www.studyblue.com

Dipity

- www.dipity.com

CK-12 Flexbooks

- www.ck12.org

Appendix 9-C: Assignment: Create a Distributed Schedule

Due date: _____

1. **Reflect on the Where does the time go? exercise conducted in class.** Consider and prioritize all regular activities that are the same every week and that cannot be changed/controlled (e.g., work, scheduled classes, important family commitments, etc.).
2. **List your high-priority activities on a separate sheet**. These activities should be things you do have control over and that are very important for your success (e.g., sufficient sleep time, regular meals—especially breakfast, working on course notes, supplementary reading, course assignments etc.). **Note:** Break each large task into smaller tasks, such as reading for and then writing an essay.
3. **Consider your varying levels of energy during the day.** Are you most productive in the morning or the evenings? When do you need to work in relation to when you eat?
4. **Create an outline for your chart.** Choose the time your day will start and the time your day will end—choose times that are realistic and work well for you. If you have never been successful at getting out of bed at 6 a.m., do not plan a schedule that begins then. Set yourself up for success by planning to get 6 to 8 hours of sleep a night.
5. **Place your prioritized activities into your chart.** Assign times for your highest priority activities. Try to keep the time slots as manageable as possible for study-related activities. (Think 30-to-60-minute blocks of time). Make sure you vary these study blocks—alternate studying math with writing an English essay, for example. Remember to factor in sufficient down time, including time for meals, breaks, and fun, to maintain motivation and replenish your energy!
6. **Code your chart**. Select a color or pattern code and code your activities in a way that is meaningful to you. Use the coding as a visual aid to help you quickly determine whether you are meeting the time allotment goals you set when you prioritized your activities. You may choose to code all activities related to one class in the same color (e.g., math related, psychology related, exercise/personal time), or you may choose to code similar types of activities (e.g., time spent in class, doing homework, interacting with others), or you may come up with a system all your own.
7. **Assign a location to each study/work slot.** Where do you work best for each of the tasks? Where will you meet your study group? Planning your locations ahead of time ensures you are selecting an environment that supports you and doesn't interfere with your commitment and motivation.
8. **Review where there are gaps in your schedule.** Look for places where you can enhance your success by starting projects early. Make use of the time you spend walking to and from classes *to think and reflect* for long-term assignments.

Appendix 9-D: Distributed Schedule Example

		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
7:00 AM	7:30 AM	Breakfast/ Getting Ready	Breakfast/ Getting Ready	Breakfast/ Getting Ready	Breakfast/ Getting Ready	Breakfast/ Getting Ready	Breakfast/ Getting Ready	Breakfast/ Getting Ready
7:30 AM	8:00 AM							
8:00 AM	8:30 AM							
8:30 AM	9:00 AM	PSYC class	Work	PSYC class	Work	Review PSYC materials		Church
9:00 AM	9:30 AM							
9:30 AM	10:00 AM							
10:00 AM	10:30 AM	ENGL class		ENGL class				
10:30 AM	11:00 AM							
11:00 AM	11:30 AM					Review ENGL materials		
11:30 AM	12:00 PM	Lunch/ Relax	Lunch	Lunch/ Relax	Lunch			
12:00 PM	12:30 PM					Lunch/ Relax		Read for the week
12:30 PM	1:00 PM	Organize PSYC notes	MATH class	Organize PSYC notes	MATH class		Basketball	
1:00 PM	1:30 PM							
1:30 PM	2:00 PM					MATH study group		
2:00 PM	2:30 PM	Organize ENGL notes	Visit MATH tutoring center	Organize ENGL notes	Visit MATH instructor OH			
2:30 PM	3:00 PM							
3:00 PM	3:30 PM	Visit PSYC OH						
3:30 PM	4:00 PM							
4:00 PM	4:30 PM	Work		Work				
4:30 PM	5:00 PM		Exercise		Exercise			
5:00 PM	5:30 PM							
5:30 PM	6:00 PM							
6:00 PM	6:30 PM							
6:30 PM	7:00 PM							
7:00 PM	7:30 PM		Read/Re-read for ENGL		"Night off"			
7:30 PM	8:00 PM							
8:00 PM	8:30 PM							
8:30 PM	9:00 PM	Review MATH homework	Work on long-term projects	Review MATH homework				
9:00 PM	9:30 PM							
9:30 PM	10:00 PM							
10:00 PM	10:30 PM							
10:30 PM	11:00 PM							
Specific Tasks to Accomplish this day								

Lesson 10 Update
Metacognition; Financial Advisor Visit

Update note

See ***Frameworks Course Essentials***[12] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

[12]The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Lesson 10
Metacognition; Financial Advisor Visit

Overview

In this lesson, students work alone and in pairs to solve a mathematical challenge. The processes student use to work through the challenge serve as a starting point for a discussion about metacognitive knowledge and self-regulation.

In the final part of the lesson, you introduce the guest speaker, a member of the financial advising staff who will outline the value of mathematics in relation to the students' planned careers and will offer advice and guidance on using resources available through the Financial Aid Office.

Week: 5 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 10-A, 10-B, 10-C, and 10-D

Key Concepts

Metacognition: Is the awareness or analysis of one's own learning and thinking processes. Psychologist John Flavell coined the term *metacognition* to refer to the process that can be described as thinking about thinking.

Student Objectives

Locate and use support center services.

- Students identify and take advantage of support services on campus, including academic advising, career counseling, financial aid services, libraries, disability services, and tutoring services.

Develop a process for replacing negative, self-defeating habits with positive habits.

- Students identify habits and beliefs that have interfered with their success and learn to apply metacognitive awareness to plan, monitor, evaluate, and reflect on their learning and to seek and use feedback to improve performance.

Resources and Preparation

1. **Background information**
    - Familiarize yourself with the terminology used in this lesson.
2. **Entry logistics**
    - Prepare the student attendance sheet for the day.
3. **Make copies of the following materials for students:**
    - If you choose, create a handout to accompany the discussion on metacognitive knowledge and metacognitive regulation.
    - Appendix 10-D: Applying Metacognition (homework assignment)
4. **Activity 1: Thinking about thinking**
    - Familiarize yourself with the coin challenge task by working through it yourself.
5. **Activity 2: Metacognition**
    - You may choose to create a slideshow for this part of the lesson. See Appendix 10-C for suggested text.
6. **Activity 3: Visit from financial aid office representative**
    - Ensure that the financial aid representative has received an outline of the questions to address and is prepared to share his or her personal story and to discuss how he or she uses math at work. (See Appendix 10-A and Appendix 10-B.)

Materials and Technology Required

Check with guest presenter to find out whether she or he will require audiovisual equipment, access to the Internet, etc., and make arrangements for that equipment to be available.

Also check what handouts, if any, the presenter will make available and confirm whether copies will need to be made.

Instructional Plan

Preliminaries

(5 minutes)

- Have students sit with a partner.
- Collect students' distributed study schedule.

Activity 1: Thinking about thinking

(20 minutes)

Objectives

Students

- Engage in a brief task that promotes critical thinking in order to motivate a discussion about metacognition.
- Reflect on the experience by sharing their thinking with a partner.

1. **Launch think-pair-share activity**.
    - Clarify the think-pair-share process.
    - Let students know that the point of the task they are about to undertake is not necessarily to solve the problem; rather, the task was chosen because it spurs interesting discussions.
    - Use the slide set to introduce the Coin Challenge Task and have students work individually for 3-4 minutes.
        - Task: Can you make exactly 5 dollars with exactly 100 U.S. coins and no nickels? If so, how? If not, why not?

    Facilitation tips

    - Students may ask if they can use $1 coins or half-dollar coins. Tell them the only restrictions on the problems are those stated in the problem. If a student or pair of students is stuck on the problem, ask them if they have considered all of the possible U.S. coin denominations.
    - If a pair of students has been successful in determining a solution to the task, encourage them to determine other possible solutions and to look for patterns among the possible solutions.
    - Use these extension questions for students who are ready for an additional challenge: "Is it possible to determine a combination that does not include a half dollar coin? Why or why not?"
2. **Pair and share**. **After students have had a chance to work on the task individually, they should pair up for a brief discussion.**
    - Have each student explain her or his approach to the task.
    - Have students ask each other questions to make sure they understand each other's strategy.
    - Pairs should consider how the task is similar to or different from other tasks they have worked on in the past.

3. **Whole-class discussion**.
    - Initiate a discussion about how often students engage in this sort of deep reflection that unpacks their thinking about a particular problem, puzzle, or task. Also ask students to consider and discuss the benefits of this sort of deep reflection.

Activity 2: Metacognition

(25 minutes)

Objectives

Students

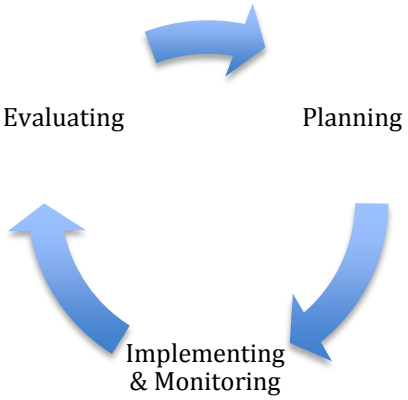
- Understand aspects of metacognition.
- Discuss the possible benefits of metacognitive knowledge and self-regulation.

1. **Introduce the concept of metacognition**.
    - Reflecting on how you think and learn is part of metacognitive thinking. Often briefly summarized as "thinking about thinking," metacognition really involves both understanding your thinking and working to regulate your thinking.
    - Connection to the course: Journal assignments are structured to prompt students to think deeply about their experiences, thoughts, and feelings and to use this self-discovery and self-awareness to establish good habits, plan for success, and enhance their academic performance.
2. **Discuss metacognitive knowledge.**
    - Use these questions to guide a class discussion about types of metacognitive knowledge.
        - What do you know? What are the limits of your understanding?
        - How can you apply this knowledge?
        - When does it make sense to apply this knowledge?
    - The three types of metacognitive knowledge are commonly referred to (in order) as *declarative*, *procedural*, and *conditional.* Use your discretion as to whether you want to use this terminology with students. Some instructors have found that focusing on the terminology complicated the lesson too much; others felt that using the terminology helped students understand the types better.
    - Model how the types of metacognitive knowledge might apply to the Coin Challenge.
        - What did you have to know to engage with the task?
        - How did you apply that knowledge to the task?
        - Which strategies worked and why? Which strategies didn't work and why?

You need different types of knowledge to complete your math assignments. Completing your homework (actually going through the process of doing and completing the problems) can help you build all three types of metacognitive knowledge. Instructors promote the acquisition of all three types of metacognitive knowledge for the subjects you are studying by asking many different types of questions on assignments, discussions, quizzes, and exams.

3. **Discuss metacognitive regulation**.

- *Metacognitive regulation* is an ongoing process of planning, monitoring, and evaluating learning and thinking. This process has given rise to the development of significant research focused on self-regulation.



  - Planning involves determining which resources and strategies to use to accomplish a specific task.
  - Implementing and monitoring means implementing your plan and continuously examining the progress you are making toward completing the task at hand.
  - Evaluating involves assessing how well the planning and monitoring helped you complete the task.
- Model how the metacognitive regulation process might apply to the Coin Challenge.
  - How did you plan as you worked on the task?
  - In what ways did you monitor your work on the task?
  - How did you evaluate your work, either individually or with your partner?

4. **Paired discussion:**

- Metacognitive regulation can be applied at the task level, with a project, or with sets of tasks. Have students work in pairs to consider questions they can ask themselves during the various phases of self-regulation. Sample responses are included in the table below.

Table 1: Using Metacognitive Self-Regulation		
Planning	**Implementing & Monitoring**	**Evaluating**
• How much time do I need to set aside to do this work? How do I know this? • Have I done problems similar to these before? • Was I in class when we first went over this material? Do I need to go to office hours before I begin this homework? • What notes do I need? • What other materials do I need to have with me as I do this work (e.g., textbook, graphing paper, calculator)?	• How much time am I spending on each problem? Are the problems getting easier as I go along? Am I getting faster with each successive problem? • Is this taking more or less time than I thought? Why? • Are the strategies I'm currently using working? Do I need to try something new? • What emotions am I feeling as I work on this assignment? Am I frustrated because I don't know how to start the problem or because I am using the appropriate process but not getting the right answer? • Am I doing the problems myself before looking at the answers? Once I look at the answers, do I look back over my work to figure out where I went wrong on a problem or to verify why I got the problem correct? • Is my confusion something I can fix on my own, or do I need to ask my instructor for help?	• Did I set aside enough time to do this work? • If I set aside too much or too little time, what information did I base my original estimate on? How can I improve my estimation going forward? • How does what I am studying now fit with what I've learned in class before? • Which strategies were most effective for this task? If I face similar problems on my quiz or exams, what strategies will I use? What special situation examples did I learn from here? • When I sought help, did I get the information I needed? Which source of help was most beneficial to me? Why? • What have I learned from this process that I can use the next time I'm completing homework problems?

Employing metacognitive techniques increases your ability to succeed.

5. **Paired activity. Have students apply metacognitive self-regulation to a new task, such as:**

- Working together to find additional solutions to the coin challenge puzzle.
- Doing other coin puzzles:
  - Place eight pennies in a row. The object is to use as few of the allowable moves as possible to form four stacks of two coins each. An allowable move consists of jumping a single coin over any two coins (which can be in a stack or lying flat next to each other) in one direction, stopping on top of the next coin. If students succeed, they should start over and try to solve the puzzle using fewer moves (four moves is the fewest).
  - To view a possible solution to this puzzle, visit Puzzles.com. This site includes interactive and pdf versions of this puzzle and many others: http://www.puzzles.com/puzzleplayground/Coins.htm

6. **Whole-group discussion**. **Ask students to consider and discuss the benefits of metacognitive regulation. Table 2 lists some sample responses.**

Table 2: Possible Benefits of Applying Metacognitive Self-Regulation

Planning	Implementing & Monitoring	Evaluating
• Being more realistic about what I can accomplish in a certain time frame. • Thinking through later steps of assignments, particularly on large assignments.	• Knowing when and why I need help (and where to find it). • Being aware of how my emotions affect my ability to learn and taking steps to transform negative feelings into positive ones. • Using effective study strategies.	• Recognizing why certain study strategies are valuable to me. • Considering negative experiences as learning opportunities so I can do things differently in future.

Activity 3: Visit from financial aid office representative

(20 minutes: 15-minute talk and 5 minutes for questions and answers)

Objectives

Students

- Meet and ask questions of a representative from the financial aid office.
- Learn about services available through the financial aid office.

1. **Introduce the guest**.
    - Invite the guest to share something personal, a little about how they achieved the career they have today, what they remember about their experience with math in college, and how math plays a role in their current work or in other jobs they have held. (See Appendix 10-A, My Story Example.)
2. **Guest makes the presentation**.
    - Encourage the visitor to make the presentation as interactive as possible. Some ideas for content that should be covered are included in Appendix 10-B, but this content can be covered in a variety of ways, including using hands-on demonstrations or case studies.)
3. **Open up for Q&A**.
    - Remind students about the value of asking good questions and not asking questions about issues that have already been covered or that are too specific to their own financial situation. (For specific questions, a visit to the financial aid office is more appropriate.)
4. **Thank the guest** (who can leave at this point if all questions have been covered).

Wrap-Up

(5 minutes)

Assign the following:

- Appendix 10-D: Applying Metacognition. This assignment must be completed prior to the next lesson. Clarify that all students must read article 1. Then divide the class in half and assign one half to read article 2a and the other half to read article 2b. Students will be using these readings during the success team work they will do for Lesson 11, so you may want to ensure that the assignment of articles 2a and 2b is well mixed within success teams as well.

Preview the next lessons:

- The next two lessons focus on how memory works and the various memory-related strategies students can use to be efficient and effective learners. The importance of meaningful (as opposed to shallow or rote) learning as a precursor to experiencing success is a highlight of the next lesson.

Appendix 10-A: My Story Example

It had been at least 20 years since I'd been in a classroom environment so I was understandably nervous about going back to school to get my PhD. My degree is in Educational Psychology and I discovered (only after I'd registered and was totally committed to the program) that each semester I had to take at least one statistics course.

I'd never taken a statistics class before (and it was years since I'd done math), but it sounded fun and I knew it was going to be essential to my success in my new field. I mean, if I wanted to graduate, then there was no way I could avoid stats!

The first day of my first statistics class, the instructor walked in, turned on the projector and began talking over his slides. It all sounded like a foreign language to me. I looked around to see if anyone else looked as terrified as I felt, but everyone just had their heads down, taking notes.

Have you heard the expression, "a deer caught in the headlights"? Well, that was how I felt that day. I really wondered what I had let myself in for and seriously questioned whether going back to school had been a good idea. I tried to take good notes, but because I didn't know what I was supposed to be doing, what information was most important, or how I was supposed to understand what the instructor was talking about, I felt completely lost. I remember being grateful that we were seated in a large auditorium with the lights dimmed, because I could feel my eyes welling up. I was really embarrassed!

After the time was up, the instructor simply shut off the projector, gathered his papers, and left the room. I didn't know any of the other students, and everyone else seemed as if they knew what they were doing. For the first time in my life, I felt completely helpless—and hopeless.

The thing was, it was really important to me to get my degree. After the shock subsided, I began to feel angry. And when I get angry, then I get very stubborn indeed! I told myself I was going to pass that darned statistics class, come hell or high water. I just needed to figure out how I was going to do it … especially as the first test was coming up in just a few weeks' time, and I needed to do well so I didn't fall behind. I also knew that doing poorly would be a blow to my self-confidence, which was already getting close to the floor!

As luck would have it, one of my other courses was called Human Learning, and the assigned textbook was really readable and interesting. In fact, it's been the only book I've ever kept from my time at college; I still refer to it today. I knew that there were chapters that talked about things like self-regulated learning, goal setting, and lots of psychological jargon like "attributions" and "self-efficacy," which simply mean the reasons we give for why we succeed or fail. So, before doing anything else, I dug into that book.

I found out a lot of interesting things reading those chapters, such as that success in college has very little to do with luck and a lot to do with effort and persistence. I knew I couldn't do anything about the way the statistics instructor taught us—that was out of my control. But I did know, because I'd experienced this myself in other situations, that when I put my mind to it, when I carved out the time and really worked hard, I could get a passing grade.

One of the best discoveries to come out of the latest research into how the brain works is discovering that our brains are "plastic." We used to think that intelligence was fixed and that you were either born smart—or you weren't. But that's been proven to be completely wrong by any number of scientists. In fact, we can set ourselves up for success by thinking more positively, finding reasons for doing whatever we find hard, and adopting some key learning strategies. This knowledge helped convince me that my inability to get statistics was only temporary. It certainly wasn't helped by the couldn't-care-less attitude of the instructor, but I wasn't going to give him power over my college experience and possibly my career by flunking his course.

I made a choice then and there that I was going to ace that course . . . and that's exactly what I did. Even though, that very first day, such an achievement seemed a million miles away.

Everything I learned that helped me be successful in my statistics courses and throughout my studies are things that you will have a chance to experience during this course. In a moment, you'll be able to see what those topics are when we go through the syllabus together and to talk about them in your small groups.

But let me end with the highlights of what I did to succeed at statistics:

- I made a **conscious choice** that I would **not** be a victim—just because the instructor was difficult didn't mean I had to join him and give up at the first hurdle! I determined instead to be a champion. I would succeed despite him—because it was my life and my career that was at stake and I wasn't going to let anyone spoil that for me.
- I set some pretty **ambitious goals** for myself, which meant a certain amount of sacrifice in terms of the time I dedicated to learning the material for this statistics course. I just kept my eye on the big picture: This course was just a small part of what was really important to me.
- But I also figured out how to **work smarter** as well as harder. I learned what successful students do that unsuccessful students don't do—in particular, how to be a good learning advocate for myself. I went to see the instructor and the teaching assistant in office hours when I couldn't understand something; I jumped on my challenges immediately, rather than letting them build up; I talked to other students who found statistics a lot easier than I did and asked if I could buddy up with them; I organized study groups and learned how to run them effectively so they didn't deteriorate into social events where no work got done.
- But perhaps what I learned that was most important of all was that **I wasn't alone.** Everyone looked as if they knew what they were doing, but we were all terrified . . . and as we became friends, we found it helped to talk things through, ask each other questions, and actively take control of our learning.

Honestly? I can't say I ever loved statistics—just like I'd never really warmed to math when I took it in high school—but I knew it was an important means to an end for me, so that made it important for me to succeed. And you know what I think? In that way it's a bit like being at

work. Sometimes you have to work with someone you don't especially like, but you know that you need to get along with that colleague in order to succeed at something that is important—like your job or the chance of getting promoted.

Statistics helped me get my degree and gave me a sense that although it's not a subject that I find easy or enjoyable, it's something I can be good at when I really try. That's the kind of experience I want for you and why we have designed this course to help you pass your math courses—not just the one you're currently registered for, but all the others you may need to take to get you through college and into the career you want.

Appendix 10-B: Suggested Topics for Financial Aid Presentation

Here are some suggested topics for discussion,.

- What is the purpose of the financial aid office?
- Where can I find information online about your office?
- How many financial aid counselors are there? Are students assigned a single counselor who advises them throughout their college career?
- What types of financial aid are available (e.g., need-based versus merit-based, emergency aid, scholarships, grants, loans, etc.)?
- Does your office have resources to help students find employment on campus?
- How do students apply for financial aid?
- How can the financial aid office help students find and apply for aid?
- What are some financial aid deadlines to be aware of?
- When are your busiest times of the year?
- What events, if any, does your department sponsor throughout the semester?

Appendix 10-C: Suggested Content for Metacognition Slideshow and Discussion

Metacognition

- Sometimes referred to as "thinking about thinking"
- Involves
  - understanding your thinking
  - regulating your thinking

Metacognition: Understanding your thinking

- What do you know? What are the limits of your understanding?
- How can you apply this knowledge?
- When does it make sense to apply this knowledge?

Reflecting on the Coin Challenge: Understanding your thinking

- What did you have to know to engage with the task?
- How did you apply that knowledge to the task?
- Which strategies worked and why? Which strategies didn't work and why?

Metacognition: Regulating your thinking

- Planning
- Implementing and monitoring
- Evaluating

Reflecting on the Coin Challenge: Regulating Your Thinking

- How did you plan as you worked on the task?
- In what ways did you monitor your work on the task?
- How did you evaluate your work, either individually or with your partner?

Appendix 10-D: Applying Metacognition

1. Read "You'll Never Learn! Students can't resist multitasking, and it's impairing their memory," by Annie Murphy Paul. You can find this article online: http://www.slate.com/articles/health_and_science/science/2013/05/multitasking_while_studying_divided_attention_and_technological_gadgets.html
2. Read whichever of the following articles your teacher assigned to you.
   - "How Does Human Memory Work?," by April Holladay, available at http://usatoday30.usatoday.com/tech/columnist/aprilholladay/2007-03-12-memory-first_N.htm
   - "The Three Knowledge-Memory Systems that Guide Your Life," by Gregg Henriques, available at http://www.psychologytoday.com/blog/theory-knowledge/201304/the-three-knowledge-memory-systems-guide-your-life
3. As you read, apply the steps of the metacognitive process outlined below and respond to the questions.

   Planning: Before reading the articles, record your responses to the following questions:
   - What do you already know about how memory works?
   - What would you like to know about how memory works?
   - What reading or note-taking strategies will you apply as you read the articles?

   Implementing and Monitoring: While reading the articles, consider the following:
   - Underline or circle any vocabulary words you need to look up.
   - Apply note-taking strategies as you read.
   - Record questions that you have about the material presented in the article.
   - Consider how the ideas presented in the article are connected to knowledge that you already have.

   Evaluating: After reading the articles, record your responses to the following questions:
   - What are the three main ideas of each article?
   - How are these ideas related to knowledge you already had, especially concepts you are learning in this course?
   - What are two to three questions you have about the concepts discussed in the article?
   - How will you apply the information in this article in your college work or other areas of your life?

Lesson 11 Update
Build a Better Memory: Part I
Attention and Deep Processing

Update note

See ***Frameworks Course Essentials***[13] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Faculty voices: Activity implementation

- "Activity 2 definitely didn't turn out the way it was supposed to. The 'constructing the story' group had the lowest average. But the group with 'counting letters and capital letters' actually rewrote the words in order of the number of letters and this help them remember the words better. Made for great discussion."

Activity 3: Making information meaningful

Faculty voices: Activity implementation

- "I did make a graph of their averages with 3 trials on the horizontal axis and the number of correct words on the vertical axis. They were amazed at how much those averages rose by adding context. I had the students figure out the average number of correct words within their groups and then they calculated the class averages as well. I did this to make an explicit connection to math content and frameworks concepts."

[13] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Lesson 11
Build a Better Memory: Part I
Attention and Deep Processing

Overview

It is likely that, aside from earlier lessons in this course that addressed smart thinking, your students have never been exposed to the ways in which learning and memory are connected. It's also likely that they aren't familiar with the various memory-related strategies they can use to be effective and efficient learners. This lesson and the one that follows focus on the importance of *meaningful* learning (as opposed to shallow or rote learning) as an important component of succeeding in college.

Week: 6 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 11-A, 11-B, and 11-C

The activities in this lesson help students understand that developing more flexible and focused attention, processing new information in a deeper way, and rehearsing new learning appropriately can ensure that what they learn in their courses (particularly their math courses) is stored in their long-term memory. This basic grounding sets the stage for the various strategies that students will learn and practice in the next lesson.

Key Concepts

Memory: The complex combination of processes by which information is acquired, stored, and later retrieved. There are various types of memory, but the two to focus on are *working memory* (limited capacity) and *long-term memory* (unlimited capacity).

Working memory: The processes that are used to temporarily store, organize, and manipulate information. Short-term memory, on the other hand, refers only to the temporary storage of information in memory.

Long-term memory: The information that is stored long term in the memory. This information can be *episodic* (about specific events), *semantic* (knowledge about the world), or *procedural* (how to do something, like ride a bicycle).

Attention: The filtering system by which we actively focus on or tune out information.

Deep processing: The process of attributing meaning to information often by linking it to prior knowledge, which ensures that it passes into long-term memory.

Shallow processing: The superficial (passive, rote) processing of information according to appearance or sound, which leads to short-term retention.

Student Objectives

Describe how to store and retrieve information from memory.

- Students investigate factors that influence memory as well as specific information-processing and organizing strategies.

Resources and Preparation

Materials and Technology Required

- Access to the Internet (for showing the YouTube gorilla video)

1. **Background information**
   - This lesson and the next one focus on practical techniques to help students improve their attention, their ability to store information in their minds, and their ability to retrieve that information.
2. **Entry logistics**
   - Prepare the student attendance sheet for the day.
3. **Make copies of the appendices for students:**
   - One copy per student of Appendix 11-A, Processing Information in the Brain: A Model.
   - The three versions of Appendix 11-B, Deep Processing and Shallow Processing Activity, will be distributed to three groups of students, so make copies of each version for one-third of the class.
   - One copy of Appendix 11-C, The Importance of Context (unless you plan to display the passage for students to read).
4. **Activity 1: Our complex brains**

   Review the article about missing the gorilla in our midst and preview the video related video clip.[1] If you plan to stop the video periodically, be sure to plan the most strategic stopping points and the questions you will use to prompt discussion.
5. **Activity 2: The difference between deep processing and shallow processing**
   - Review the three versions of Appendix 11-B and the activity that accompanies these appendices.
6. **Activity 3: Making information meaningful**
   - Review Appendix 11-C and the accompanying activity.
7. **For the next class period**

[1] MedicalXpress. (2011, April 18). Missing the gorilla: Why we don't see what's right in front of our eyes? Retrieved January 25, 2013, from http://medicalxpress.com/news/2011-04-gorilla-dont-front-eyes.html.

- Preview Activity 2 of Lesson 12, which focuses on using think-aloud protocols as a tool for processing information. Prepare a script for a think-aloud protocol on a math-related problem in order to model this approach for students. This is a great opportunity to work with a *Foundations for Mathematical Reasoning* instructor to increase your comfort with using this strategy in math. You may have students who are adept at using this process; perhaps you could invite them to demonstrate the process for the class with a math problem of their choice.

Instructional Plan

Preliminaries
(5 minutes)

- Have students sit with their success teams. Confirm with the teams that each of the articles assigned at the end of the last lesson was read and prepared by at least one team member. You may need to rearrange some groups if all readings are not represented in a group.
- Do not worry about collecting the reading assignment until after the first activity.
- Return the distributed schedule assignment (if you collected it).

Activity 1: Our complex brains
(35 minutes)

Objectives
Students

- Identify some complexities of how the brain works.
- Summarize factors influencing memory.
- Describe how new information is processed through short-term and working memory into long-term memory.

1. **Show video clip**: **Selective attention test**[2]
    - Find the clip here: www.youtube.com/watch?v=vJG698U2Mvo&feature=player_embedded.

[2] This video was created and uploaded by Daniel Simons, a researcher studying and publishing about inattention blindness. For more information, including the study description and results, see Simons, D. J., & Chabris, C. F. (1999). Gorillas in our midst: Sustained inattentional blindness for dynamic events. *Perception*, *289*(9), 1059–1074.

- The video demonstrates the "gorilla in our midst" phenomenon described in a well-known psychological study.
    - You can set the stage by telling students that the video clip will help us better understand some of the complexities of how our brains work. (Don't mention gorillas in your introduction to the activity, though!)
    - Make sure students understand that the important point to take away from the clip is that our brains are very complex. The brain is designed for efficiency. It takes shortcuts, one of which is that it causes people to see what they expect to see. Seeing only the people in white shirts—and NOT seeing the gorilla in their midst—is an example of this kind of shortcut; not seeing billboards or pedestrians walking on the sidewalk as we drive is another example.

An understanding of attention, perception, and memory can help students learn more effectively and have more patience with themselves when their perceptions or memories are not perfect. The good news is that it is possible to increase working memory capacity in a number of ways, and students will learn some of these ways—including how to become more flexible about what they focus on—in the next lesson.

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2. **If you need an alternative activity on the same topic (in place of the above activity).**
    - Ask students to draw something that is quite familiar to them—the campus logo, the logo of their favorite sports team, a map of aisles at the grocery store. Students should choose an actual thing so that they can compare their drawing to it to see how accurate their representation is.
    - The key points for understanding and main takeway should be the same as in the above activity.
3. **Pose this question to the class: Why do we forget information?**
    - Prompt students to think about forgetting in different situations—when they are taking a test, when they go grocery shopping, when they have met someone new at a party, when a long period of time has passed since they learned the information, during a period when they are stressed, etc.

We forget information for a number of reasons. Sometimes we fail to store the information in our brains in the first place. We might get information mixed up as we process it (new information may be too similar to something we already know, and we don't distinguish it sufficiently from that information). Sometimes memories fade because we don't recall and work with them often enough (think back to the brain video with the bridge-building analogy shown earlier in the semester). Each of these reasons makes sense given what scientists know about memory and the complexity of the brain.

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4. **Distribute one copy of Appendix 11-A to each student.**
5. **Success team work**: **Have teams use the information from the articles assigned for preparation (see Lesson 10 assignment) to develop an explanation of the model they can use to teach other students about how the brain processes information.**
    - Each reading provides unique information that is helpful in understanding how the brain processes and stores information. Success team members will need to work together to develop an explanation of the model that incorporates information from all the articles.
        - The team's explanations should cover these components of the model: external stimuli (sight, hearing, smell, taste, touch); perception; attention; short-term memory (specifically, how long information stays in short-term memory), working memory; long-term memory (encoding, storage, retrieval); what gets stored in short-term, working, and long-term memory; declarative and procedural memory; and effects of sleep and emotion on the process.
        - Remind students to take notes on the information their team members share from the readings so they have a record of how they developed their explanation of the model. You can choose to collect this write-up.
6. **Transition to the next activity.**
    - Let students know that a critical ingredient for creating memories that "stick" is the depth of the processing that occurs when the information is first learned. The next activity will demonstrate this is a fun and engaging way.

Learning to focus your attention on important information is a skill that can help you effectively organize the information in your brain, making it easier to retrieve later and enhancing your overall ability to learn and succeed.

Activity 2: The difference between deep and shallow processing[3]
(20 minutes)

Objective

Students

- Differentiate between shallow processing and deep processing.

1. **Divide the class into three groups**.
2. **Distribute one of the three versions of Appendix 11-B, Deep Processing and Shallow Processing Activity, to each group.**
    - Make sure all three versions are used.
3. **Allow five minutes for the groups to work.**
    - Help groups apply the strategy provided to learn the words on their version of Appendix 11-B. For the group assigned Appendix 11-B3, the following adaptation of Aesop's fable "The Ant and the Grasshopper"[4] may help you guide their work.

One **summer**'s day, a merry Grasshopper was singing and **playing** his **fiddle**. He saw an **Ant** carrying a huge bale of **wheat**. "**Dance** with me instead of working so hard," said the Grasshopper. "I must store **food** for **winter**," said the Ant. "You should do the same." "Don't worry about winter," said the Grasshopper, **smirking**. But the Ant continued his **toil.** When the **snow** came, the starving Grasshopper went to Ant's house to **beg** for something to eat. "If you had **worked** instead of playing you wouldn't now be **hungry**," said the Ant, slamming the **door** in Grasshopper's face.

4. **Ask students to turn over their list of words** (or you could collect the sheets).
5. **Now tell students to record the words in the correct order and format on a separate sheet of paper.**
    - Give them three to five minutes, or until you notice that most students have stopped writing.

[3] In developing this activity, the author consulted S. A. McLeod (2007). Levels of processing. Retrieved January 25, 2013, from www.simplypsychology.org/levelsofprocessing.html. McLeod's article draws from F. I. M. Craik and R. S. Lockhart's original research on deep and shallow processing (1972). Levels of processing: A framework for memory research. *Journal of Verbal Learning and Verbal Behavior*, 11, 671–684.

[4] This adaptation of Aesop's fable "The Ant and the Grasshopper" is drawn from the Kids' Pages website at www.kids-pages.com/folders/stories/Aesops_Fables/page1.htm.

- You can also use this time to ask students to record different aspects of the words (for example, the number of vowels or the number of five letter words) in order to demonstrate how challenging it is to answer more challenging questions if we have only memorized the material.

6. **Correct the lists**.
    - Read the original lists aloud, asking students to put a ☐ by the words they got right and an X by those they got wrong.
7. **Average the group scores.**
    - **Ask one memb**er from each group to add up the number of words each group answered correctly and come up with the group's average.
8. **Compare group averages.**
    - Compare the average number of correctly remembered words for each group (writing them on the whiteboard). You could represent the numbers in a graph or have a student graph the averages. Students should be familiar with graphing as they have recently worked with graphing in the *Foundations of Mathematical Reasoning* course.
    - Make sure all groups know the strategies the other groups used to learn the words.
    - According to studies on deep and shallow processing, Group 1 should have the lowest average score, and Group 3 should have the highest average score.

> **Note:** You may not get the same outcome with your groups. If you don't, use the class-wide debrief time as an opportunity to explore the differences between shallow and deep processing and why the outcome was different. (Reasons may include small sample size, unequal group sizes, or an unrepresentative sample.) Students will be covering averaging in *Foundations of Mathematical Reasoning*, so this discussion can be brief and still give them an opportunity to use mathematical reasoning in the discussion. If you are uneasy about including the mathematics within this activity, reach out to a *Foundations* instructor for guidance on facilitating this discussion.

9. **Success team discussion: What could explain why the groups differed?**
10. **Whole-class debrief: What explanations did you come up with? How do you think these explanations relate to studying and learning?**
    - Key differences between shallow and deep processing that you can help the class identify:
        - Shallow processing (engaged in by Groups 1 and 2) focuses on superficial elements, such as the number of letters in a word, whether the word begins with a capital or lowercase letter, and the sound of the word.

  - While the members of these groups may remember some of the words now, it is unlikely they have fully stored these memories, and therefore it will be harder or impossible for them to retrieve the words later.
  - In addition, this shallow processing makes it unlikely that the members of Groups 1 and 2 will be able to recognize the list of words if it is presented differently from how it was originally presented.
- Repeating terms or ideas over and over (for example, saying a telephone number over and over to yourself because you don't have paper to write it on) stores information in your working memory and is fine for superficial tasks like remembering a simple list of grocery items. But this strategy is not suitable studying college material because it does not store information in your memory in a way that makes it easy to retrieve that information later. Deep processing involves meaningful learning.
  - Ask one of the Group 3 members to explain how he or she converted a random list of words into a story.
  - It may have been easier for this group to remember the words in the correct order because they linked them together in a meaningful way, adding detail and context and using mental imagery to store the information in a visually memorable way.
  - Connect deep processing and smart thinking: How do smart thinking habits use deep processing to create meaningful learning?

- Implications for studying:
  - When you say you are studying something, are you using strategies that help you make the information meaningful (as Group 3 did)? Or are you just looking at the words and trying to memorize them (as Groups 1 and 2 did)?

To move information from your working or short-term memory to your long-term memory, you need to make the information meaningful. Meaningful learning is our goal; making connections between new information and what we already know helps us learn the information deeply, instead of just being able to repeat it back to an instructor in class or on an exam. Many of the strategies covered in the next activity will show you how to make information meaningful.

Activity 3: Making information meaningful

(10 minutes)

Objectives

Students

- Identify characteristics of meaningful learning.

1. **Task the group:**
    - This next activity continues our work to understand what making information meaningful is really all about.
2. **Distribute one copy of Appendix 11-C to each student.**
3. **Individual activity: Have students read the passage and decide what they think it's talking about.**
    - The passage (about washing clothes) is taken from a famous experimental study published by J. D. Bransford & M. K. Johnson in 1972.[5] If you prefer, you may compose your own brief, highly ambiguous description of an everyday task.
    - Ask students to indicate when they think they know what the passage is talking about. Depending on how engaged your students are, this indication can range from a simple thumbs-up to writing their response on a scrap of paper.
4. **Debrief the individual activity: What is the passage talking about?**
    - For those who guessed correctly, what clued you in? At what point did you know what the passage was about?
    - For those who guessed something else, what did you guess? What evidence did you use to make that guess?
    - For those who didn't guess anything (if applicable), why didn't you guess?
    - How does having good background knowledge (e.g., knowing that the passage was about washing clothes before you started reading it) affect your studying and learning?

This passage provides a simple example of how it is harder to learn and remember new information when you have no context for understanding the information. Developing background knowledge of the content and tasks you complete for your classes can have a major impact on your learning and your ability to remember what you have learned.

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[5] Bransford, J. D., & Johnson, M. K. (1972). Contextual prerequisites for understanding. Some investigations of comprehension and recall. *Journal of Verbal Learning and Verbal Behavior, 11,* 717–726.

5. **Individual activity: Ask students to make meaning out of this string of numbers: 19221935194819611974198720002013.**
    - You could project this number onto a screen or print it out on slips of paper for each student.
6. **Individual activity debrief: How did you make meaning out of the numbers?** Possible Answer: The long number consists of calendar years (1922, 1935, 1948, 1961, 1974, 1987, 2000, 2013) that increase by 13. This answer was derived by breaking down, or "chunking," the long number into smaller, manageable pieces.
    - Emphasize the following in the debrief: Our brain functions optimally by processing smaller pieces of information; long lists are not easily processed or remembered.
        - Fun point: Phone numbers (minus the area code) in the United States typically consist of seven numbers. This was originally considered the maximum amount of information that could be held in working memory at any one time.
        - Research supports that we can hold approximately seven chunks of information in our working memory at one time. This limit on how much information we can store in our working memory explains why cramming the night before a test usually doesn't lead to success—we can't hold a whole bunch of new information in our working memory for long periods of time. Eventually (and likely, soon) some of what we are holding onto will be pushed out by new information!

There are many different things to take into consideration when you try to make information meaningful for yourself: how you are going to use the information (think back to the word list exercise), how familiar you were with the context (the laundry example), and how complex the information is (the long list of numbers). Making meaning isn't a one-step-and-done endeavor. You need to apply different strategies for different tasks; developing a deeper understanding of the content presented in your courses will required sustained and focused effort.

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7. Revisit the information-processing model and discuss the following questions:
    - Where in our memory do we want the information we learn in class to reside? [Answer: In our long-term memory]
    - What is the key to moving information from our short-term into our long-term memory? [Answer: Make the information meaningful to you]
    - What is one way your *Foundations of Mathematical Reasoning* course helps you make things personally meaningful to you? [Sample responses could include:

Uses real-life examples. The teacher doesn't lead us through everything; we have to make connections ourselves. It is not plug and chug the way other math classes have been.]

Wrap-Up

(5 minutes)

Ask students to recap the three most important ideas from this lesson:

- Our brains are extremely complex, and understanding how attention, perception, and memory all work together can help us choose good strategies for learning new information.
- Meaningful learning is active! It involves using deep-processing strategies to learn the information acquired in our courses, rather than trying to remember new information simply by repeating it over and over (i.e, using shallow processing strategies).
- Activating prior knowledge and chunking information into manageable pieces are two strategies we can use to maximize learning and enhance memory.

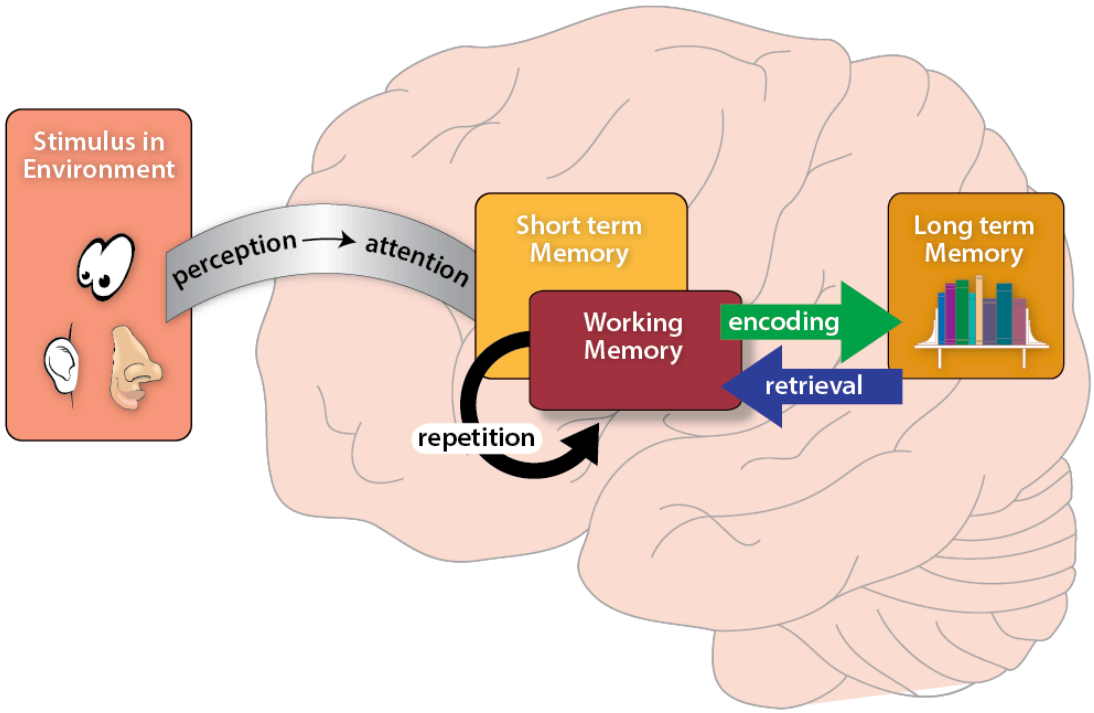
Assign the following:

- Journal assignment: Write about three strategies you use to make information meaningful to you as you study. How do these strategies promote shallow or deep processing? How have you used the smart thinking strategies we discussed earlier in the semester? Connect what we discussed in class today with what you learned earlier about smart thinking.
    - Due: Beginning of Lesson 12

Preview what will be covered in the next lesson:

- Students will learn and practice a series of strategies they can use to improve their memories and boost their learning, especially for math. If you plan to have students apply these strategies to material in their math textbooks and math class notes, remind students to bring their textbook and notes to the next lesson

Appendix 11-A: Processing Information in the Brain: A Model



Appendix 11-B1: Deep Processing and Shallow Processing Activity

Instructions:

Your group has five minutes to learn the words on this list. Use these two strategies to learn and remember the words: 1) Count the number of letters in each word, and 2) Focus on whether the words begin with a capital letter.

Summer	**hungry**	**smirking**
Ant	**wheat**	**Dance**
snow	**beg**	**Fiddle**
Food	**Toil**	**winter**
Worked	**playing**	**Door**

Appendix 11-B2: Deep Processing and Shallow Processing Activity

Instructions:

Your group has five minutes to learn the words on this list. To help you learn the words, think of a word that rhymes with each word on the list.

Summer	**hungry**	**smirking**
Ant	**wheat**	**Dance**
snow	**beg**	**Fiddle**
Food	**Toil**	**winter**
Worked	**playing**	**Door**

Appendix 11-B3: Deep Processing and Shallow Processing Activity

Instructions:

Your group has five minutes to learn the words on this list. Specifically, you should learn this list by constructing a "story" that links all the words together.

Summer	**hungry**	**smirking**
Ant	**wheat**	**Dance**
snow	**beg**	**Fiddle**
Food	**Toil**	**winter**
Worked	**playing**	**Door**

Appendix 11-C: The Importance of Context

The procedure is quite simple. First you arrange things into different groups. Of course, one pile may be sufficient depending on how much there is to do. If you have to go somewhere else due to lack of facilities that is the next step, otherwise you are pretty well set. It is important not to overdo things. That is, it is better to do too few things at once than too many. In the short run this may not seem important, but complications can easily arise. A mistake can be expensive as well. At first the whole procedure will seem complicated. Soon, however, it will become just another facet of life. It is difficult to foresee any end to the necessity for this task in the immediate future, but then one can never tell. After the procedure is completed, one arranges the materials into different groups again. Then they can be put into their appropriate places. Eventually they will be used once more and the whole cycle will then have to be repeated. However, that is part of life.

Lesson 12 Update
Build a Better Memory Part II: Elaboration and Organization Strategies

Update note

See ***Frameworks Course Essentials***[14] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

[14] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Lesson 12
Build a Better Memory Part II: Elaboration and Organization Strategies

Overview

This lesson builds on the previous one by equipping students with strategies they can apply to better acquire, store, and retrieve knowledge related to their math course. In addition to learning strategies such as chunking and think-aloud protocols, students also learn how to use flash cards to enhance memory and retention.

Week: 6 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 12-A, 12-B, and 12-C

Key Concepts

Memory: The complex combination of processes by which information is acquired, stored, and later retrieved. There are various types of memory, but the two to focus on in this lesson are *working memory* (limited capacity*)* and *long-term memory*.

Elaboration: A form of deep processing whereby information is not only actively linked to things that the student already knows but is enhanced or embellished.

Visual organizing strategies: Techniques for depicting the relationships between things visually, as with concept maps/hierarchies, mind maps, and timelines.

Think-aloud protocols: A learning strategy that involves verbalizing aloud the processes and steps necessary to solve a math or other problem.

Flash cards: Visual devices used to help remember key information.

Student Objectives

Describe how to store and retrieve information from memory.

- Students investigate factors that influence memory as well as specific information-processing and organizing strategies.

Resources and Preparation

Materials and Technology Required

None

1. **Background information:**
   - This lesson builds on the previous one by introducing practical techniques students can use to improve how they acquire, store, and retrieve information. These techniques can in turn help them become more effective, and thus more successful, learners. The material in the previous two lessons provides good background information for this lesson.
   - The activities in this lesson are very applicable to math learning. While some information about these connections is provided here, you may want to consult with a *Foundations of Mathematical Reasoning* instructor as you prepare for this lesson to help you tie the activities in this lesson to specific information students are currently covering in the *Foundations* course.
2. **Entry logistics**
   - Prepare the student attendance sheet for the day.
3. **Make copies of the following materials for students:**
   - Appendix 12-A, Information-Processing Strategies
   - Appendix 12-B, Guidelines for Creating Flash Cards
   - "Do you know what you don't know?" A Harvard Business Review Blog Network entry written by Art Markman and posted on May 3, 2012. It is available at blogs.hbr.org/cs/2012/05/discover_what_you_need_to_know.html
4. **Activity 1: Elaboration and organization strategies**
   - Familiarize yourself with the strategies and examples provided. Students may struggle to understand the differences between some of them, so be prepared to give alternate examples and explanations.
5. **Activity 2: Practice using think-alouds**
   - Identify the questions you want to ask for the think-aloud prompt. You can consult with the *Foundations for Mathematical Reasoning* instructor to see if there is a specific problem they would like you to use in lieu of the prompt provided here.

6. **Activity 3: Creating flash cards**
    - Select examples of flash cards to show the class. You may want to create your own flash cards that reflect information covered in this and the previous lesson, so that you can use them as examples for your students.
7. **For the next class period**
    - The next lesson focuses on building skills to read and process information from textbooks. Bring in examples of the different kinds of textbooks that students will read in college so they can interact with these texts throughout class. Students may also benefit from looking at the textbooks they are currently using in the coursework; they can immediately begin applying class concepts to their studying in these texts.

Instructional Plan

Preliminaries
(5 minutes)

- Have students sit with their success teams.
- Collect journal entry assignment. Alternatively, students can hold onto this assignment until the end of the lesson so they can use journal entries in some of the activities.

Activity 1: Elaboration and Organization Strategies
(40 minutes)

Objectives
Students

- Identify elaboration and organization strategies (including memorization by chunks, by acronyms, and by acrostics; creating associations; elaborating on concepts; and diagramming information).

1. **Success team activity: Ask the success teams to summarize the key ideas from the last lesson.**
    - Key points to listen for as you move among groups:
        - How short-term, long-term, and working memory affect learning
        - The benefits of meaningful learning
        - Deep processing versus shallow processing
        - The importance of prior content knowledge in learning new information
2. **Pose the following question to the class: How does a toilet work?**
    - Feel free to ask any "how does it work?" question you want here, and to follow up with appropriate prompts to elicit clarification and further explanation.

- The goal is to have the class struggle to come up with a complete explanation of the process at work to demonstrate that we often use faulty or incomplete information to judge what we think we know. Our incomplete or incorrect understanding sometimes leads to overconfidence—we believe we know more about a topic than we actually do. This overconfidence influences the study choices we make and has tremendous impact on our learning.

3. **Distribute the article "Do you know what you don't know?"**
    - One copy per student.
    - "Do You Know What You Don't Know?" is a Harvard Business Review Blog Network entry written by Art Markman and posted on May 3, 2012. It is available at blogs.hbr.org/cs/2012/05/discover_what_you_need_to_know.html
4. **Success team activity: Read "Do you know what you don't know?" and answer the question "How do the strategies Markman writes about help you get information into your long-term memory?"**
    - Prompt students to pull out the Processing Information in the Brain model they worked with in the last lesson. Encourage them to use the terminology and content from the last lesson in their discussion.

As you teach someone else what you are learning, work collaboratively, or explain concepts to yourself as you learn them, you are making the information meaningful to you. There is a learning curve with using these strategies. It will take practice to get good at using them, but it will be worth it!

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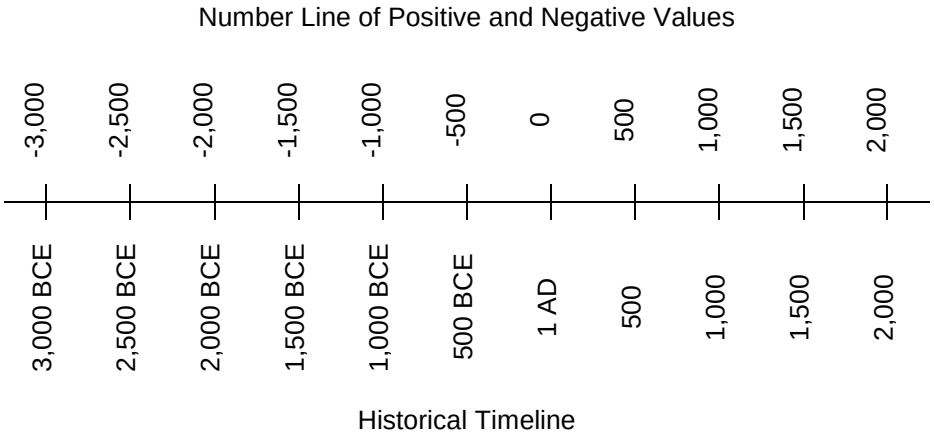
5. **Distribute Appendix 12-A, Elaboration and Organization Strategies Worksheet**.
    - One copy per student
    - This handout describes strategies students can use to move information into their long-term memory.
6. **Success team activity: Apply these strategies to your study of math.**
    - Consult with a *Foundations of Mathematical Reasoning* instructor as you prepare for this part of the lesson. The instructor will be able to give you information about the examples students have heard in class and help you practice using these examples before you introduce them to your students.
    - Students should work to identify how the featured strategies can help them make learning more meaningful.
    - Provide examples to help students see the level of application you would like them to get to. The examples provided here are from topics students will have already covered (or are in the process of covering) in *Foundations of Mathematical Reasoning*.

- Associations/analogies
  - Think about studying percentages. We often compare 100% to $1.00 to help make something that is abstract (a percentage) more concrete (paper money). Another analogy would be to say that 100% is like having a full gas tank; 75% represents one quarter of the tank being empty, etc.
- Classifying or categorizing the material (See Appendix 12-C).
- By understanding the characteristics of various tools for displaying data (e.g., stem-and-leaf plots, box plots, dot plots, histograms), you are able to decide which tool is most appropriate for visually representing a set of data or interpreting information that is presented to you in a graph form. Which types of graphs show individual data points? Which types of graphs can be used to show the average value in the group? Which types of graphs are appropriate for large data sets?
- Relating parts to one another (by creating timelines, graphs, concept maps, etc.)
  - Consider the double number line below. The top number line indicates both negative and positive values. The bottom number line is a historical timeline. The double number line models how historical dates are related and how integers model real-world scenarios. In particular, the double number line illustrates how dates are reported relative to a specific historical event (the start of the Current Era). This representation can help to illuminate or clarify that a historical artifact dated 2,000 BCE (–2000) is actually older than one dated 1,500 BCE (–1500), because 2,000 BCE (–2,000) is located farther from 0 than 1,500 BCE (–1500).[1]



[1] There are two systems associated with dating years: "BC and AD" and "BCE and CE" (Before Current Era and Current Era). Common usage often mixes the two.

Activity 2: Practice using think-alouds[2]

(10 minutes)

Objective

Students

- Practice using a think-aloud processing method.

1. **Paired discussion: How much ketchup is consumed in the cafeteria in a year?**
    - Have students use the think-aloud processing method to plan how they would answer this question. You can develop other questions if you want variety in the group or if you feel a different question suits your students better.
    - If you feel that your students already have a good grasp on think-aloud protocols, you could abbreviate the discussion to focus on one think-aloud example and then debrief the challenges and benefits of using this strategy.
2. **Partner debrief**: Pose the following questions:
    - What are some benefits associated with using this method?
    - What are some challenges associated with using this method?
    - What are some resources (think back to the balloon activity from earlier in the semester) that can help you use this method?
3. **Key points to make sure are brought up in the partner debrief:**
    - Verbalizing your thinking in this way with a fellow student helps you identify misconceptions and/or points at which you are stuck.
    - Thinking aloud aids metacognition (refer to the earlier discussion about monitoring what you are doing and what you know as you execute a plan for learning new material).
    - Thinking aloud also frees up space in your brain to consider whether the words you are using convey the meaning you intend. This technique does take practice, though. If you feel discouraged, understand that what you're feeling is actually your brain growing and learning to think in a new, productive manner.

[2] In developing this activity, the author consulted "The Think-Aloud Protocol: A High Yield/Low Stakes Assessment," a publication of The Carnegie Foundation for the Advancement of Teaching. Retrieved December 22, 2012, from bondessays.carnegiefoundation.org/?p=9.

Activity 3: Creating flash cards[3]

(15 minutes)

Objectives

Students

- Identify recommended uses for and construction of flash cards.
- Organize class notes onto flash cards.

1. **Distribute Appendix 12-B and discuss the appropriate construction and use of flash cards.**
    - There are many more tips and strategies for using flash cards than this handout covers. Feel free to supplement with any points you feel should be added. The handout is intended to help students get started on using flash cards without overwhelming them with all of the possibilities.
2. **Display different examples of flash cards.**
    - These sites provide examples:
        - Virtual Math Flash Cards on the Study Stack website: www.StudyStack.com/Math
        - Free Math Flash Cards on the ProProfs website: www.proprofs.com/flashcards/search.php?search=math
3. **Individual work: Create their own individual flash cards on memory, how the brain works, or strategies for getting information into long-term memory.**
4. **Group work: Build a set of flash cards from the individual cards created.**
    - Have groups identify the varying aspects of information included and how information is organized differently on each card.

[3] In creating this activity and the accompanying handout, the author consulted pages 13–15 of "The science of psychology and its research methods," retrieved January 12, 2013, from new.ipfw.edu/home/search_results.html?search_query=flash+cards&searchDomain=1 and "Using flash cards to remember information" by Cody Blair. Retrieved January 12, 2013 from www.how-to-study.com/study-skills/en/32.asp.

Wrap-Up

(5 minutes)

Assign the following:

- Tell students to use the instructions on Appendix 12-B to finish creating flash cards for the information covered in Lessons 11 and 12. Give students an approximate number of flash cards you would like them to create.

Preview the next lesson:

- The next lesson will focus on helping students identify important information in their classes, especially their math class. The lesson will cover developing a system for more effectively identifying, attending to, storing, and retaining the knowledge they need to succeed in college.

Appendix 12-A: Information-Processing Strategies

Active Rehearsal	Elaboration	Organization
Chunking Acronyms/acrostics	Associations/analogies Applying knowledge to new situations Paraphrasing/summarizing Explaining/teaching to others	Dividing material into meaningful parts Classifying or categorizing the material Relating parts to each other (by creating timelines, graphs, concept maps, etc.)

Chunking: Grouping small amounts of information into larger units to aid recall. How would you chunk these letters so they become meaningful and therefore more easily recalled?

B F F M T V F B I D O D

Possible Answer: BFF (**B**est **F**riends **F**orever); MTV (**M**usic **T**ele**V**ision); FBI (**F**ederal **B**ureau of **I**nvestigation); DOD (**D**epartment **o**f **D**efense)

Acronyms/acrostics: Using the initial letters of a set of information to create an easily remembered statement.

- Consider a commonly used acronym, PEMDAS, to represent the order of mathematical operations: Parentheses, Exponents, Multiplication, Division, Addition, and Subtraction.

Associations/analogies: Comparing something new to something you already know.

- To remember the definition of the associative property of math, you could think about socks in your drawer. If you have three blue pairs and two black pairs, it doesn't matter if you count the blue pairs first and then the black, or count them in a mixed up order, because in total you will always get five pairs of socks.

Applying knowledge to new situations: Taking what you are studying and making connections to other things in your life. Making connections to experiences you have had helps make information more meaningful to you.

Paraphrasing/summarizing: Putting the material you are studying into your own words.

Explaining/teaching to others: Using your own words, teach someone else the material you are learning. Come up with new examples that will be meaningful for your student and have multiple, different explanations. Teaching material to others has been found to be one of the most effective ways for students to really learn the material and to test how much they know.

Dividing material into meaningful parts: Separating the material into parts and explain how the individual sections are part of the whole.

Classifying or categorizing the material: Developing categories to classify new information. This process helps break down the information and helps make the connections among the categories more meaningful for you.

Relating parts to each other (by creating timelines, graphs, concept maps, etc.): Organizing information in a visual way, using visual components to represent key relationships among the parts. If you can identify which piece of information is a main point and which pieces of information play a more supportive role, your graphical representations can include the hierarchical nature of the information as well.

Appendix 12-B: Guidelines for Creating Flash Cards

Why create flash cards?

1. They are portable: Key information is easier to carry with you when it's on a few index cards instead of in your math textbook or notes. Flash cards allow for ongoing, easy reference. You can make paper flash cards or use an electronic application to create them—both are good ways to make sure you have information available for studying on the go.
2. They can help boost your memory: Consistent use of flash cards helps you acquire or retrieve new information. Flash cards also aid in rehearsal, which is important to the process of embedding information into long-term memory.
3. They help you identify challenges: Flash cards help identify what you know, and they help pinpoint aspects of course material that you find challenging to remember—aspects that you might need to seek additional help (from your course instructor or other campus resource) to master.

How to create flash cards

1. Write only one concept or piece of information on each index card. Cramming too much information onto your flash cards defeats the purpose. Consider whether the material is too complex for using flash cards or whether you need to do more work to break the information down into meaningful pieces.
2. Engage in meaningful learning by using your own words to describe key terms, concepts, and other information rather than copying verbatim from your instructor or the course textbook.
3. Use more than words. As appropriate, use simple graphics (e.g., drawings, charts, diagrams) to convey the information to be learned more effectively. Using different colors can also help you organize the information in a creative way.
4. Continually improve your flash cards. See your flash cards strategy as a work in progress rather than as a one-off activity.

Ways to use your flash cards

1. Remember, flash cards are useful only if you carry them around with you! You almost always have some downtime during the day (e.g., waiting for the bus, standing in line at the grocery check-out)—don't let that precious time go to waste!
2. Shuffle them like a deck of playing cards and challenge yourself to learn from a certain number of cards every day, in whatever order.
3. Use the cards to test yourself. Be sure to use both sides of each card. Try choosing two cards at random and trying to make connections or distinctions between the material covered on each card.
4. Separate your cards into piles, such as "Material I definitely know" and "Information I need to work on." Take that second batch of flash cards with you when you visit your instructor during office hours and ask for help in better absorbing the information.

Appendix 12-C: Supporting Information for Classification Example

Students could create this organizer to compare the characteristics of the charts and graphs. This example is NOT intended to provide a complete comparison of charts and graphs; *Foundations of Mathematical Reasoning* covers charts and graphs that are not represented here. Furthermore, numerous other comparison statements could be used to describe the three types of data representations included; here the comparison statements provided are simply for demonstration.

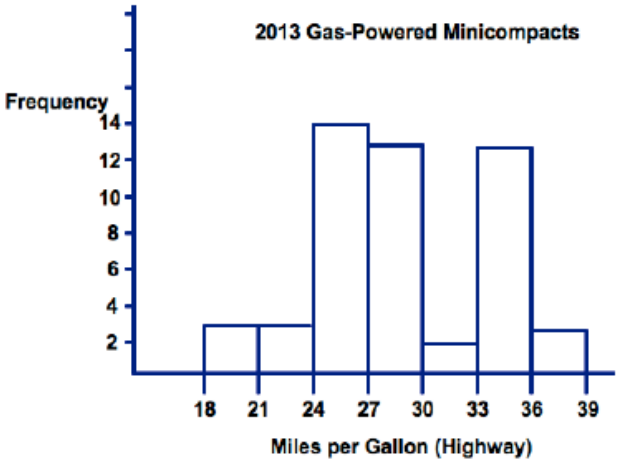
	Histogram	**Stem-and-Leaf Chart**	**Boxplot**
Includes individual responses		**x**	
Can determine the minimum and maximum value in a group		**x**	
Can determine the average value in a category			**x**
Good for large data sets	**x**		**x**

Examples of Four Types of Graphs Illustrating Highway Miles-Per-Gallon Achieved by 2013 Gas-Powered Cars (Minicompacts)[4]

Frequency Table

Range	Frequency
18 to 20	3
21 to 23	3
24 to 26	14
27 to 29	13
30 to 32	2
33 to 35	13
36 to 38	3

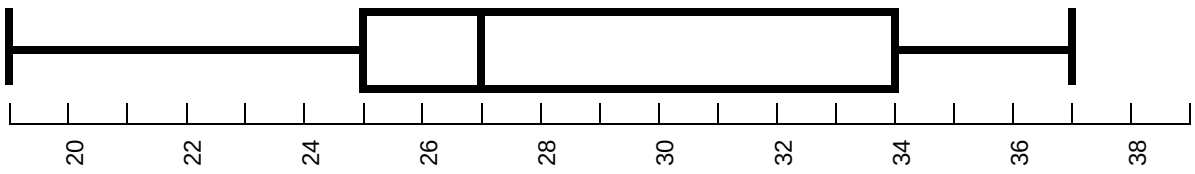
Histogram



Stem-and-Leaf Plot

Stem	Leaf	Key: 1| 9 means 19 mpg
1	9 9 9	
2	2 2 2 4 4 4 4 4	
2	5 5 6 6 6 6 6 6 6 7 7 7 7 7 7 7 8 8 8 8 8	
3	0 0 4 4 4 4 4 4 4 4	
3	5 5 5 5 5 6 7 7	

Box Plot



Miles Per Gallon (Highway)

[4] Data used in these graphs are taken from the U.S. Department of Energy's Fuel Economy website: http://www.fueleconomy.gov/feg/byclass/Minicompact_Cars2013.shtml

Lesson 13 Update
Identifying Important Information As You Read

Update note

See ***Frameworks Course Essentials***[15] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Activity 1: Using the SQ4R model to engage with course texts

Facilitation note

Appendix 13-C, "Preview Assignment 10-ABC from the *Foundations of Mathematical Reasoning* course," has been updated to reflect the changes made when *Foundations c*ourse materials were revised to create *Foundations* version 2.0 (July 2014 release).

This updated appendix 13-C, along with Appendix 13-D, is included as a resource for students to analyze during this activity.

(Note that Appendix 13-D, which remains part of the *Frameworks* 2.0 course materials, has not been updated and thus is not included in this *Updates* document.)

Faculty voices: Activity implementation

- "I did create a handout for students to use to evaluate textbooks from other disciplines. I felt that they needed structure to know exactly what I wanted them to notice about the texts. I had very diverse texts and I felt having a uniform set of criteria was helpful."

Content note

- An example of such a handout is available here:

  College Readiness Assignments for Texas (CRAfT). (2013). "Exploring a College Textbook," in CRAs for Classroom Use: Cross-disciplinary. Austin, Texas: The University of Texas at Austin. Retrieved June 15, 2014, from http://craftx.org/exploring-college-textbook.

[15] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Appendix 13-C: Preview Assignment 10-ABC from the *Foundations of Mathematical Reasoning* course

Preparing for the next class

In the next lesson, you will need to understand the concept of area and how to calculate population density.

Questions 1–3: In Lesson 2, Part A, you learned that Earth's human population has grown from about 1 billion people to nearly 7 billion in the last two centuries. However, populations in different regions do not always grow uniformly. For example, populations tend to increase in areas where people already live close enough to one another to find mates. On the other hand, crowded populations decrease when deadly diseases, such as SARS or Ebola virus, sweep through them. In this lesson, you will compare geographic regions by their population densities.

The **population density** of a geographic region is the ratio of the number of people living in that region to the area of the region.

Population density = $\frac{\text{number of people}}{\text{area of the region}}$ and its unit is people per unit area.

Population density ratios are converted into decimal form in order to compare them with a similar area measurement.

The following information will be used in Lesson 10, Part A. The fifty states of the United States vary greatly in both size and population. Some states, especially on the east coast, are small and mostly urban, meaning that most people live in cities. Other states, in the west and plains, are larger and more rural, with people living in small towns or in the countryside. Population density is one way to measure how crowded a state is.

If an area is densely populated, it will need more services, such as schools and hospitals. Some states, such as Washington, use the population density of counties to classify them as urban or rural in the state law. This can affect whether residents can be qualified for certain kinds of assistance programs.[16]

[16] Office of Financial Management. "Population density and land area criteria used for rural area assistance and other programs." *Access Washington*. [State of Washington website]. Retrieved June 14, 2014, from http://www.ofm.wa.gov/pop/popden/rural.asp

The following problems should be completed in your binder.

Alaska is the largest state, with 571,951 square miles, but in 2010 it had one of the smallest populations, with only 710,231 people.

1) What is the ratio for Alaska's population density?

2) What is the decimal form of that ratio? Round to the nearest tenth.

3) Write a contextual sentence about the answer to Question 2.

4) Refer to the table shown below. Use the information given in the table to calculate the population density for each of the states listed. Round to the nearest tenth. Keep a record of the densities on your own paper.

State	Land Area Square Miles	2010 Population	Density: People per Square Mile
Alaska	571,951	710,231	1.2
Idaho	82,747	1,567,582	
Kentucky	39,728	4,339,367	
Louisiana	43,562	4,533,372	
Nebraska	76,872	1,826,341	
New Hampshire	8,968	1,316,470	
New Jersey	7,417	8,791,894	
South Dakota	75,885	814,180	
Washington	66,544	6,724,540	
Wisconsin	54,310	5,686,986	

5) Recreate the table below on a new page in your notes. Allow an entire page, as this table will be extended later. Using the calculated densities in the previous question, place the states in the appropriate column. Alaska has been done for you.

Density < 10 people/mi^2	10–100 people/mi^2	100–1,000 people/mi^2	Density > 1,000 people/mi^2
Alaska			

6) The following problems have to do with multiplying and dividing by powers of 10. Look for patterns and ways to find the answers mentally without a calculator or writing the problem down. Check your answers with a calculator if you wish.

Part A: 0.32×10

Part B: 3.2×10

Part C: 32×10

Part D: 32×100

Part E: $51{,}000 \times 10{,}000$

Part F: 900×10^4

Part G: 1.3×10^7

Part H: $0.32 \div 10$

Part I: $3.2 \div 10$

Part J: $3{,}200{,}000 \div 10$

Part K: $5{,}500{,}000 \div 1{,}000$

Part L: $83{,}000{,}000 \div 10{,}000{,}000$

Part M: $67 \div 10^4$

7) You multiply 58,000,000,000 x 10,000 and your calculator displays: 5.8 E14. Which of the following represent(s) the same number as the number displayed on your calculator? There may be more than one correct answer.

a) 5.8×14

b) 5.8×10^{14}

c) 58×10^{14}

d) 580,000,000,000,000

e) 5,800,000,000,000,000

8) How many feet are in 1 mile?

9) What is the area of a square that is 2 feet long on each side?

Monitoring your readiness

10) To effectively plan and use your time wisely, it helps to think about what you know and do not know. For each of the following, rate how confident you are that you can successfully do that skill. Use the following descriptions to rate yourself:

5—I am extremely confident I can do this task.

4—I am somewhat confident I can do this task.

3—I am not sure how confident I am.

2—I am not very confident I can do this task.

1—I am definitely not confident I can do this task.

Skills Needed for Lesson 10, Parts A, B, and C

Skill or Concept: I can . . .	Questions to check your understanding	Rating from 1 to 5
Calculate population density	1–4	
Multiply and divide by powers of 10	6–7	
Understand the concept of area	9	

Now use the ratings to get ready for your next lesson. **If your rating is a 3 or below, you should get help with the material before class.** Remember, your instructor is going to assume that you are confident with the material and will not take class time to answer questions about it.

11) What are two ways you have gotten help? Why did you choose those resources?

Lesson 13
Identifying Important Information As You Read

Overview

Most students are given textbooks but receive little or no instruction on how best to use them—especially in math courses. Students received direct reading instruction in earlier schooling; reviewing those techniques and applying them supports students' success at this level. In this lesson, students will learn about and apply the SQ4R method—a classic method for getting the most out of a textbook—to develop flash cards and chapter outlines.

This lesson paves the way for upcoming lessons in which students will learn to create practice tests and deepen their reading comprehension. It also links with a previous lesson's activity on note-taking processes. Students will have further opportunity to think about and practice producing these useful memory aids for themselves.

Week: 7 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 13-A, 13-B, 13-C, and 13-D

Key Concepts

SQ4R: A six-step process devised by psychologist Frank Robinson of Ohio State University that helps students more effectively (and efficiently) engage with course textbooks for maximum benefit.

Flash card: A visual device containing a single concept, term, or thought, typically recorded on a 3×5 card, that is used to help students remember key information and review for tests/exams.

Student Objectives

Develop a process for replacing negative, self-defeating habits with positive habits.

- Students identify habits and beliefs that have interfered with their success and learn to apply metacognitive awareness to plan, monitor, evaluate, and reflect on their learning and to seek and use feedback to improve performance.

Demonstrate effective reading and note-taking strategies that enhance retention and comprehension.

- Students learn and apply strategies for identifying key concepts in lectures and readings, organizing class notes, and increasing reading comprehension.

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Resources and Preparation

Materials and Technology Required

None.

1. **Background information**
   - Familiarize yourself with the SQ4R method and prepare example connections between the SQ4R method and other course material.
2. **Entry logistics**
   - Prepare the student attendance sheet for the day.
3. **Make copies of the following materials for students:**
   - Appendix 13-A: The SQ4R model
   - Appendix 13-B: Guidelines for creating flash cards (Students may already have a copy of this, as it was also distributed in Lesson 12. Have extra copies on hand for students who were absent or may have lost their copy.)
   - Appendix 13-C: Preview Assignment 3.1.ABC from the *Foundations for Mathematical Reasoning* course
   - Appendix 13-D: Resource: Length, Area, and Volume from the *Foundations for Mathematical Reasoning* course
4. **Activity 1: Using the SQ4R model to engage with course texts**
   - You may want to bring in representative samples of texts that groups can use. Such texts could include novels, science texts, math texts, journal articles, and magazine articles. For mathematics samples, see Appendices 13-C and 13-D.
5. **Activity 2: What information is important in math?**
   - Familiarize yourself with the *Foundations for Mathematical Reasoning* sample materials in Appendices 13-C and 13-D. Be prepared to highlight the ways in which applying the SQ4R method may be different when reading mathematics or other technical texts.
6. **Activity 3: Applying the SQ4R model**
   - The student assignment for this class is to finish applying the SQ4R method to a specific chapter in one of their course textbooks. If possible, coordinate with the *Foundations for Mathematical Reasoning* course faculty to determine an appropriate chapter or other reading.

7. **For the next class period**
    - In the next lesson, students will begin preparing for success on the midterm exam. If you will assign the essay questions as a take-home option, identify those questions in advance of Lesson 14.

Instructional Plan

Preliminaries

(5 minutes)

- Have students sit with their success teams.
- Confirm that students completed their flash cards for the information covered in Lessons 11 and 12.

Activity 1: Using the SQ4R model to engage with course texts

(25 minutes)

Objectives

Students

- Discuss current habits and smart habits for careful studying of college texts.
- Investigate the SQ4R model for studying academic texts.

1. **Whole-class discussion: What are some of the habits you apply when reading your textbooks or other course material?**
    - Within the discussion, connect student responses with earlier course material:
        - Lesson 3—establishing smart habits. You could ask students for examples about how the approach you offered in class (know thyself, start small, don't replace something with nothing, plan to fail, and be kind to yourself) has worked for them.
        - As with any new habit, there may be a learning curve to modifying existing reading habits. Most of us have not thoughtfully considered how to read and use course materials effectively, and any change to a system requires sustained effort. You might use the analogy of learning to drive a car: Without proper instruction at the outset, new drivers might establish poor driving habits without being aware of it.
2. **Success team exploration: What clues in various kinds of texts can help you identify important information?**
    - Allow 10–12 minutes for teams to work with a variety of texts (such as novels, science texts, math texts, articles), noting similarities and differences among the texts as well as aspects or features of the materials (i.e., clues) that help identify

which information is important for them to know. One facilitation strategy is to have different sample texts available on each table and have the success teams rotate through tables; you could also pass the materials from table to table.

3. **Whole-class debrief: Report on how various texts are organized and discuss the benefits of a systematic process for analyzing texts.**
    - Aspects of texts to draw attention to include the following:
        - Learning objectives at the beginning of each chapter
        - Text appearing in bold print or otherwise highlighted in sidebars and boxes
        - Examples offering step-by-step guidance on tackling math problems
        - Questions for students to respond to
        - Chapter summaries
        - Useful diagrams or charts (that could be duplicated on flash cards)
        - Glossary of math terms and concept
        - Homework problems (and whether the answers are contained within the textbook).
    - The benefits of using a systematic processing method to pay attention to the information include the following:
        - Making sure you don't miss something important
        - Making sure you don't get overwhelmed by the information
        - Making sure you are making the information meaningful to you (which, as covered in earlier lessons, is key to learning and storing information in long-term memory).
4. **Distribute the SQ4R worksheet (Appendix 13-A).**[1]
5. **Outline components of the SQ4R model shown on the handout**.
    - Additional information to share as you outline the model:
        - Ohio State University psychologist Frank Robinson created this model, and it has been used successfully for decades.[2] It is considered the classic approach to getting the most out of a textbook.
        - Reading does not equal engaging. Engaging involves thinking through the steps outlined, creating questions to ask in class about parts you don't understand, etc.

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[1] Information from the following sources informed the creation of this resource:

- *SQ4R—A Solid Textbook Study System* (1987) by Irene Lietz. Available on the Lansing Community College website at www.lcc.edu/tutorial/study_skills/sq4r.aspx.
- *Reading: Do It Smarter, Not Harder—The SQ4R Strategy*. Available for download from the Iowa Central College website, www.iowacentralonline.com/pdfs/Study_Materials/Reading_Tips.pdf.
- *SQ4R Method*, article on Textbook Reading. Available on the Berkshire Community College website at www.berkshirecc.edu/ContentManager/index.cfm?Step=Display&ContentID=527.

[2] The SQ4R approach evolved from Robinson's original SQ3R method.

- Completing the homework problems provided in the book is important. Even more important is resisting the temptation to look at the answers when one gets stuck! Encourage students to try to figure out the problems for themselves.
- Highlight and annotate the text judicially. Remind students that an over-highlighted textbook is of no value when test-taking time comes, as they won't be able to see what's important and what's not.

Activity 2: What information is important in math?

(20 minutes)

Objective

Students

- Investigate additional strategies for studying mathematics or other technical texts.

1. **Whole-class discussion: How is reading a math textbook different from reading other kinds of textbooks?**
   - What are some differences between different types of texts?
     - Example: English/history books tend to have lots of words in paragraph form, maybe a few tables or charts or art, but not much white space. Math texts tend to have more white space, worked problems, shorter descriptions, and short definitions.
   - How do these differences affect time management? Motivation?
     - Time management: Students tend to underestimate the amount of time they need to spend studying math.
     - Time management and motivation:
       - When we read a history textbook or a novel for English class, we may feel a sense of completion as we move from page to page. After reading for 20 minutes, we may have read through 8 pages of text and have a general idea of plot progression. Some of the main points may even be explicitly spelled out in whole sentences.
       - But if you spent the same amount of time reading a math text, you may not move past one page, you may feel like you are not making progress, and your motivation may therefore wane. Mathematicians communicate using a specific language that relies more heavily on the use of symbols and words with *very precise* definitions.
   - Some of the strategies you have learned to use when reading a novel or a social science text may be counterproductive for you to use in your math studies.

- "Just keep reading" and "use context clues" are good strategies for reading *non-math* texts.
  - In math, it may be a better use of your time to look up the mathematical definition of a term (in your text or in math-specific resources) immediately, because math texts often do not include the same kinds of context cues as other texts. You need to understand the meaning of this term in this context, otherwise you may misunderstand the entire rest of the lesson.
  - Just as studying a foreign language begins with understanding basic vocabulary, mathematics study is built on understanding the precise definitions and meanings behind words. Some of these words mean something different in math than they do in everyday use, and their use in math problems signals very specific calculations that need to be made. Symbols also have very specific meanings—if you do not understand the symbol, you are likely to have trouble solving the problem or will get an incorrect answer.

    Example: The definitions in Appendix 13-D each contain additional critical vocabulary (e.g., square units, two-dimensional) and notation ($A = lw$) that, if not already understood, would need to be explored. The word "scale" in the description of length is an example of a word that has a different meaning in mathematics than it does in everyday usage.
- Linear reading
  - Students are most comfortable with a top-to-bottom, left-to-right reading convention—a linear progression through the text. Math reading requires going beyond top-to-bottom, left-to-right processing to understand the material. Sometimes the key information in a problem comes in the middle. For example, think of using the order of operations: If the grouping symbols (such as parenthesis or brackets) are in the middle of the problem, you need to attend to those before moving on to other operations.
  - Math reading also requires reading between the lines. Math texts are unlikely to have many example problems that explain exactly what needs to be done to get from one line to the next. More than likely, the example problems look like this:

    $(x + 2)^2$

    $(x + 2)(x + 2)$

    $x^2 + 4x + 4$

- But these three lines are really implying the following five steps:

  $(x + 2)^2$

  $(x + 2)\ (x + 2)$

  $(x)(x) + (x)(2) + (2)(x) + (2)(2)$

  $x^2 + 2x + 2x + 4$

  $x^2 + 4x + 4$
- Reading word problems requires linear reading and close reading of each of part. Students often look for key words (e.g., product, sum) without placing those words in the full context of the scenario.

Activity 3: Applying the SQ4R model

(20 minutes)

Objectives

Students

- Apply the SQ4R model to the *Foundations for Mathematical Reasoning* course materials.
- Discuss the advantages of, and corresponding mindsets for, applying the SQ4R method.

1. **Individual activity: Apply the SQ4R model to one section of the *Foundations for Mathematical Reasoning* course materials.**
   - The assignment this week is to use the SQ4R method to read, annotate, and create flash cards for a specific section in the *Foundations for Mathematical Reasoning* course. Students will show the instructor their annotations and flash cards in an upcoming class.
   - Students should begin the process during this class period and continue applying the model for homework.
   - Encourage students to draw on their success team members for support and guidance in applying the method.
2. **Whole-class discussion:** Discuss experiences applying the SQ4R method.
   - What will you do when you come across words or concepts you don't fully understand?
   - What mindset will help you when you are beginning to use the SQ4R model? (Look for students to identify themselves as detectives, researchers, or even tutors.)

- What are the advantages to being judicious when highlighting your study materials?
- How are you planning to work together as a success team or with a study group to create the chapter outline for this week's assignment?

Wrap-Up

(5 minutes)

Assign the following and determine appropriate due dates based on the chapter you have chosen:

- **Create a chapter outline:** Students are to finish producing a single sheet of notes on one section of their *Foundations for Mathematical Reasoning* course materials using the SQ4R process they learned in class today. Remind them you will be looking to see that they have captured the most important information (not everything from the chapter) and have shown an understanding of how the material connects with what they already know.
- **Flash cards:** Students are to create a minimum of six flash cards based on the instructions given in Appendix 13-B. These flash cards should demonstrate how headings and subheadings from the textbook can be converted into questions written on one side of the card with concise answers written on the other side. Remind students that the question on each flash card should concern a single concept, term, or thought, and that you will be looking for clarity and neatness in addition to concise content.

Appendix 13-A: The SQ4R Model

S—Survey

Quickly survey the chapter you are working on. Scan the title, headings, subheadings, learning objectives, chapter openings, chapter summaries, diagrams, etc., to get a sense of what the chapter is about. Actively engage with the material to get a sense of

- what the chapter is about,
- what you intend to learn from reading it, and
- how much of the material you already know or understand from earlier courses, what you're currently learning in class, or from outside experience.

Q—Question

Ensure meaningful learning of the material by determining your own *purpose*. Convert the title of the chapter and the headings and subheadings into questions. For example, in a book on statistics that has a heading "Computing the Mean," you might write: "What is a *mean*?" "What is the formula for working out the mean (average)?"

Create flash cards for each question. The next step is to find answers to these questions.

R—Read

Read through the chapter chunk by chunk (meaning, read a section or a few pages at a time), looking for the answers to the questions you've just created. Use a highlighting pen (maybe in different colors if you develop your own system for what information is highlighted by each color) to identify key passages. Make brief notes in the margins, relating material to questions. Check any words you don't understand in the dictionary. Make a note of any that are still confusing so you can ask your course instructor, tutor, or study buddies.

Question yourself as you read further:

- What words or concepts do I not understand? (Write these down and be sure to ask for clarification during class or office hours.)
- Where might I be getting lost (because sentences are too complex, paragraphs are too long, I'm not able to see the overall purpose)? Who can help me?

R—Recite

Close the book and notes and state, in your own words, what the chapter is about, what key terms and concepts are covered, and what (if anything) you are still unclear about. This could also be a conversation you have with a study buddy, members of your success team, or your course instructor during office hours.

R—wRite

Create an outline of the chapter on a single sheet of paper using a specific note-taking method (Cornell, mind-mapping/concept mapping, math application problem organization, etc.).

Pull out one or more of the flash cards you created with questions from the chapter. Write out your answers without looking at the book. Check the book to see if you covered everything in your answer. Update your flash cards as necessary, simplifying the language and making it even more concise and clear.

R—Review

Once you have covered the whole chapter (repeating the Survey, Question, Read, Recite, and wRite steps for each section or chunk of material), take time to review. (Be sure to include review time in your study schedule.) Every day you should take time to review (and modify) your notes, practice answering questions from your flash cards, use the material to create practice tests, and work alone or with others to predict possible exam questions. Check with your study buddies to make sure you haven't missed any important details or concepts. Get into the habit of using your own language to describe and explain the material, rather than relying on the way the material is explained in the textbook or by the course instructor.

In particular, look for ways in which you can adapt what you have learned to new problems and scenarios. Continually test yourself to make sure you *understand* what the material means, not just that you are able to spout it back.

Appendix 13-B: Guidelines for Creating Flash Cards

Why create flash cards?

1. They are portable: Key information is easier to carry with you when it's on a few index cards instead of in your math textbook or notes. Flash cards allow for ongoing, easy reference. You can make paper flash cards or use an electronic application to create them—both are good ways to make sure you have information available for studying on the go.
2. They can help boost your memory: Consistent use of flash cards helps you acquire or retrieve new information. Flash cards also aid in rehearsal, which is important to the process of embedding information into long-term memory.
3. They help identify challenges: Flash cards identify what you know, and they pinpoint aspects of course material you find challenging to remember—aspects on which you might need to seek additional help (from the instructor or other campus resource) to master.

How to create flash cards

1. Write only one concept or piece of information on each index card. Too much information on flash cards defeats the purpose. Consider whether the material is too complex for flash cards or whether you need to break the information down into smaller meaningful pieces.
2. Engage in meaningful learning by using your own words to describe key terms, concepts, and other information rather than copying verbatim from your instructor or the textbook.
3. Use more than words. As appropriate, use simple graphics (e.g., drawings, charts, diagrams) to convey the information to be learned more effectively. Using different colors can also help you organize the information in a creative way.
4. Continually improve your flash cards. See your flash cards strategy as a work in progress rather than as a one-off activity.

Ways to use your flash cards

1. Remember, flash cards are useful only if you carry them around with you. You almost always have some downtime during the day (e.g., waiting for the bus, standing in line at the grocery check-out)—don't let that precious time go to waste!
2. Shuffle them like a deck of playing cards and challenge yourself to learn from a certain number of cards every day, in whatever order.
3. Use the cards to test yourself. Be sure to use both sides of each card. Try choosing two cards at random and make connections or distinctions between the material on each card.
4. Separate your cards into piles, such as "Material I definitely know" and "Information I need to work on." Take that second batch of flash cards with you when you visit your instructor during office hours and ask for help in better absorbing the information.

Appendix 13-C: Preview Assignment 3.1.ABC from the *Foundations for Mathematical Reasoning* Course

In Lesson 1.1, Part D, you learned that Earth's human population has grown from about 1 billion people to nearly 7 billion in the last two centuries. However, populations in different regions do not always grow uniformly. For example, populations tend to increase in areas where people already live close enough to one another to find mates. On the other hand, crowded populations decrease when deadly diseases, such as SARS or Ebola virus, sweep through them. In this lesson, you will compare geographic regions by their population densities.

*The **population density** of a geographic region is the ratio of the number of people living in that region to the area of the region. Population density ratios are converted into decimal form in order to compare them with a similar area measurement. For example:*

$$\textit{Population density} = \frac{\text{number of people}}{\text{area}}$$

The following information will be used in Lesson 3.1, Part A. The states of the United States vary greatly in both size and population. Some states, especially on the east coast, are small and mostly urban, meaning that most people live in cities. Other states in the west and plains are larger and more rural, with people living in small towns or in the countryside. Population density is one way to measure how crowded a state is.

If an area is densely populated, it will need more services such as schools and hospitals. Some states, such as Washington, use the population density of counties to classify them as urban or rural in state law. This can affect whether residents qualify for certain kinds of assistance programs.[3]

Alaska is the largest state, with 571,951 square miles, but in 2010 it had one of the smallest populations, with only 710,231 people.

1) What is the ratio for Alaska's population density?
2) What is the decimal form of that ratio? Round to the nearest tenth.
3) Write a contextual sentence about the answer to question 2.

Check your answers on the next page.

[3]Retrieved from www.ofm.wa.gov/pop/popden/rural.asp.

Population density of Alaska = $\frac{710{,}231 \text{ people}}{571{,}951 \text{ square miles}} = 1.2417... \approx 1.2 \text{ ppl/mi}^2$

The population density of Alaska is approximately 1.2 people per square mile.

4) Use the information given below to calculate the population density for each of the states listed. Round to the nearest tenth. Keep a record of the densities on your own paper.

State	Land Area Square Miles	2010 Population	Density: People per Square Mile
Alaska	571,951	710,231	1.2
Idaho	82,747	1,567,582	
Kentucky	39,728	4,339,367	
Louisiana	43,562	4,533,372	
Nebraska	76,872	1,826,341	
New Hampshire	8,968	1,316,470	
New Jersey	7,417	8,791,894	
South Dakota	75,885	814,180	
Washington	66,544	6,724,540	
Wisconsin	54,310	5,686,986	

5) Recreate the table below on a new page in your notes. Allow an entire page, as this table will be extended later. Now place the states in the appropriate column. Alaska has been done for you.

Density < 10 people/mi^2	10–100 people/mi^2	100–1,000 people/mi^2	Density > 1,000 people/mi^2
Alaska			

6) The following problems have to do with multiplying and dividing by powers of 10. Look for patterns and ways to find the answers mentally without a calculator or writing the problem down. Check your answers with a calculator if you wish.
   a) 0.32 x 10
   b) 3.2 x 10
   c) 32 x 10
   d) 32 x 100
   e) 51,000 x 10,000
   f) 900×10^4
   g) 1.3×10^7
   h) 0.32 ÷ 10
   i) 3.2 ÷ 10
   j) 3,200,000 ÷ 10
   k) 5,500,000 ÷ 1,000
   l) 83,000,000 ÷ 10,000,000
   m) $67 \div 10^4$

7) You multiply 58,000,000,000 x 10,000 and your display reads: 5.8 E14. Which of the following represent(s) the same number as the number displayed on your calculator? There may be more than one correct answer.
   a) 5.8 x 14
   b) 5.8×10^{14}
   c) 58×10^{14}
   d) 580,000,000,000,000
   e) 5,800,000,000,000,000

8) How many feet are in 1 mile? (Do an internet search if you are not sure.)

9) What is the area of a square that is 2 feet long on each side? (Do an internet search if you are not sure.)

Monitoring your readiness

10) You are expected to be able to do the following things for the next class. Rate how confident you are on a scale of 1–5 (1 = not confident and 5 = very confident).

Skill or Concept: I can…	**Questions to check your understanding**	**Rating from 1 to 5**
Calculate population density	1-4	
Multiply and divide by powers of 10	6-7	
Understand the concept of area	9	

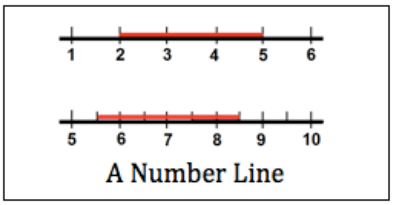
Now use the ratings to get ready for your next lesson. **If your rating is a 3 or below, you should get help with the material before class.** Remember, your instructor is going to assume that you are confident with the material and will not take class time to answer questions about it. Ways to get help:

- see your instructor before class for help
- ask your instructor for on-campus resources
- set up a study group with classmates so you can help each other or work with a tutor

Appendix 13-D: Resource Length, Area, and Volume from the *Foundations for Mathematical Reasoning* Course

Length

Length is one-dimensional. An example would be the length of an extension cord that you need in order to plug in an electronic device. Examples of units of measure for length are inches, feet, yards, or miles (or in the metric system, centimeters, meters, or kilometers).



A Number Line

A number line can be used to model lengths.

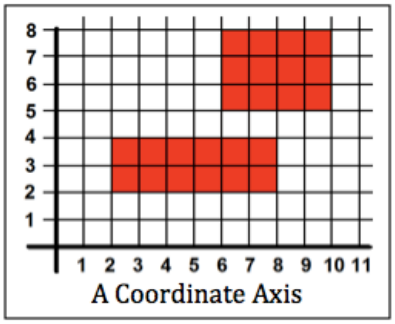
The thicker segment on each number line shown above is 3 units long. If the scale is in inches, each line segment is 3 inches long. If the scale is in feet, each line segment is 3 feet long.

Area

Area is two-dimensional and is measured in square units. The total number of one-foot square tiles needed to cover the floor of a room is an example of area measured in square feet, and can be modeled with a rectangle. Recall the formula for the area of a rectangle:

$$A = L \times W$$

The area of a rectangle is the product of the length and the width, which is a shortcut for counting the number of square units needed to cover the rectangle.



A Coordinate Axis

Each of the two shaded areas on the coordinate axis has an area of 12 square units. If the horizontal and vertical scales are in inches, each area is 12 square inches. If the scales are in feet, each area is 12 square feet. Notice that the regions measured do not have to be squares, yet the area is measured in square units.

If the units are in inches, the area of the top rectangle is:

$$\begin{aligned} A &= (3\ inches) \times (4\ inches) \\ &= (3 \times 4) \times (inches \times inches) \\ &= 12\ inches \times inches \\ &= 12\ square\ inches \end{aligned}$$

If the units are in feet, the area of the bottom rectangle is:

$$\begin{aligned} A &= (2\ feet) \times (6\ feet) \\ &= (2 \times 6) \times (feet \times feet) \\ &= 12\ feet \times feet \\ &= 12\ square\ feet \end{aligned}$$

For more about labeling units, see the note on the next page.

Note 1:

It is common to abbreviate the units of measure using exponents. If the area is $A = 12\ feet \times feet = 12\ square\ feet$, we often write $A = 12\ ft^2$

Notice the connection to algebra here!

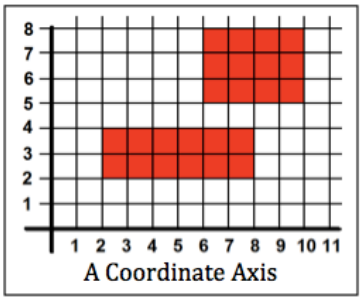
Multiplying $(3\,feet)$ by $(4\,feet)$ is similar to multiplying $(3x)\times(4x)$. You multiply the numbers in front of the variables (coefficients), and then multiply the variables:

$$(3x)\times(4x) =$$
$$(3\cdot 4)(x\cdot x) =$$
$$12x^2$$

Note 2:

It is common to confuse length and area formulas. Look at the bottom rectangle. Because it is shaded, it is tempting to think about area. If you want to know how many floor tiles to buy, area is the correct concept.

But what if you want to trim the edges of the room with baseboards? (If you aren't sure about this term, search the internet for "baseboard images.")



A Coordinate Axis

The length of the distance around a shape is called the **perimeter**. To calculate this length, simply add the total number of units as if traveling around the edge. For example, if the units are in feet, then the length of the line around the bottom rectangle is

$$P = 2\,feet + 6\,feet + 2\,feet + 6\,feet$$
$$= 16\ feet$$

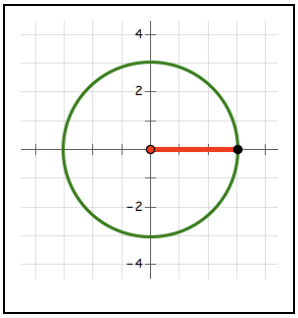
The arithmetic operation for length is **addition**, and the unit of measure is feet (you are adding up a lot of feet, so the final result is feet). By comparison, the arithmetic operation to compute area is **multiplication**, and the unit of measure is square feet (you are determining the number of square tiles). Again, this connects to algebra. To add algebraic terms, you must have **like terms**, meaning terms with the same variables:

$$2x + 6x + 2x + 6x =$$
$$16x$$

You cannot add $2x + 3y$ just as you cannot add $2\ feet + 3\ inches$.

Not every shape for which you need to find the length or area will be a square or rectangle. Think about a circular rug in the living room, or a gazebo in the shape of an octagon.

Circle Length and Area



The distance around a circle is called the **circumference**, which can be found with the formula:

$$C = 2\pi r$$

The area of a circle is given by the formula:

$$A = \pi r^2$$

- π is a *constant* that is approximately 3.14159
  (You probably learned 3.14, but carrying additional decimal places reduces the amount of rounding error.)
- r is the radius of the circle, which *varies* depending on the size of the circle. It is the distance from the center to any point on the circle.
- C is the circumference of the circle, which *varies* depending on the radius.
- A is the area of the circle, which *varies* depending on the radius.

In this example, the radius is 3 units. Let's say those units represent inches.

The circumference is:

$$\begin{aligned} C &= 2\pi r \\ C &= 2\pi(3\ inches) \\ &= 2 \cdot 3 \cdot \pi\ inches \\ &= 6\pi\ inches\ \ (exactly) \\ &\approx 6 \cdot 3.14159\ inches \\ &\approx 18.85\ inches \end{aligned}$$

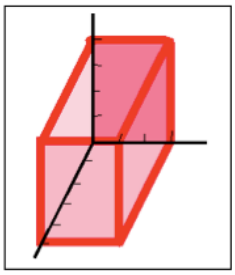
Look at the length of 1 unit on the radius. Does $19\ inches$ seem like a reasonable estimate for the distance around the circle?

The area is:

$$\begin{aligned} A &= \pi r^2 \\ A &= \pi(3\ inches)^2 \\ &= \pi(3\ inches) \times (3\ inches) \\ &= \pi \cdot 3 \cdot 3(inches)(inches) \\ &= 9\pi\ square\ inches \\ &\approx 9 \cdot 3.14159\ square\ inches \\ &\approx 28.27\ in^2 \end{aligned}$$

Look at the grid. Is $28\ in^2$ a reasonable estimate of the area of the circle?

Volume



Volume is three-dimensional and is measured in cubic units. The formula to calculate the volume of a box is:

$$V = L \times W \times H$$

If the graph at the right is in inches, then this shape is 5 inches long, 3 inches wide, and 4 inches high.

$$V = (5\ inches) \times (3\ inches) \times (4\ inches)$$

$$V = 60\ inches^3\ or\ 60\ cubic\ inches$$

Area: Square Units and Rectangles
Youtube.com/watch?v=epeFZ6v7u_U

Area: Parallelograms and Triangles
Youtube.com/watch?v=vQC10PPmuoA&feature=related

Area of Composite Shapes
Youtube.com/watch?v=by9-_95Zn08&feature=related

Geometric Solids: Lesson Hook
Youtube.com/watch?v=RGlU_SqgjEg

GMAT Prep: Math, Geometry, Rectangular Solids by Knewton
Youtube.com/watch?v=SJycga8V02M&feature=related

Lesson 14 Update
Critical Thinking Strategies and Questions

Update note

See ***Frameworks Course Essentials***[17] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

[17]The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Lesson 14
Critical Thinking Strategies and Questions

Overview

Students beginning their college careers are often surprised to discover that they are expected to think critically—that is, to actively engage with the course materials and ask questions to gain a deeper understanding of the course content. Frequently, however, students receive no instruction in what it means to *think critically* or how to shift to that mode of engagement.

This lesson is designed to introduce key components of critical thinking, including making and testing evidence-based hypotheses and arguments, drawing inferences and interpreting data in logical ways, evaluating the credibility of evidence, and identifying multiple approaches to solving problems.

Week: 7 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 14-A, 14-B, 14-C, 14-D, 14-E, and 14-F

This lesson is an introduction to these components of critical thinking. In the future, students will be expected to *apply* critical thinking. The first activity provides an opportunity for students to analyze their own beliefs (a tie-in with earlier lessons) and to reflect critically on them. Building on this foundation, Activity 2 focuses on Bloom's Taxonomy, the classic taxonomy of educational objectives, and delves deeper into the types of questioning students can apply to push their thinking to higher levels. In Activity 3, students practice applying the taxonomy levels as they start to prepare for the midterm exam.

Key Concepts

Taxonomy: A system of classifying or a way of grouping ideas, concepts, etc.

Bloom's Taxonomy: A classification of learning objectives devised by Benjamin Bloom and colleagues in 1956. Bloom's Taxonomy identifies a hierarchy of thinking, from simple and factual to more complex and conceptual.

Credibility: The quality of being believable or worthy of trust.

Student Objectives

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Identify and apply effective strategies to use before, during, and after taking an exam.

- Students develop strategies for preparing for exams, taking exams, and reviewing performance.

Resources and Preparation

Materials and Technology Required

- None.

1. **Background information**

   For more information on Benjamin Bloom and the development and evolution of Bloom's Taxonomy, see the following resources:

   - The September 23, 1999, *University of Chicago Chronicle* (volume 19, number 1) article available at http://chronicle.uchicago.edu/990923/bloom.shtml.
   - A collection of readings titled "Revising Bloom's Taxonomy" in the June 2001 issue of *Theory into Practice, 41(4),* 212-264 available at www.tandfonline.com/toc/htip20/41/4#.UZ-wNuuhD7Q.

2. **Entry logistics**
   - Prepare the student attendance sheet for the day.
   - Post your list of possible issue topics (see Activity 1).
3. **Make copies of the following materials:**
   - Appendix 14-A: Bloom's Taxonomy Diagram—one per student and one per success team.
   - Appendix 14-B: Bloom's Taxonomy Graphic Organizer—one per student.
   - Appendix 14-D: Bloom's Taxonomy Verbs—one page per success team. Cut out the verbs so each success team has a full set.
   - Appendix 14-E: Strategies for Taking Exams—one per student.
4. **Activity 1: Commitment issues**
   - Prepare a list of possible issue prompts to post on the board or provide electronically that will pique students' interest in this activity. Create statements about the topics, such as "The federal government should raise the debt ceiling." You may want to focus on only one issue and get deeper into the activity with it, but prepare some backups in case an issue doesn't generate the level of discussion you want.

5. **Activity 2: Bloom's Taxonomy**
    - You may want to print a copy of Appendix 14-C, Bloom's Taxonomy Graphic Organizer (with examples), to use as reference during this activity. However, do not distribute this to students.
6. **Activity 3: Midterm exam discussion**
    - Review the upcoming midterm exam (administered in Lesson 17) and be prepared to discuss and clarify any confusion students may have about the parameters of the exam.
    - If you choose to have complete the exam's essay questions outside of class (this would give them an opportunity to visit the writing center to improve their responses), prepare the essay questions and associated instructions and rubrics.
7. **For the next class period**
    - The next lesson provides information on effective test-taking strategies. Students will discuss the purposes and types of assessments as well as emotions associated with testing. Brush up on important motivational concepts relevant to exam taking.

Instructional Plan

Preliminaries

(5 minutes)

- Have students sit with their success teams.

Activity 1: Commitment issues

(25 minutes)

Objectives

Students

- Begin to engage in critical thinking and using evidence to support their ideas.
- Reflect on their own beliefs and use critical thinking skills to make oral arguments supporting their beliefs and choices.
- Evaluate the accuracy, credibility, and worth of the evidence provided in oral arguments.

A brief note: This is a "discovery learning" activity. Students will analyze and reflect on their learning while engaged in the activity and during the debriefing session. Set this activity up by showing a questionnaire that uses the terms *agree*, *somewhat agree*, *disagree*, and *somewhat disagree* as choices. To activate student thinking and interest, you may also want to have the topics scroll on the screen as students enter the classroom. This activity will involve discussing individual beliefs and challenging the validity of the claims students make and the evidence they

use to support their beliefs. A brief reminder of what respectful communication and disagreement look like in a college classroom may be in order at the onset of the activity, as well as during the hot topic portion. The goal at this stage is to challenge thinking patterns and have students recognize the value of higher levels of critical thinking.

1. **Label four corners of the room**: **agree, somewhat agree, somewhat disagree, disagree.**
2. **Give students a prompt you have chosen or prepared.**
    - The prompts are suggestions. We advise starting with a prompt from Set 1 (see number 3 below) to give students a chance to practice critical thinking with a topic that is known to them, before moving on to topics they may not be as familiar with familiarity (such those in Set 2).
        - In Set 1, use the "I'm a stellar math learner" prompt last. This prompt and follow-up discussion will provide a good transition to the hot topic prompts, as it is a topic that all students have explored during the semester.
        - Have position statements about the hot topics prepared ahead of time. (For example: "The federal government should raise the debt ceiling.")
        - You may want to focus on only one topic and get deeper into the activity with it, but have some backups in case a topic doesn't generate the level of discussion you want.
        - Use discretion and your own knowledge of what is appropriate for each class. Keep in mind the diversity of your students to make sure that everyone is challenged to think outside their comfort zones during the activity.
3. **Ask students to respond to the rest of the prompts by standing up and moving to the the corner of the room whose label best represents their level of agreement with the prompt. Following the "I'm a stellar math learner" prompt and discussion, move on to the hot topics prompts.**
    - Once students are in their corners, follow up with questions that focus on why they chose their corner. Prompt a few students to try to give counterarguments and use factual sources of information to support their positions. Ask students to develop their own clear, precise, and relevant questions for students in other corners.
    - Use the follow-up discussion questions in the chart below to push the depth and complexity of the discussion.

Prompts—Set 1: Personal Preferences	Prompts—Set 2: Hot Topics
I am an extreme sports fan. I love new culinary dining experiences. I am a morning person. I study best at the library. I learn the most when I study in groups. I'm a stellar math learner.	Immigration Economy Military action Parenting issues Climate change Education
Follow-up discussion questions to draw out underlying beliefs, thought processes, and factual bases for positions: • How do you know these are your preferences? • Have you tried other ways of thinking about these issues? • How did you decide where to stand? • What experiences led to your belief? • Have you always held this belief? • What can we infer about the students who chose "always" or "never" about this issue? Are they wrong? • Would you expect some issues to have more "somewhat agree/disagree" than "strongly agree/disagree"? Why? • Where do your beliefs about these kinds of issues come from? People? Resources? Past experiences? • What facts are you relying on to support your position? Where did those facts come from? • Are there points of agreement among the groups? What are the factors that set the groups apart? • Are there other issues we should discuss? • How did you answer when you had little experience or no strong feelings about the topic? • Do you expect your position to change over time? • How can we respectfully disagree with our fellow students?	

Connection Notes:

After using the *I'm a stellar math learner* prompt, you can refer back to the lesson on self-efficacy to help students make connections to how they have previously engaged with this kind of deeper reflection and analysis of their thoughts and behaviors.

Refer back to some of these questions after Activity 2 to categorize them into the appropriate level of Bloom's Taxonomy and to link the active learning in Activity 1 to theory in Activity 2.

4. **Class-wide debrief: How might you use some of these same questioning techniques in your other courses?**

    - Make explicit connections to the questions students asked of one another or that you asked as you circulated through the room. Ask students to provide examples of questions that were fairly straightforward (What is your opinion? Do you support capital punishment?) and of questions that require more complex thinking (How does your opinion compare to that of others? How do you interpret the arguments in opposition to your position?).
    - Connect with the metacognition lesson by pointing out that engaging in more complex thinking requires metacognitive knowledge and processes.
    - Emphasize that college classes are designed to require critical thinking. This kind of thinking can be very complex. Knowing how questions are formed or classified can improve your critical thinking skills and you understanding of new concepts. One way to do this is to group questions into categories of thinking, which will be the focus of the next activity.

Building analytical skills is critical for internal reflection (looking at evidence to try to understand our own beliefs) and evaluating information we encounter in our coursework. Taking a systematic look at the different levels of thinking we may have to use in our courses is useful.

Activity 2: Bloom's Taxonomy[1]

(30 minutes)

Objectives

Students

- Learn about Bloom's Taxonomy and its usefulness in academic settings.
- Categorize questions and verbs using Bloom's Taxonomy.

A brief note: There are several versions of Bloom's Taxonomy, as it has been revised over time. The version used in this lesson has been selected with the nature of the course and the experience level of the students in mind. This version is less complex than some of the revised versions, but it provides ample information for students to use.

1. **Introduce Bloom's Taxonomy, perhaps by discussing the following ideas:**
    - What is a taxonomy? A commonly applied classification system used in education is called Bloom's Taxonomy. A taxonomy is a system for classifying things into categories. Some taxonomies students may have encountered before include classifications of animals (invertebrates, reptiles, fish, mammals, etc.) and parts of speech (nouns, verbs, pronouns, conjunctions, etc.). Students can use Bloom's Taxonomy to prepare for the way that test questions are asked and the kinds of answers each question requires.
    - Connect back to earlier lessons on memory and how organizing information in a meaningful way (especially visually) helps people understand the relationships among the parts of a whole and helps them keep track of information.
    - Development of the taxonomy: In 1956, educational psychologist Benjamin Bloom led a committee at the University of Chicago to develop a way to more accurately measure how well undergraduates had mastered course material. They

[1] Numerous Bloom's Taxonomy resources exist; the following resources were especially useful in creating this activity and the related appendices:

- Anderson, LW., & Krathwohl, D.R. (2001). *A taxonomy for learning, reaching and assessing: A revision of Bloom's taxonomy of educational objectives.* New York: Longman.
- A 2002 collection of readings: "Revising Bloom's Taxonomy," *Theory into Practice, 41*(4), 212-264.
- "Modeling self-questioning on Bloom's Taxonomy," a September 7, 2007, online posting to the Wisconsin Education Association Council webpage, authored by Doug Buehl.
- Heer, R. (2012). A Model of Learning Objectives (based on *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*). Ames, IA: Center for Excellence in Learning and Teaching, Iowa State University. Available at http://www.celt.iastate.edu/teaching/RevisedBlooms1.html.
- "Bloom's Taxonomy 'Revised' Key Words, Model Questions, & Instructional Strategies" compiled by Indiana University-Purdue University Indianapolis with a revised date of December 2002
- Wake County Public School. Sample question stems based on Revised Bloom's Taxonomy. *Toolbox for Planning Rigorous Instruction* wiki available at http://tpri.wikispaces.com/Bloom%E2%80%99s+Question+Stems+for+Instruction

called this method Bloom's Taxonomy, and it has been in use ever since, with minor revisions as more and more research into how people think and learn has been conducted.

- Usefulness: We can engage in many different levels of thought. Sometimes we need to recall basic facts; other times we need to select which fact or piece of evidence is the most appropriate to support an argument we are making. Clearly these two examples of types of thinking are not at the same level. Bloom's Taxonomy helps distinguish between skills that are lower order and those that are higher order. Understanding these levels and how they relate to tasks we need to complete for coursework can guide us in preparing to complete that coursework appropriately.

2. **Distribute one copy of Appendix 14-A and one copy of Appendix 14-B to each student.**
    - These will serve as note organizers throughout the activity. Distribute an additional copy of Appendix 14-A to each success team for group use.
3. **Briefly help students define the specific levels of the taxonomy.**
    - Part of the success team work is to struggle productively to figure out what the levels involve and what kind of thinking is expected at each level; therefore, it may be most useful to have students brainstorm only general notions of what each level represents. At the end of the lesson, you can revisit the definitions to finetune them as appropriate. If you need an example to use during the wrap up to clarify how the different levels are applicable within the academic environment, see Appendix 14-E.
    - Encourage students to use resources like dictionaries and web searches to define what each level means.
    - Additional strategies for helping students connect to Bloom's Taxonomy include the following:
        - Have students create a picture or graphic representation for each level.
        - Students might also include a popular technology app to link to each level. For example, a calendar app would represent the "Remember" level, and Facebook might represent the "Evaluate" level, as you leave comments, critiques, and position defenses on others' posts. Have students draw the appropriate app's symbol on Appendix 14-A.
    - You may want to include mathematics examples for each level of Bloom's Taxonomy. Consult with a *Foundations for Mathematical Reasoning* instructor for examples.
4. **Distribute a packet of the words from Appendix 14-D to each success team. (Each word should be on its own small slip of paper.)**
    - Ask the groups to classify the action words according to the taxonomy levels. Test questions include action words such as these, and the words are often clues about the level of thinking expected of the student.

- Some words will be fairly easy to categorize, but students may struggle with others. While one way of organizing the verbs is provided for instructor use in Appendix 14-C, some verbs can be placed in more than one category. Students should develop a rationale for why they are choosing to put a verb in one category and not another category; question students about their rationales as you circulate among the groups.

5. **Class-wide debrief:**
    - Tie this back into the first activity—specifically the questions you used as you prompted students to think more about their positions on the hot topic issue. Look for students to make the connection that the activities were moving them toward analysis and evaluation levels of thinking and that these are the levels of thinking expected of college students. Ask students the following questions to close the debrief:
        - How would using a system of classification help you?
        - How can you use Bloom's Taxonomy (test-taking skills, thinking about material at higher levels, etc.)?
        - How does metacognition, or thinking about your thinking, help you become a better student?
    - If necessary, address student concerns that this is too much information. They are not expected to know every bit of information on the handout. They should be able to use the handout as a resource while studying and preparing for exams. More class time will be devoted to using this information again, so they will have a chance to work with the material more.
6. **If you are in need of additional descriptions for Bloom's Taxonomy, see Appendix 14-E.**
    - This appendix need not be necessary if you feel students are comfortable with the content.

Activity 3: Midterm exam discussion

(10 minutes)

Objectives

Students

- Identify midterm exam requirements.
- Begin to choose which essay questions they will answer for the midterm exam.
- Connect Bloom's Taxonomy with the required level of written response.

Note: The midterm exam is scheduled for Lesson 17. Some instructors may want to assign the exam's essay questions in advance to give students time to respond to those questions prior to the testing session. The following instructions assume you are assigning essay questions to be completed outside of class and turned in on a hard copy on test day.

1. **Present midterm information.**
    - Review the purpose of exams. "Why do we take tests?" "How is testing useful for students and for instructors?" "What would be helpful for students to know about a specific test?" More discussion on the purpose and process of testing will be covered in a later lesson, but some essential purposes of testing should be discussed here:
        - For students to review the material and interact with it again—a process that leads to longer retention.
        - For instructors to check in and see how effective their instruction has been—do students understand the information you are presenting?
    - The midterm exam will be in two parts. Part 1 asks students to respond to two (out of a choice of five) essay questions.
        - Responses are to be typed and handed in at the start of the in-class midterm exam.
        - Students should use MLA or APA format (instructor's preference; you can opt to give them specific formatting instruction in lieu of full MLA or APA formatting).
        - Work on the essays is to be done individually—no conferring with classmates!
        - Students can use all other course materials.
        - If students are required to visit the writing center to get feedback on their assignment and then revise their writing, be clear on that instruction and note how you would like students to demonstrate that they visited the writing center.
        - Each response is to be no longer than 500 words (approximately 2 pages; instructor's preference).
    - Part 2 requires students to answer questions in class. Let students know how many questions and what format (multiple choice, short answer, etc.) to expect on the in-class exam.
        - Will the exam be written or given on a computer?
        - The exam will be completed in class. Announce the specific date of the exam.
        - The in-class exam will be closed book and closed notes.
    - **Make sure students know answers to the following questions**: How will the exam be scored? How many points for each essay response? Is there a rubric for essay responses? How many points for the in-class sections? What percentage of the final grade will depend on the midterm exam score?
2. **Distribute essay question choices, if appropriate**.
    - Let students know that their assignment for this lesson is to begin working on these essays, and that they should add this work to their distributed study schedule as soon as possible. Call students' attention to the verbs used in the essay portion of the midterm exam. What level of response will the question require? How can they use the information on Bloom's Taxonomy to guide their responses?

Wrap-Up

(5 minutes)

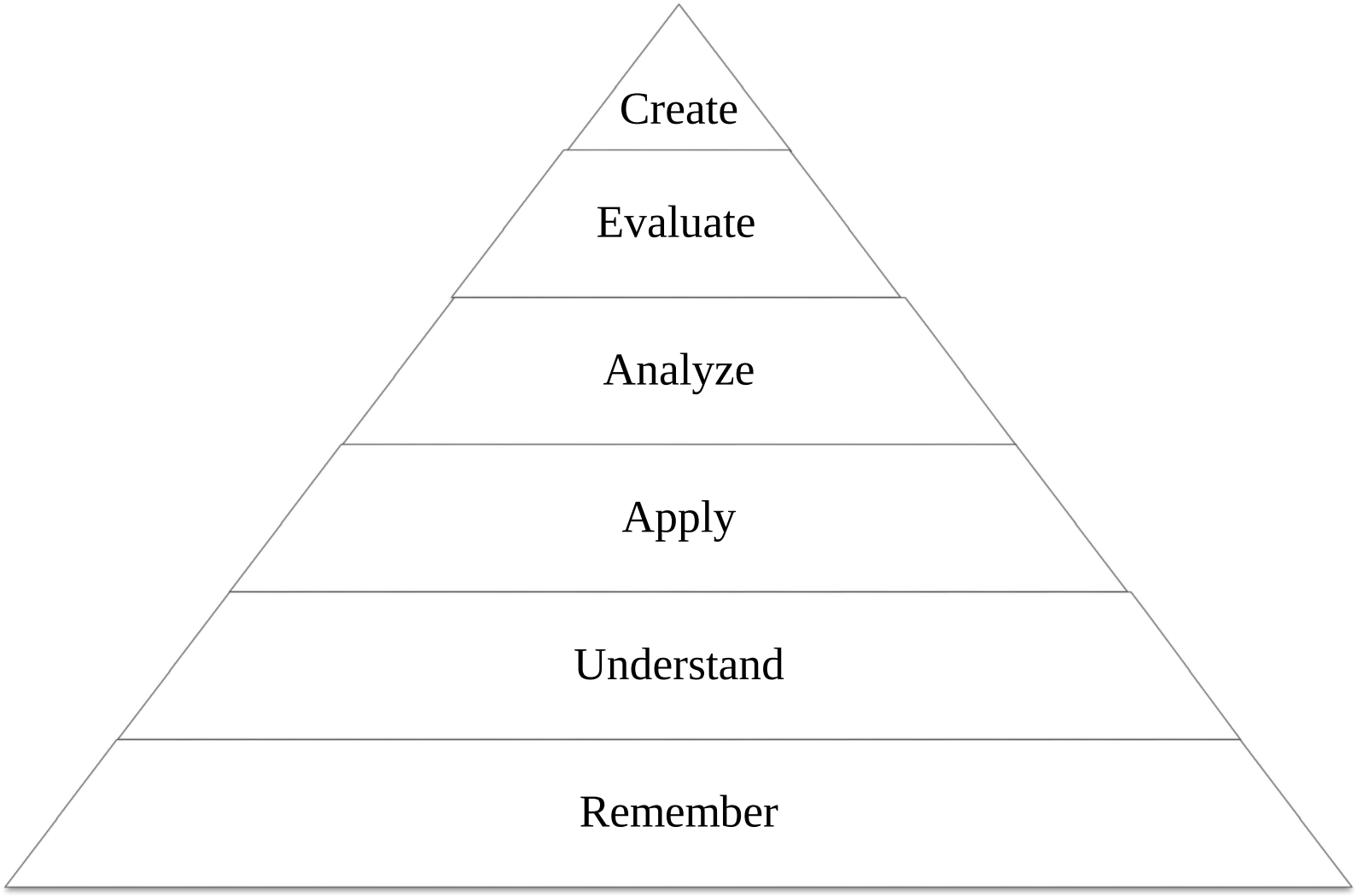
Assign the following:

- Reading—Strategies for Test-Taking. Read the document on strategies for taking exams (Appendix 14-E). It will be used during Lesson 15. To help process the information and prepare for using the information in the lesson, create a graphic organizer that represents what you identify as the key information in the reading.

Preview the next lesson:

- In the next class, students will work in groups to develop and deliver a skit, song, poem, rap, or other demonstration that helps their classmates better understand the content covered in the test-taking strategies reading.

Appendix 14-A: Bloom's Taxonomy Diagram



Appendix 14-B: Bloom's Taxonomy Graphic Organizer (Student Handout)[2]

	Definition	Example Verbs	Types of Exam Questions	Sample Questions to Prompt This Thinking
Create	Creating something new, an original product			Propose an alternative. How else would you _____? Design a new plan for _____.
Evaluate	Using criteria and standards to make judgments			What errors exist? What are the alternatives? Defend the given position. Is there a better solution? Judge the value of _____. What evidence exists to support this conclusion? How reasonable are the results? Is this outcome good or bad?
Analyze	Determining what is relevant/irrelevant, important/not important, and how the elements fit together			What is fact? What is opinion? Why did _____ happen? What conclusions can you draw about _____ ? What assumptions is this conclusion based on? Do the assumptions and evidence justify the conclusion? Are there other possible outcomes? What is the same between _____ and _____? What is the difference between _____ and _____? How does _____ relate to what you already know?

[2] The examples provided in this graphic organizer are but a sample of the many examples that exist. The types of exam questions are suggestions, included here to demonstrate how higher order thinking skills (analyzing, evaluating, creating) are emphasized only in specific types of test questions, and this knowledge should guide preparation for those specific types of exams.

	Definition	Example Verbs	Types of Exam Questions	Sample Questions to Prompt This Thinking
Apply	Applying knowledge to execute routine and non-routine tasks			Explain why _____. What would happen if _____? Choose the best statement that _____. How much change will there be?
Understand	Constructing meaning from provided information			Explain how _____. Explain what happened in the story. Explain the steps of the process. Describe in your own words. Give an example. (What is an example of _____?) What does the graph represent? What does _____ mean? (Ex: What does this data point mean?)
Remember	Recognizing and retrieving information stored in memory			Who, what, when, where, why questions such as: Identify what question is the data answering. State the title of the chart. Label the city where the Battle of Midway took place. Name the first signer of the U.S. Constitution.

Appendix 14-C: Bloom's Taxonomy Graphic Organizer (with examples for instructor reference)[3]

	Definition	Example Verbs	Types of Exam Questions	Sample Questions to Prompt This Thinking
Create	Creating something new, an original product	construct, create, design, generate, hypothesize	Essay	Propose an alternative. How else would you _____? Design a new plan for _____.
Evaluate	Using criteria and standards to make judgments	critique, debate, defend, explain, interpret, judge, prioritize, rank, support	Essay	What errors exist? What are the alternatives? Defend the given position. Is there a better solution? Judge the value of _____. What evidence exists to support this conclusion? How reasonable are the results? Is this outcome good or bad?
Analyze	Determining what is relevant/irrelevant, important/not important, and how the elements fit together	analyze, compare, contrast, deconstruct, differentiate, examine, infer, organize	Short answer Essay Math problems	What is fact? What is opinion? Why did _____ happen? What conclusions can you draw about _____ ? What assumptions is this conclusion based on? Do the assumptions and evidence justify the conclusion? Are there other possible outcomes? What is the same between _____ and _____? What is the difference between _____ and _____? How does _____ relate to what you already know?

[3] The examples provided in this graphic organizer are but a sample of the many examples that exist. The types of exam questions are suggestions, included here to demonstrate how higher order thinking skills (analyzing, evaluating, creating) are emphasized only in specific types of test questions, and this knowledge should guide preparation for those specific types of exams.

	Definition	Example Verbs	Types of Exam Questions	Sample Questions to Prompt This Thinking
Apply	Applying knowledge to execute routine and non-routine tasks	apply, draw, illustrate, implement, prepare, relate, select, show, solve, use	Fill-in-the-blank Short answer Math problems	Explain why _____. What would happen if _____? Choose the best statement that _____. How much change will there be?
Understand	Constructing meaning from provided information	clarify, categorize, describe, discuss, distinguish, explain, report, predict, summarize	True/False Multiple Choice Fill-in-the-blank Short Answer Math problems	Explain how _____. Explain what happened in the story. Explain the steps of the process. Describe in your own words. Give an example. (What is an example of _____?) What does the graph represent? What does _____ mean? (Ex: What does this data point mean?)
Remember	Recognizing and retrieving information stored in memory	choose, define, describe, identify, label, list, match, name, recall, state	True/False Multiple Choice Fill-in-the-blank Short Answer Math problems	Who, what, when, where, why questions such as: Identify what question the data are answering. State the title of the chart. Label the city where the Battle of Midway took place. Name the first signer of the U.S. Constitution.

Appendix 14-D: Bloom's Taxonomy Verbs

Remember	Understand	Apply	Analyze	Evaluate	Create
define	clarify	apply	analyze	critique	construct
describe	categorize	illustrate	compare	debate	create
label	discuss	relate	contrast	defend	design
list	explain	show	examine	interpret	generate
match	report	solve	infer	judge	hypothesize
name	summarize	use	organize	prioritize	

Appendix 14-E: Strategies for Taking Exams

Preparing for an exam involves engaging in a series of activities to increase your confidence in your ability to demonstrate what you know about the course content. (Think back to what you learned about self-efficacy.) Continuous study and focused preparation are mastery experiences that help you build necessary confidence and change any negative beliefs you have about your capabilities into more positive beliefs.

The most important strategy for demonstrating what you know on an assessment is to make sure that you *know the content*. No matter what other techniques you may learn to use during testing, nothing can help you if you have not learned the content. Earlier in this course we focused on strategies for learning the material, such as making information meaningful for you, thinking of information in terms of the rule of three, and applying information to new situations. We also discussed strategies like creating flash cards and outlines, using a variety of good note-taking approaches, crafting sample exam questions, participating in study groups, and using peer questioning and reciprocal teaching. The strategies outlined here build upon those preparation ideas.

Know the exam *format*.

- What kinds of questions will you be asked (multiple choice, short answer, essay, etc.)?
- How much time will you have to take the exam?
- What are the instructor's expectations for how you provide responses? That is, will the instructor expect full sentences, proper paragraph form, outlines, specific examples?
- Are there any materials you are allowed to bring in to the exam? That is, are you allowed to use your notes, your textbook, a dictionary, a calculator?
- Are there learning objectives or review questions you can use to get an idea of the most important concepts?
- Will there be a sample exam for you to practice with?

Create a distributed study schedule.

- Create a plan for exam preparation that includes the following:
  - A goal for your performance (using the SMART characteristics).
  - Everything you know about the upcoming exam (the content to be covered, exam format, etc.).
  - When and where you will study (specific dates, times, and locations).
  - The strategies you will use while studying (peer teaching, reviewing notes, creating concept maps, completing more homework problems, etc.).
  - Who your study partners will be.
  - What you have learned from previous exams that may be useful for this exam (what kinds of questions your instructor tends to use, how questions have been organized, etc.).
- Be sure to allocate sufficient time for study. Allocating some extra time protects you in case of an emergency or something else outside your control (you get called in to work an extra shift, your computer crashes, the power on campus goes out, a family member falls ill, you become ill, etc.).

Put your study schedule into practice.

- Do NOT cram; instead, get plenty of rest and cultivate a positive attitude.

Be well rested and have a good breakfast.

- It's important to eat a meal full of brain-boosting nutrients, but not so much that you feel sluggish and over full. Consider—if it is allowed by your instructor—taking snacks into the exam room (like chocolate for a sugar boost) and plenty of water to keep you hydrated.
- The following resources provide more information on brain-boosting foods.
  - "Brain foods that help you concentrate," a WebMD slideshow reviewed by Brunilda Nazario, MD, on August 5, 2011. The slideshow is available at www.webmd.com/add-adhd/slideshow-brain-foods-that-help-you-concentrate
  - "What is good brain food?" an October 2003 *Psychology Today* article by Hara Estroff Marano. The article is available at www.psychologytoday.com/articles/200310/what-is-good-brain-food.

Arrive early to get yourself situated.

Start off with a good attitude.

- Thinking of negative things that might happen is counterproductive. It can be helpful to remind yourself that you did everything you could to prepare to do well, and that whatever grade you end up with can be bettered next time by learning from this experience.
- Engage in meditation or deep breathing exercises to calm your nerves—because everyone, no matter how well prepared or confident, feels nervous before an exam.
- Get into the mindset of the course; that is, prepare to answer questions from the perspective of the course.

Inform yourself: Read instructions completely and carefully.

- Understand the expectations and confirm your plan of attack: This way you avoid wasting time (say, by answering all five essay questions when the instructions said to choose only three).
- Look to the clues offered by word problems (remember Bloom's Taxonomy!). If a question asks you to summarize, then you need to concisely record the most critical ideas about the topic. In contrast, if a question asks you to evaluate, then you need to produce an argument for or against and show evidence of your ability to assess the material. Have a plan for answering each type of question.

Pace yourself: Strategically allocate effort. Do what you know first.

- Good test takers rarely complete a test in order. Answer the questions you are sure about first, then work on the more difficult questions.
- Allocate effort where you will get the most reward—give yourself enough time to finish all the high-scoring questions. Divide the time allotted for the exam, calculating how long you should spend on each type of question (less time on multiple-choice, lower-point questions and more time on essay-type, higher-point questions).

- If you are running out of time, aim to at least outline your responses. You may get points for partial responses. You will also be able to use these outlines when you review your exam and learn from the experience.
- Try to build in 5 to 10 minutes after you have completed all the questions to review your answers and make sure you haven't made any careless mistakes.

Help yourself: Jot notes and be strategic in answering questions.

- Before even looking at the exam questions, do a quick brain dump—jot down key facts, formulas, and key information onto scratch paper (or whatever format the exam structure allows). In an exam environment, you may not have much time to think, so creating an instant cheat sheet is a valuable way of getting all that information out of your head and onto paper where you can refer to it quickly.

  Doing a brain dump on scratch paper during the exam isn't cheating. It's a smart strategy that can help when your brain feels like it's going to shut down during the exam itself.

Use question-specific strategies.

- Multiple-choice question
  - Try to think of your answer to the question before looking at the answer choices.
  - Read all the answer choices.
  - Eliminate wrong answers.
  - Take care when answer choices include "All of the above" and "None of the above."
  - Don't overthink questions. Use verbs from Bloom's Taxonomy to help determine what kind of response is appropriate for the question.
- Short answer questions
  - Identify what you need to write about.
  - Before you start writing full sentences, outline the general points you want to make. Think of this as a second brain dump of information relevant to the questions on the exam—again, so you don't need to spend too much time retrieving information when the time comes to compose your answer.
  - Use vocabulary from the course as appropriate.
- True/false
  - Be aware of absolute terms like always and never. They are usually not correct choices, especially compared to statements that contain terms like often and sometimes.
  - If one part of the statement is false, the whole statement is false. The opposite is not true, however. If one part is true, the remaining parts of the statement may or may not be true. Be sure to evaluate each part independently of the other parts.

Show your thinking: Make your thought process visible to yourself and your instructor.

- Writing down the problem and the steps you take to solve it slows you down and helps you avoid making careless calculation and process errors. You are also less likely to accidentally ignore a part of the problem if you are writing down the steps you are taking to solve it. This also helps your instructor understand your thinking process and may lead to partial credit for your answer.

- Writing down what you are thinking provides clues you can refer to when you review the exam in a later class period. This documentation will help you learn from any errors you may make.
- By the end of the exam, you need to have completed all the questions. But it is likely that you do not need to go in order as you are answering them. If you are using an answer sheet (such as a Scantron), verify you have filled it out accurately and that it represents the answers you intend. Check it and then check it again.

Check yourself: Review small but critical details in problem solving.

- Do your best to allocate time to review all your work. If you tend to make one kind of error, be sure go through your exam focusing on identifying any place you may have made that error. A second sweep through can focus on identifying other issues.
- Some common things to double check:
  - Have you calculated and written percentages properly (e.g., 8% is .08, not .8)?
  - Are all decimal points in the correct place?
  - Does your response make sense given the information provided?
  - Does each response seem appropriate for the question's Bloom's Taxonomy level?
  - Do your answers include enough detail?

Trust yourself: Go with your gut.

- Some level of anticipation can be a good thing.
  - You need to be pumped up just enough to be alert and focused on the exam but not so much that you freak yourself out. Find the sweet spot and use reassuring self-talk.
  - If you find your anxiety escalating, compartmentalize the thoughts triggering it. Give yourself permission to think about the consequences of the exam later, and remind yourself that all you can control during the actual time of the exam is making sure that what is in your head comes through on the paper. That is something you have control over—the domino effect of what you think might happen is not controllable.

Focus on yourself.

- Avoid looking at other people while you are taking the exam. Not looking at your classmates eliminates any temptation to cheat. And what other students are doing isn't really your concern during an exam. Not observing your classmates can be especially hard at the end of an exam, when others appear to have finished and you are still working. Think of it this way: When an exam is 90 minutes long, there are no extra points for walking out of the room at the 75-minute mark; in fact, that's a bad idea, as you could have used that extra 15 minutes to check for careless mistakes. Also, you can't know whether an early finisher did a good job or if they just gave up and quit early.
- Don't change an answer at the last minute. More often than not, last-minute changes tend to be incorrect. If you are absolutely certain you made a mistake, then of course correct it. But if you are only second guessing yourself, consider leaving the answer as is but making a note to the side of the question about your doubt, so you can review the question later.

Control your emotions.

- If you have prepared, remind yourself that you have put forth great effort and done your best. If you have not prepared, take a deep breath, focus on attending to your negative emotions, and make plans to prepare more effectively next time.

Avoid discussing the exam.

- At this point, it is out of your hands, and continuing to speculate on your performance before you have the results eats up valuable time you could be using to keep up with the new material you are expected to learn.

Reflect on the preparation you did.

- Did you make a preparation plan and stick to it? Was your plan complete enough? If not, how can you tweak your next plan to prepare more effectively?

Read feedback carefully.

- Listen to your instructor during the debrief; what is the reason for the correct answer? Do you understand how your response is different from what your instructor wanted for a correct response? What signals (in class, in the exam question, etc.) could have helped you identify the expectation?

Analyze and correct errors.

- You won't make the same error again if you truly learn from the mistake. More information on evaluating your performance will be covered in a future lesson.

Appendix 14-F: Sample Description of Bloom's Taxonomy as Applied to Academic Trajectory

Below is an example of how one instructor came to understand the different levels of thinking as she progressed through college.

- Most of what I learned early in my education required rote memorization (times tables, capital cities, spelling difficult words, etc.)—this relates to the base of the triangle (Remember).
- In some of my courses (say, science or math), I was expected to show I understood concepts by explaining them in my own words (paraphrasing)—that's the next level up (Understand).
- But that was never enough to be able to pass all my exams because the examples would change from those I was exposed to during class; I needed to show the instructor that I could take the principles I had learned and apply them to new situations—relating to the next level up (Apply).
- Sometimes I had to demonstrate that I could compare and contrast two or more concepts or ideas (as the students did the previous week when they reviewed the three note-taking strategies and worked out which would be best suited to different courses), which is the next level up again (Analyze).
- When I was a member of the debating team, an even higher level of thinking was required because now I had to take a stand or position and justify it—which relates to the level given here as Evaluate.
- And for my dissertation, I had to take all I had learned and produce a completely new, original piece of work (develop a model or approach that was different from anything done before), which represents the pinnacle of the triangle (Create).

Lesson 15
Preparing to Do Well on Exams

Overview

Students who consistently score well on assignments and receive positive feedback in class are often surprised when they do not score as well on exams. That's because many students have never learned how to prepare for success on exams—which can require more than just demonstrating that they know the course material.

This lesson emphasizes that when it comes to doing well on exams, students have to become skilled in creating a pre-exam review plan and, when taking the exam itself, in budgeting their time, reading instructions, and tackling different kinds of questions.

Week: 7 of 15
No. of Lessons: 1 of 2
Lesson Length: 75 minutes
No. of Activities: 2
Supplementary Materials: Appendices 15-A and 15-B

While this lesson identifies some key strategies, it does not cover all possible strategies. Students will likely also have their own techniques. Thus, another goal of this lesson is for them to share their tips with each other and identify which tips are counterproductive and should be discarded.

Student Objectives

Identify and apply effective strategies to use before, during, and after taking an exam.

- Students develop strategies for preparing for exams, taking exams, and reviewing performance.

Resources and Preparation

Materials and Technology Required
None.

1. **Read background materials listed in this lesson to familiarize yourself with ways students can prepare themselves for exams and exams.**
   - Also see Appendix 14-E: Strategies for Taking Exams (from Lesson 14).
2. **Entry logistics**
   - Select some relevant quotes and affirmations that students will see when they enter the classroom to set the tone for the importance of maintaining focus and positivity for exam taking.
   - Prepare the student attendance sheet for that week.
3. **Make copies of the following materials:**
   - Appendix 15-A: Sample Exam-Taking Strategies Graphic Organizer—one per student

- Appendix 15-B: Write Test Questions—one per student

4. **Activity 1: Understanding the purpose of assessments**
   - Brush up on important motivational concepts relevant to exam taking. Be sure to prepare explanations for how students can best deal with anxiety—e.g., by being prepared before the exam (thereby lessening the likelihood they will experience some symptoms of anxiety) as well as ways for addressing anxiety while taking the exam.
   - Decide which questions you want to post around the classroom for students to respond to.
5. **Activity 2: Demonstrating the process of testing**
   - Lesson 21 includes some specific strategies students can use during the *evaluating* phase of exam-taking strategies (see Appendix 15-A). You may find it beneficial to refer to Lesson 21 when preparing for the discussion in Activity 2.
6. **For the next class period**
   - Students will complete the assignment to write three test questions in multiple formats using course topics.

Instructional Plan

Preliminaries

(5 minutes)

- Do a quick check to make sure students completed the preparation reading.

Activity 1: Understanding the purpose of assessments

(15 minutes)

Objectives

Students

- Identify their emotions and physical reactions to testing.
- Acknowledge their prior experiences with testing.
- Move toward focusing their energy on aspects of testing that are under their control.
- Identify the tools they have acquired thus far that can help in preparing for assessments.

1. **Put posters around the classroom with the following (or similar) questions. You may want to limit the total number of questions you ask and organize them in the order in which you want to discuss them later in the activity in an effort to reduce downtime during the activity.**
   - Why do we have assessments like quizzes, exams, and presentations?
   - How do you feel (physically? emotionally?) as you take exams?

- What kinds of exam preparation are within your control?
- What are your go-to test preparation strategies?
- How can you use Bloom's Taxonomy to help you on exams?

2. **Give each student a marker and have students move from poster to poster, answering the questions listed at the top. About halfway through the activity, remind students to move about, looking at the responses other students have left.**
    - You may want to seed responses for a few of the boards to indicate the level of response you are looking for. Disclosing your own feelings about testing (e.g., that your palms sweat when you sit down for an exam) can open the door for students to feel comfortable being honest about their experiences.
    - Rather than rewriting the same thoughts on each poster, if a student agrees with something already written, have them place a star or check mark to show that more than one person echoes the sentiment.
3. **As you circulate and read through the boards, look to see that the following ideas are surfaced by students:**
    - There are different kinds of assessments: short quiz, pop quiz or announced quiz, a longer exam, a presentation, an oral conversation (common in language classes), etc.
    - Exam-like situations are an opportunity for you to demonstrate the knowledge you have accumulated and for instructors to make sure you have learned the course material. Though students may write otherwise, most professors are not out there to trick students; they simply need to make sure students have learned the course objectives so they will be prepared for future courses.
    - Evidence of our anxious feelings and thoughts (sweaty palms, jumbled thoughts, an upset or nervous stomach, rapid heart beat, short temper) as well as positive thoughts when testing (being excited, feeling like giving yourself a high five, etc.)
    - Strategies that have been identified in the course or the reading students prepared for the class.
4. **When time comes to debrief, have students stop where they are, in front of the posters. Ask the group in front of each poster to summarize the most agreed-upon responses on the poster for the group.**
5. **Transition to the next activity.**
    - Note that we share common feelings about quizzes, exams, presentations, etc., but as they are an inevitable part of college (and professional life after college), it is necessary to understand their purpose, focus on the things that you can control, and maximize the strategies and mindsets that will help you demonstrate what you know.

When it comes to exam taking, it is important to focus on the things you can control. Most of the time you cannot avoid taking an exam, and you cannot control how the exam is designed or what questions are asked.

You can, however, use your resources to properly prepare for the exam, increasing the likelihood that you will know the material and be able to demonstrate your knowledge during the exam. This preparation will reduce anxious thoughts and feelings, further helping you show what you know.

Activity 2: Demonstrating the process of testing

(50 minutes)

Objectives

Students

- Demonstrate effective strategies to use in *preparing for exams*.
- Demonstrate effective strategies to use *while taking exams*.

1. **Quick Review: What are the stages of self-regulation? What happens in each stage?**
    - This topic was covered during an earlier lesson on metacognition. The current lesson emphasizes the stages again as a frame for helping students prepare for an exam, take it, and evaluate their performance.
    - Look for opportunities to highlight the following information:
        - The stages of self-regulation are planning, implementing and monitoring, and evaluating.
        - Though some elements of each stage can happen before, during, and after testing, the bulk of what happens in each stage is essentially as follows:
            - Planning—What you do before the exam.
            - Implementing and monitoring—What you do before and during the exam.
            - Evaluating—What you do during and after the exam.
        - Understanding the components of this process as it is applied to exam taking is important as it helps move students move beyond knowing a list of strategies to knowing how to effectively use them.
2. **Success team work: Design a demonstration of test-taking strategies.**

    Note: Students will have read the document "Strategies for Taking Exams" as part of their assignment from Lesson 14 (Appendix 14-E).
    - Have each group present on a different combination of test taking/self-regulation categories:
        - Planning before the test

  - Implementing and monitoring before the test
  - Planning during the test
  - Implementing and monitoring during the test
  - Evaluating during the test
- Have each success team decide how to present the information to the rest of the class. Invite creative ideas such as a skit, visual, poem, song, and so on (the Create level of Bloom's Taxonomy). Give groups 15 minutes to prepare a three-to-four-minute lesson for the rest of the class.
  - The goal for the success teams is to demonstrate good use of strategies. You could have students assume that their audience is high school seniors who are learning about preparing for and taking tests in college.
  - It is not necessary that every strategy from the reading be represented; it is most important that students understand there are strategies to draw upon before, during, and after testing and that there is tremendous value in planning, monitoring, and evaluating one's performance. To this end, encourage students to use the graphic organizers they prepared based on the assigned reading to ensure they focus on the most important aspects that relate to their presentation topic.
  - If you have more than five groups, you may need to shorten the amount of time each group presents, or streamline the demonstration process to save time between presentations.
- If you will be evaluating the presentations for a grade, be sure to share your rubric with students so they can use it in planning their demonstration.
- If you need to assign more than one group to a stage, be sure to double up on the planning and the implementing and monitoring groups. Students will do more work with evaluating after the midterm exam, so while it is important to get an overview of what is done during evaluation and why, a larger discussion on evaluating performance will take place in the future.

3. **Success team work: Demonstrate strategy using the developed creative idea.**
   - While a group is presenting, other students can expand on the notes they prepared for class (the exam-taking strategies graphic organizer).
   - After each group presents their information, guide the class in making notes and helping connect observations with what already may exist on their graphic organizers.
   - To carefully guard class time, use a timer to make sure the student presentations last only five minutes and then have a one-minute debrief to fill in the graphic organizer.
4. **Debrief:**
   - With remaining time, have students share the graphic organizers they created and their three biggest takeaways from the presentations.

Wrap-Up
(5 minutes)

1. **Assign the following:**
    - Use Appendix 15-B as a guide for creating three test questions based on course content covered so far. Students should create a multiple choice, a true/false, and an essay question. Consider this exercise as a part of your preparation for the midterm exam.
2. **Preview the next lesson:**
    - The next lesson will serve as the review of course content in preparation for the midterm. Students will be able to use the practice test questions to help their group compete in a game focused on exploring connections among course content.

Appendix 15-A: Sample Exam-Taking Strategies Graphic Organizer

	Before Testing	During Testing	After Testing
Planning	Know the content. Know the exam format. Create a distributed study schedule.	Read instructions carefully and completely. Jot down notes before you get started—brain dump. Plan out essay questions—outline and specific details you are going to include.	Reflect on the preparation you did for the exam.
Implementing and Monitoring	Put a study schedule into practice. Be well rested and have a good breakfast.	Arrive early and start off with a good attitude. Focus on yourself. Do what you know first. Put effort toward the questions that will help you earn the most points. Use question type strategies (mc, short answer, essay, true/false). Show thinking (show all work, make notes about your process for solving).	Avoid discussing or dissecting the exam. Read feedback carefully.
Evaluating		Review all of your work. Go with your gut.	

Appendix 15-B: Assignment: Write Test Questions

Name: _____ Due Date: _____

Directions: Choose topics from the following list. Write three test questions (one multiple choice, one true/false, and one essay) to assess a student's knowledge of your topics.

Topics

Smart Thinking	Campus Resources	Online Learning System
Neuroplasticity	Memory	Motivation
Bloom's Taxonomy	Concept Map	Goal Setting
Note Taking	Self-Regulation	Critical Thinking

Question Type: Multiple Choice Topic: _____

Question:

	Answer choices	What makes this answer correct/incorrect?
A.		
B.		
C.		
D.		
E.		

Question Type: True/False Topic: _____

Question:

Answer	What makes this answer correct/incorrect?

Question Type: Essay Topic: _____

Question:

What elements need to be included to get full credit for this essay response?

Lesson 16 Update
Where We've Been, Where We're Going

Update note

See ***Frameworks Course Essentials***[18] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Activity 1: Connecting course concepts
Appendix 16-B: A sample scenario

Content note: Additional activity information

- Appendix 16-B contains one sample scenario to support Activity 1. The following are additional scenarios that you could use in addition to the scenarios you create yourself.
    - Sally earned her GED five years ago and is taking classes so she can enroll in a nursing program at the college. She is worried about the competition she will face getting into the program. What can Sally do to be successful in reaching her goal?
    - Ernesto is a dual enrollment student, taking classes both at his high school and at the college campus. He spends a lot of time going back and forth between campuses and thinks he has a problem getting everything done on time. What theories studied in class could help Ernesto identify strategies he can use to be successful?
    - Rick is a single parent who works part time and is taking two classes at night. He carves out time to study in the evenings and actually sits down to work when he says he will work. Rick wants to make sure he is getting everything he can out of his study time. What will be helpful for Rick to know?
    - Ali has two more classes before she finishes her criminal justice degree. One of those classes is an English class. She has not taken an English class since high school and is concerned she will struggle in the class. What will be helpful for Ali to know?

[18]The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Lesson 16
Where We've Been, Where We're Going

Overview

As we reach the midpoint of this course and approach midterm exams, it is an appropriate time to recap some of the key concepts and strategies that students have been exposed to. This lesson offers further opportunity for students to reflect on the extent to which they have actively used the concepts and strategies in their courses.

This recap provides a segue into the success team presentations that students will deliver shortly after the midterm exam, and Activity 3 provides time for students to assess their progress with the career project and identify the remaining components.

Week: 8 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendices 16-A and 16-B

Student Objectives

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Demonstrate organization and management of time and study materials.

- Students create and maintain a distributed study schedule and employ time-management strategies.

Apply strategies to maintain motivation.

- Students maintain their motivation by focusing on controllable academic behaviors and using strategies to monitor and manage their attitudes, emotions, and thoughts when facing challenging tasks or academic setbacks.

Resources and Preparation

Materials and Technology Required

- Sticky note pads (one pad per group, different color for each group)
- Timer

1. **Background information**
   - Review course concepts to date and have students brainstorm connections among the materials. If there is any information you forgot to mention during the initial lessons, make a note to address the key points during this lesson. There will be ample opportunity during Activities 1 and 2.
2. **Entry logistics**
   - Prepare the student attendance sheet for the day.
   - Do a quick check of the assignment that students were to prepare for class. You can do this during the beginning of Activity 1.
3. **Make copies of the following materials:**
   - Appendix 16-A: Self-reflection—one per student
4. **Activity 1: Connecting course concepts**
   - Review course topics to date.
   - Prepare either the word prompts or scenario prompts and boards (see Appendix 16-B for samples).
   - Review the game's rules.
   - Have a timer ready.
5. **Activity 2: Reflection and strategy modification**
   - Review the prompts for the self-reflection. Decide on which date you will cover Lesson 18 (the Midterm Debrief) and set this assignment due date accordingly.
6. **Activity 3: Moving ahead with the career project**
   - Review the career project instructions and prepare to discuss due dates and clarify any confusion students may have about the remaining parameters of this assignment.
7. **For the next class period**
   - Students will take the midterm exam. Secure sufficient Scantron forms, if needed.

Instructional Plan

Preliminaries

(5 minutes)

- Students should sit in either success groups or expert teams.
- Conduct a quick check for the Lesson 15 homework assignment. Students were to use Appendix 15-B as a guide for creating test questions.

Activity 1: Connecting course concepts

(40 minutes)

Objectives

Students

- Recap the material learned so far in the course.
- Make connections among the key topics in the course.

This activity is for the whole class. The purpose is to have students recap the material from this semester and make connections among the topics. With this primed in their minds, they will complete self-reflections on their progress so far this semester and update their distributed study schedules (Activity 2).

1. **Arrange students in either their success groups or in expert teams**.
2. **Distribute a stack of sticky notes to each team (one color per team)**.
3. **Instruct teams to brainstorm all of the content covered in class so far**.
    - They should cover what they have learned, specific content, strategies, overarching ideas, etc. and write each idea on a sticky note. Their goal at this step is to get as many course ideas written down onto sticky notes as possible. Students cannot use their notes during this game, but you can encourage them to use the sample test questions they prepared for the class (from Appendix 15-B).
    - Give them a time limit and remind them when preparation time is coming to a close.
4. **Once the brainstorming part is done, explain the process and rules for the game**:
    - In each round, set a timer for two minutes.
    - A round begins when the instructor places one topic or scenario on the board (see Appendix 16-B) and asks, "What is one concept you have recorded that applies to this topic or scenario?"
    - Team members raise their hands, and the first team to be acknowledged sends one representative forward to place a sticky note near the topic or scenario and explain how the information on the sticky note is applicable to the broad topic or scenario.
    - Once the first sticky note goes on the board, play continues with other groups adding to the board. In order to put up a sticky note, a group must explain the connection between what is already on the board and what they are adding to it.

      This means, for example, that if the first group connects the scenario to setting SMART goals, the next group needs to make sure their contribution (e.g., reading a textbook chapter) is connected to both the scenario and SMART goals. The third team should connect the scenario, SMART goals, reading a textbook chapter, and their contribution. Play continues until time (2 minutes) expires.

- Groups do not need to send the same representative each time. Groups are allowed to contribute more than once each round, but the same group cannot go twice in a row.
- Once an idea has been placed on the board, subsequent groups cannot place sticky notes with similar ideas on the board. Groups should instead focus on expanding the connections among the topics. For example, if "characteristics of SMART goals" is already on the board, and the group explained some of the characteristics as their justification for the connection, you might discourage subsequent groups from adding notes that continue breaking SMART down to the remaining individual characteristics. Instead, encourage groups to suggest ideas that are more clearly distinct and not just additional detail for an idea already posted. This is a fine line to draw, but it is important to be fair in enforcing this rule.
- Once the timer goes off, that round is over and another topic is added. If a group isn't able to add a sticky note to the current topic, remind them that they should try to connect it when the class moves onto a different topic. Subsequent rounds continue as you unveil the topic/scenario boards until no topics remain or until it is time to wrap up the activity.
- Determine how to select the winner. You could have multiple categories in which teams compete—the most connections, the most memorable explanation, and so on. To keep the game moving quickly, ensure that scoring encourages everyone to move swiftly through making the connections so each group has many opportunities to get their sticky notes on the board.

Reflecting on what we know and striving to make deeper connections within the material are important aspects of deep learning.

Activity 2: Reflection and strategy modification

(15 minutes)

Objectives

Students

- Reflect on academic behaviors, connecting course concepts to their own lives.

1. **Explain the connection to the previous activity and the value of the current activity**.
    - Now that we have recapped some of the ideas and strategies, determine how you have personally been applying them.
    - Reflection is part of the monitoring and evaluation stages of the self-regulation cycle (planning, implementing and monitoring, evaluating).

- Looking back and looking forward provides an opportunity to increase your motivation by seeing how much progress you have made so far and to make changes (if necessary) so you can continue to grow.

2. **Hand out Appendix 16-A**.
3. **Have students begin engaging in self-reflection**; **they will complete the self-reflection outside class.**
    - Students can complete it before or after they take the midterm, but they may find it helpful to use the questions as prompts to identify information they should study for the exam.
    - Students should bring the completed self-reflection assignment with them to use during Lesson 18 (when they do the midterm exam debrief).

Activity 3: Moving ahead with the career project

(10 minutes)

Objectives

Students

- Identify the remaining requirements for the career project.

1. **Briefly review the preparation students have already done for this activity:**
    - Lesson 6: A career counselor visited the class. The students' assignment was to go to the Career Center and use one or more of the assessment tools to help identify some career areas of interest to them.
    - Lessons 7 and 8: Students identified values and goals and worked toward creating meaningful, motivating goals. They used the mind map and the Nine Boxes activity, one of which related to jobs or careers.
    - Lesson 8: The instructor introduced the project and handed out project requirements.
    - Lesson 9: Students discussed the concept of planning and creating schedules to help monitor their time more effectively; ideally, students have spent some time since then thinking about this project.
2. **What's next:**
    - Discuss the requirements for the upcoming assignment, including deadlines.
    - If you feel students need additional guidance, have them schedule an appointment with you in which you discuss the project and any challenges, review options, offer guidance, and address their accountability/planning to achieve the deadline.
3. **Additional reminders:**
    - In the coming weeks, there will be some guest speakers from the community who will talk about their own career trajectories and how they have used, and

continue to use, math in in their careers. There may also be potential mentors here in class—students who may be in a career area that other students are interested in exploring and who could help answer any questions.

- Students should try to leverage their connections on campus and use all the resources at their disposal, both online and offline (e.g., the Career Center, the library).

Wrap-Up

(5 minutes)

Assign the following:

- Self-reflection (Appendix 16-A): Students should complete the self-reflection by Lesson 18.

Preview the next lesson:

- Remind students that the midterm exam will be given during the next lesson. If you decided to have students complete essay questions before arriving in class, remind them of this and be clear about the logistics of how you would like the assignment submitted.

Appendix 16-A: Self-Reflection

Use your journal entry reflections, class notes, and completed assignments to help you reflect on the following questions. Look for evidence in these documents to support your reflections; try to spot any patterns that emerge from these documents and your own reflections.

1. Overall—How has this semester been going for you so far?
   a. Describe how your expectation for the course and the semester as a whole align with how things are actually going.

   b. What has surprised you about this course? Which aspects of this course have been especially challenging?

2. Considering *this* course, briefly respond to the following questions:
   a. What has your attendance in this course looked like? In what ways have you actively engaged during class (e.g., asking questions, taking notes, contributing to group discussions)?

   b. How well have you kept up with reading assigned materials before class, completing assignments afterward, reviewing notes on an ongoing basis, and preparing for tests ahead of time?

   c. In what ways have you used campus or course resources, such as reaching out to your instructors, going to tutoring, or working with classmates in study groups? Which resources have been most beneficial?

   d. What grades have you earned so far? For which courses are your grades aligned to the goals you set for yourself?

3. Considering your *math* course, briefly respond to the following questions:
   a. What has your attendance in this course looked like? In what ways have you actively engaged during class (e.g., asking questions, taking notes, contributing to group discussions)?

   b. How well have you been keeping up with readings and completing the assigned materials before class, completing assignments afterward, reviewing notes on an ongoing basis, and preparing for tests ahead of time?

   c. In what ways have you used campus or course resources, such as reaching out to your instructors, going to tutoring, or working with classmates in study groups?

   d. What grades have you earned so far? Are you doing as well as you had hoped?

4. What strategies are working? Choose two course strategies you learned about this semester that you feel have been working for you so far. How have you used these strategies? How do you know they are working?

5. What changes do you need to make to stay on course toward success? Name two strategies you think will be helpful to start using. How will you begin implementing the strategies?

   (If you have previously tried using a strategy listed here, answer the following questions: Why did you stop using the strategy? Why will it be useful to start using the strategy again? What do you need to do differently this time to make the strategy stick?)

Appendix 16-B: A Sampling of Course Topics to Date and a Sample Scenario

Course topics

A. **Connecting to campus resources**

- An early focus for this course was the importance of community building for students—getting to know each other, their instructors, and the on-campus resources available to them.
- Helping students think of their academic advisor, career counselor, or financial aid advisor resources, just like the members of their success teams or study group.
- The importance of visiting with their academic advisor regularly. Suggest that students make a note now to arrange an appointment if they have not already done so.

B. **The plastic brain and smart thinking**

- People used to believe that everyone had a certain amount of intelligence and that it could not be changed. In fact, anyone can get smarter with persistence and purposeful engagement.
- With purposeful engagement, the brain forms new neural pathways. When learning something new, it is more difficult for signals to cross the synaptic gap, but with persistence the crossing becomes effortless.
- Markman's formula for smart thinking: develop smart habits, acquire high-quality knowledge, and apply high-quality knowledge.
- There are two critical components to changing habits: Stop the old behavior, and replace the old behavior with new behavior.
- Rule of 3: We typically can recall only three independent bits of information about an event or article. We can leverage that facet of our memories by ensuring that we deliberately look for the three most important ideas and connect them with our current knowledge.

C. **Goals**

- The usefulness of goals, types of goals (for education, career, and life generally), length of goals (short, enabling, and long-term), and characteristics of goals (SMART).
- An earlier lesson stressed the goal of becoming an intentional or active learner by using time wisely, getting organized, and creating a distributed study schedule that breaks down study activities (read, review, and revise notes and study materials, etc.) a little every day rather than cramming it into one long session.

D. **Motivation**

- Confidence in your ability to complete the work (self-efficacy) comes from previous experiences, vicarious experiences (seeing the successes and failures of peers you feel similar to), and social persuasions (messages about your capabilities you hear from others).
- Attributing outcomes to things that you can control (such as effort, strategies you use).

E. **Metacognition**

- *Understanding your thinking* includes three types of knowledge: understanding what you know and the limits of your knowledge, understanding how to apply your knowledge; understanding when it makes sense to apply your knowledge.
- *Regulating your thinking* includes an ongoing process of planning, implementing and monitoring, and evaluating.
- Journaling supports metacognition.

F. **Processing information effectively**

- The distinction between deep and shallow processing, how to process information deeply (actively engaging with the material instead of just passively reading it and trying to remember it by rote), strategies for active rehearsal, elaborating, and organizing information.
- The role motivation plays in memory—making material personal, including having a personal reason for studying math, such as finding how useful it will be for a future career or ongoing studies. This is why guest speakers are asked to talk a little about the use of math in their work.
- Active engagement with study material by finding patterns (making up rhymes, identifying chunks of information) and associations (creating short stories) to help learn facts and concepts. All of these approaches help to embed material in long-term memory and help with recall during tests and exams.
- Other techniques include the "think-aloud protocol" and making flash cards.

G. **Reading textbooks**

- The six components of the SQ4R model (an example of an acronym—a possible connection as an active rehearsal information-processing strategy); the specific information that applies to reading a math textbook.
- The value of and processes for highlighting, annotating text, and creating a one-page summary/outline of key concepts.

H. **Bloom's Taxonomy**

- Levels: remembering, understanding, applying, analyzing, evaluating, creating.
- Understanding these levels and how they relate to tasks we may complete for coursework guides us in preparing to complete that coursework appropriately.

I. **Test preparation**

- Students learned and evaluated a number of note-taking strategies: the Cornell Method, concept maps, and organizing math application problems.
- Remind students of the mind-mapping method that they were exposed to in Lesson 5 and the assignment on Possible Lives.
- Different kinds of test questions and how they hold clues on how best to answer them by identifying the kind of thinking the instructor is looking for—the different levels of thinking in Bloom's Taxonomy triangle.

Sample scenario

Bert is a first-year student at the college. He has worked full time for the last two years and is returning to get a degree so he can get promoted at work. What will be helpful for Bert to know?

Lesson 17 Update
Midterm Exam

Update note

Sample midterm questions are available from the Dana Center. Please contact Nancy Stano at nk.stano@austin.utexas.edu or the DCMP staff in general at dcmathpathways@austin.utexas.edu to request this resource.

Lesson 17
Midterm Exam

Overview

This midterm exam provides an opportunity to see how much students have understood about the course material to date. To help them develop a habit of getting into the right mindset just before taking a test, initiate a pre-exam centering exercise near the start of class.

As part of the overall test-taking strategies component of this course, this lesson also sets up the next lesson, in which students will reflect on their test performance. This reflection consists of a set of detailed activities to help students identify mistakes they may have made on the exam, how many points they lost as a result, and a solution for not repeating the same mistakes on future exams. Students have engaged in similar debriefing exercises in the *Foundations for Mathematical Reasoning* course, so the next lesson provides an opportunity for them to (a) engage with the process again and (b) reflect on how they have improved the process.

Week: 9 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: None

Student Objectives

Make personal connections with peers, instructors, and other campus support personnel.

- Students actively participate as members of identifiable teams throughout the term and visit with instructors and campus resource center personnel.

Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.

- Students develop written and oral arguments that are insightful, purposefully organized, logically supported, audience appropriate, and effectively delivered.

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Resources and Preparation

Materials and Technology Required

- Sufficient copies of the Scantron for each student
- Box of pencils (for completing the Scantron sheets)

1. **Have the midterm exam ready for students. Be prepared to answer students' questions about specific elements of the exam.**
2. **Entry logistics**
   - Select some relevant quotes and affirmations that students will see when they enter the classroom to emphasize the importance of maintaining focus and positivity when taking a test.
   - Attend to any issues concerning outstanding assignments (specifically, collect students' responses to the essay questions, which are Part One of the midterm).
3. **Make copies of the following materials for students:**
   - Midterm exam
4. **Activity 1: Pre-exam centering exercise**
   - Decide which strategies you will use to help students calm their minds and establish a positive attitude before testing.
5. **Activity 2: Midterm exam**
   - Make sure you have one copy per student of the midterm exam as well as any scratch paper you would like to make available for students to use.
6. **For the next class period**
   - If you are able to grade the exams before the next class period, then you should continue to Lesson 18. During that lesson, students will reflect on their test performance by completing a set of detailed activities to identify areas where they were successful on the assessment, mistakes they may have made on the exam, how many points they lost as a result, and a solution for not repeating the same mistakes on future tests. If you are not able to return exams during the next class meeting, you may need to move to Lesson 19, returning to Lesson 18 when appropriate.

Instructional Plan

Preliminaries
(5 minutes)

- Students will work individually for this entire lesson.
- Collect the essay portion of the midterm exam.

Activity 1: Pre-Exam Centering Exercise
(5 minutes)

Objectives
Students

- Engage in centering activities to support their success with the midterm exam.

1. **Use this time to allow tardy students to enter the room and get settled and to help students mentally center themselves before the exam.**
2. **Establish a calm, confident environment. Some exercises you can lead students through include the following:**
    - Ask students to close their eyes and take several deep, cleansing breaths (breathe in through their nose to the count of four and expel all the air through their mouths to the count of five, as noisily as they like).
    - Suggest they do a mental body check to identify any areas of tension and to loosen up with some shoulder circles or leg/arm stretches.
    - Suggest they anchor themselves by controlling their internal dialogue, using a mantra like, "I am going to do well on this test" or "I have prepared wonderfully for this test." No matter what they use as an affirmation, ask that they begin the test in a positive frame of mind.
    - Remind students to think of this experience as an opportunity both to demonstrate their knowledge and to apply some of the test-taking approaches learned in this course.
    - Ask students to remain quietly seated, practicing deep breathing and positive, affirmative thinking (perhaps even with their eyes closed) while you hand out the exam paper (and Scantron sheets, if you are using them).

Activity 2: Midterm Exam
(60 minutes)

Objectives

Students

- Complete the in-class portion of the midterm exam.

1. **Recap final instructions:**
    - The amount of time students have to complete the in-class portion of the exam.
    - Any warnings you will give on how much testing time remains.
    - How you want students to turn in their exams to you.
    - Any additional testing rules you may have.
2. **To avoid any temptation students may have to finish the exam early so they can leave class early, make sure they know that they are expected to stay until the end of class.**
    - If all students finish before the end of class, include Activity 3 in this lesson.
    - Possible activities for them to work on individually after testing include the following:
        - Career Project assignments yet to be completed.
        - Self-reflection (assigned at the end of Lesson 16, to be turned in at the beginning of Lesson 18)

Activity 3: Success Team Presentation Preparation
(any remaining time)

Objectives

Students

- Work with their success teams to develop and prepare presentations.

1. **Success team work: Continue to develop presentations.**

Wrap-Up
(5 minutes)

Preview the next lesson:

- If you are teaching Lesson 18 next, inform students that in the next class there will be a test reflection activity and they should be prepared to reflect on their testing experience, including their test preparation. If you are moving on to Lesson 19, let students know that the focus will be on successful group work.
- Remind students about the self-reflection assignment to be turned in at the beginning of Lesson 18.

Lesson 18
Midterm Exam Debrief

Overview

Week: 9 of 15
No. of Lessons: 2 of 2
Lesson Length: 75 minutes
No. of Activities: 2
Supplementary Materials: Appendices 18-A through 18-E

Too often, students receive test scores without any formal debrief with the instructor, or they don't take time to review and reflect on their test results. Having students assess their study and test-taking skills in relation to a specific exam is of vital importance, as reflection is necessary in order to identify which strategies work for *them* across various subjects and assessment types.

In this lesson, students reflect on their preparation and performance on an in-class assessment and consider how to apply this reflection skill to assessments across the curriculum, including mathematics.

Students collaboratively develop a process for identifying specific areas of the assessment where they were successful and specific areas for improvement. This approach helps students focus on how they can learn from the experience, rather than getting bogged down in self-blame and recriminations. They also consider similar processes, such as the "After Action Review," used in various fields.

Students may feel uncomfortable during this lesson, since reflecting on our performance, especially if we do not perform at the level we had hoped, can be painful. Assure them that this is an effective strategy for improving behavior and building the skills to be successful across a wide variety of assessment situations. In the learning environment we have been working to establish throughout the semester, this kind of reflection is valued as a normal part of the culture. Framing the exercise as a way to identify actionable tasks for the future is one strategy for easing the discomfort and maximizing the positive feelings so that students can learn from this experience. Not learning from mistakes is why failure gets replicated, so we are going to learn from them.

Key Concepts

Debrief: A process used to analyze a sequence of and outcomes of an event, after an event has happened

Student Objectives

Identify and apply effective strategies to use before, during, and after taking an exam.

- Students develop strategies for preparing for exams, taking exams, and reviewing performance.

Resources and Preparation

Materials and Technology Required

- Answer key for the midterm exams
- Students' individual Scantron sheets.
- Sample of A-grade essays or list of key concepts expected of high-scoring essays

1. **Background information**
   - Familiarize yourself with different types of debrief activities typical in various career paths.
     - One article that provides a good overview of a widely used process is "The U.S. Army's after action reviews: Seizing the chance to learn," in David A. Garvin's *Learning in Action: A Guide to Putting the Learning Organization to Work* (Boston: Harvard Business School Press, 2003).
2. **Entry logistics**
   - Select some relevant quotes and affirmations that students will see when they enter the classroom to help get them into a good state of mind for reflection.
   - Prepare the student attendance sheet.
3. **Make copies of the following materials for students:**
   - Sample of A-grade essays or list of key criteria for high-scoring essays.
   - Appendix 18-A: After Action Report (optional)
   - Appendix 18-C: Exam Debrief Report
   - Appendix 18-D: Goal Modification Review
   - Appendix 18-E: Revising Your Distributed Study Schedule
4. **Activity 1: Design a review process**
   - Prepare to guide students in collaboratively building an exam debriefing process.
5. **Activity 2: Apply your review process**
   - Review the test, identify common errors, and identify any specific pieces of feedback you want to make sure individual students have as part of their debrief.
6. **For the next class period**
   - In Lesson 19, students will be introduced to the group presentation project, will establish group work norms, and will apply those norms as they begin planning for the project. Decide how you will determine or assign the group presentation topics.

Instructional Plan

Preliminaries

(5 minutes)

- Students should sit in groups of three for the start of the lesson. During Activity 2, they will work independently.
- Students should bring their completed self-reflection (assigned during Lesson 16) with them to class. They can use this reflection as they complete their analysis during Activity 2.
- Set the tone for the day:
  - In math and many other subjects like science or technology, material builds on itself, and uncorrected mistakes or misunderstandings can compound mistakes made later on.
  - Reflection is not about "what I did wrong." Reflection is about identifying specific areas for improvement so you can focus on controllable behaviors—e.g., "I can work on this with my study group, the course instructor, teaching assistant, math tutor, etc."
  - This work builds on previous course concepts involving reflection—learning from past experiences and self-regulated learning (planning, implementing, monitoring, and evaluating).

Activity 1: Design a review process

(35 minutes)

Objectives

Students

- Collaboratively construct a process for debriefing an event.
- Identify questions to consider when debriefing an exam.

Note: In this activity, students collaboratively design a debriefing process. In Activity 2, students will apply the process to debrief their midterm exam. The goal for the debrief is to identify what they will continue to do or what they will change in order to get their desired result. Students should be taking notes throughout this activity so that they will have the information they need to implement the process during the next activity.

1. **Have students consider the following as they create an exam debriefing process (one item at a time). See the Guide for Eliciting Students' Identification Of Exam Performance Reflection Questions (Appendix 18-B) for additional support.**
   - Identify some general steps necessary to debrief an event. Consider debriefing processes you may use in your career field or have heard about in other fields.

  - Some examples of processes students may find interesting to think about for this portion of the activity include:
    - Sport team: game debriefs and film reviews
    - Medical field: M&M (morbidity and mortality) conferences
    - Election campaign debriefs
    - National Transportation Safety Board: accident inquiry
    - NASA: postmortem analyses of equipment failures
- What questions and/or analyses are important to consider when analyzing an event? Have students brainstorm as many questions as they can in in their groups.
  - As you circulate, look for students to identify the following questions: What was my desired result? What did I think was going to happen? Why? What actually happened? Why? What does this mean for the next time?
- In the trio group: With respect to debriefing an exam, what information do you need to analyze in order to learn from the experience?
  - As you circulate, look for students to identify the following pieces of information: The strategies they used to prepare for the exam and to take the exam and how their exam responses compare with those that earn full credit.
- In the trio group: Help students address the question "Why did this happen?" by asking, "What are some of the reasons we lose points on exams? What are some reasons we earn full credit on questions?"

Facilitation note: it is important that students make this list as comprehensive as possible. Appendix 18-B is provided to help you help students identify these kinds of questions and outcomes more deeply.

- As a class, build a visual that represents the process.
  - Students can record the results of their brainstorming and analysis items in on paper and hang the paper on the wall; the groups will build a more complete process as a whole class. You can also have two or three trio groups work together to build a visual if you feel your class size inhibits having the whole class build the visual representation.
  - You will want to hold onto a copy of the visual representation the class builds. After the final exam, students will engage in an activity designed to have them revise the review process and apply it a second time. That lesson (Lesson 29) references the process constructed here.
- ***If appropriate*:** Have students compare their brainstormed process with an established practice.
  - You could have students review the USDA Forest Service After Action Review Guide (available for download at www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb5394559.pdf), or you can distribute Appendix 18-A: After Action Review. In their original trio group, have students analyze the similarities and differences between the process they created and

the After Action Review (AAR). Then, have students update their process, making changes they feel are necessary after reading through the AAR.

Facilitation note: If you feel the review process students have created is complete, this step can be omitted. The AAR could be used as a resource for students who miss class on the debrief day and need to independently debrief the exam.

2. **Transition to the next activity**:
    - Tell students that they will continue to refine the process as they learn more about how it works for them. To understand the effectiveness of a process, they must apply it. The next activity has students using the process and questions they developed to review their midterm exam.

Activity 2: Apply your review process

(25–30 minutes)

Objectives

Students

- Analyze their test performance.
- Identify trends they observe in their performance.
- Set intentions to guide future actions—continuing to do what has worked well and modifying strategies that have not contributed to the desired outcome.

1. **Hand back student midterms**.
    - Make sure to have copies of the correct answers and any grading rubrics available for students to reference. Have samples of A-grade student essays or a list of key concepts expected of high-scoring essays available.
2. **Model using the *why* questions identified in Activity 1 with a question or issue you saw consistently across the class set of midterm exams**.
    - Balance out the feedback by including at least one positive thing you noted and one correction you would like students to make.
3. **Students apply process to reviewing midterm**.
    - Direct students to record their steps and their thoughts as they apply the process. You can collect these notes at the end of the activity and review them to ensure application and reflection. You can also provide feedback on areas where you think students need to dig in more deeply with their analysis.
    - Remind students to use their completed self-reflection that they brought to class (assigned in Lesson 16) to help identify some of the preparation that may have influenced their performance.
4. **Distribute Appendix 18-C: Exam Debrief Report**
    - Instruct students to summarize their findings on the one-page report.

5. **Collect the midterm exam, any related answer keys you distributed, students' self-reflections, their notes about applying the debrief process, and their completed Exam Debrief Report.**
    - Hold on to the Exam Debrief Report; you can hand back the form to each student later in the semester when they are preparing for their final exam. At that point, you can use it to remind students what they intended to do differently and to check who is making those changes.

Wrap-Up

(5 minutes)

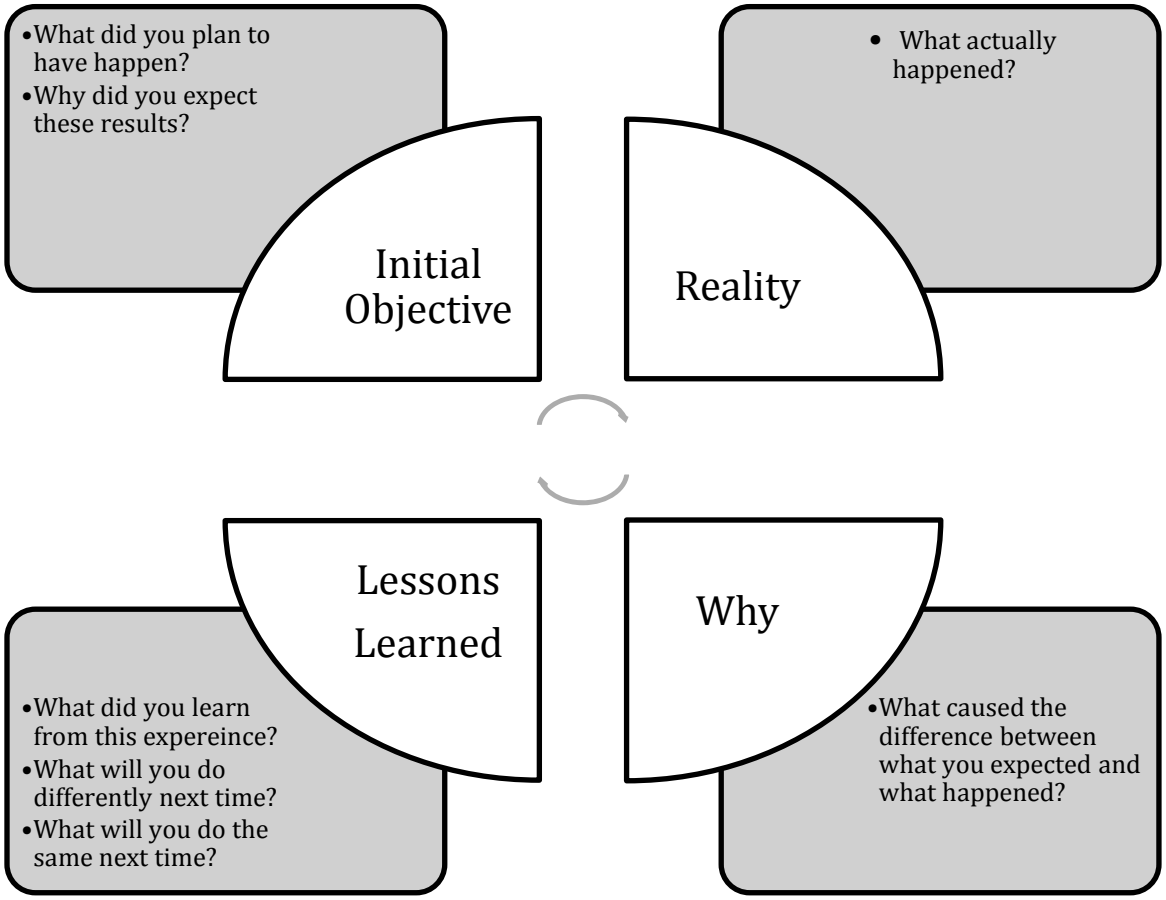
Assign the following:

- Connect the exam reflection to a semester-long process by having students choose one of the following activities to complete. Whichever they choose, they will use information identified during these reflections and apply it to a process that has been operating in the background throughout the term.
    - Goal modification review (Appendix 18-D)
    - Revision of distributed schedule (Appendix 18-E)
- Due: Beginning of Lesson 20.

Preview the next lesson:

- In the next lesson, students will be introduced to the group presentation topic and will discuss and apply quality group-work norms. Students should bring their Bloom's Taxonomy notes and the graphic organizer from Lesson 14.

Appendix 18-A: The After Action Review



The focus of an after action review (AAR) is not on *why* but on *what*. It is not about whether you were successful or you failed; it is about learning what to do next time to get closer to the desired result. The AAR focuses on learning from experience to improve your performance over time.

The process begins by asking what you expected to happen and comparing your expectation to what actually happened rather than jumping directly to focusing on why you didn't do better. The AAR recognizes that to improve performance, you have to begin with a goal.

Analyzing the outcome using an AAR requires thinking about these questions:

- What was supposed to happen? (initial objective)
- What actually happened? (reality)
- What caused the difference? (why)
- What will you do differently next time? (lessons learned)

Examples of how the process might unfold

Steven

Steven left his statistics exam confident that he had earned a score of 90% or higher. He thought he had applied all the right strategies: He studied all the material, completed practice tests, and reviewed all the notes about how to take tests effectively.

When Steven got his test back, he saw that he earned a score of 75%. He was disappointed, but he wanted to learn from his performance.

He reviewed the answers and discovered that he had made a number of careless mistakes:

- He filled in the wrong part of the Scantron sheet on a number of questions so that his answers were for the wrong questions.
- He misread question stem sentences and thus responded to a different question than the one that was asked.
- He puzzled over some of the questions for a long time, causing him to run out of time and not answer several questions.

Based on the themes he identified, Steven concludes that:

- He was pretty comfortable with his content knowledge; he didn't lose points because he didn't understand the content. *Next time*, he will continue to complete practice tests and review notes.
- He needs to better manage his time while testing. *Next time*, he will slow down and read each question carefully to ensure he knows exactly what the question is asking. *Next time*, he will stop at the bottom of every Scantron column to make sure he has filled in the correct portion of the form. And *next time*, he will leave questions he is unsure about to the end, carving out sufficient time to give them more thought.

Eleanore

Eleanore left her psychology exam believing she had answered only two of the six essay questions correctly. She had set aside only enough time to study half of the material in her notes, and she wasn't sure if the test covered all or part of the content in her notes.

When she got the test back, she saw that she earned a score of 90%. She couldn't believe her eyes; she was sure there was a mistake and she wanted to figure out what the instructor had graded incorrectly.

She went through the answers and her instructor's comments and discovered the following:

- The only points she lost were because she used incorrect terminology in her responses; she had the overarching ideas correct.
- Even though she hadn't studied all of the material in great detail, she had studied the most important parts.
- She changed one sentence just before it was time to hand in her paper, but her original response was correct.

Based on the themes she identified, Eleanore concludes that:

- Her time management strategies need refocusing; *next time*, she needs to revise her study schedule to give herself time to study all of the material in her notes.

- Her instructor is more concerned with assessing students' understanding of the underlying content than on their ability to reproduce the exact definitions introduced in class. *Next time*, Eleanore will continue to learn the content as she had been doing, but will pay a little more attention to applying the correct terms on the test.

- She needs to trust her gut. Next time, she will take an extra pause before changing her answer at the end of a test and only change it if she is 100% confident that the new answer is correct.

The graphic in this appendix is inspired by the "Steps for Conducting the AAR" graphic from www.nwlink.com/~donclark/leader/leadaar.html.

Appendix 18-B: Instructors' Guide for Eliciting Students' Identification of Exam Performance Reflection Questions

The following questions are examples of what students should identify to help them dig deeper into *why* they earned full credit or lost points on exam questions. These questions are provided to help you prepare for eliciting this thinking from your students during Activity 1.

Did you study the information covered in this question?

If yes:

- What resources and strategies did you use to identify that this information was important?
- How can you continue to use this information in the future?

If no:

- How can you be more proactive in discovering what content will be covered on the test?
- What resources and strategies can you use to identify the information likely to be covered on the exam (e.g., course syllabus, classmates, tutors, instructor)?

Did you study the information covered on the test but still get the question wrong?

If yes:

- What kind of strategies did you use to learn this information? Were you relying on short-term memory devices or did you work to move the information into long-term memory by using organization and elaboration strategies?
- What kind of self-assessment can you apply as you are studying to make sure you are understanding *and* remembering the information?

If no:

- Were you 100% confident in your response when you marked it?
- Was this an easy problem for you or was it challenging?
- Did your expectation about how deeply you would need to know this content match the depth called for by this question?

Did you do poorly on one type of question (multiple choice, essay, problem solving)?

If yes:

- What type of question did you struggle with?
- How did you study for this specific type of question?
- How can using Bloom's Taxonomy help you prepare for this type of question in the future?

If no:

- What strategies did you use for each type?
- How did your strategies differ?

Did you follow directions?

If yes:

- What guidewords and key terms in the directions turned out to be most helpful?

If no:

- Did you read the directions?
- Was something in the directions unclear?
- What guidewords and key terms would have been helpful?
- What process could you use while testing to make sure you are following directions?

Did you lose points because you just did not answer a question?

If yes:

- Did you run out of time? What elements of the exam situation led to your running out of time? How might you better plan your time management on future tests?
- Did you overlook the question or the specific part of the question you didn't answer?

If no:

- How did you allocate your time across the questions? Is there anything you would tweak about this time allocation going forward?
- Did you almost miss answering any part of this question? How did you catch yourself? What can you do in the future to make sure you answer all of parts of the question?

Did you know the material but make careless mistakes (such as calculation errors)?

If yes:

- Were you rushing?
- Did you stop to carefully consider what the question was asking?
- Did you double check your answers and proofread carefully before submitting your test?

If no:

- Were there any close calls?
- How did you avoid making careless errors?

Did you panic and become too stressed to answer any of the questions, even those for which you knew the answer?

If yes:

- What caused you to panic?
- Was it something you could control in the moment?
- What can you do in the future to address whatever triggered the panic?

If no:

- Why do you feel you did not panic?
- Do you feel that this not panicking is something stable—that is, is it something that you will be able to do again in the future?

Appendix 18-C: Exam Debrief Report

In addition to turning in your notes on applying the debrief process that you developed in class, use the space below to identify the trends your analysis surfaced and to write intention statements to guide your future behavior in light of these trends.

What trends did you find? (*e.g., I found that I did well on questions in the following categories; I found I spent too much time on questions I was unsure of; I found that I did not write with the level of detail my instructor expected of me.*)

Write three to five positive intention statements that reflect concrete strategies based on your findings. (*e.g., I will take two minutes at the start of the exam to review the test in its entirety in order to make good use of my time.*)
1
2
3
4
5

Appendix 18-D: Goal Modification Review

Goals are works in progress and should be reviewed regularly and modified based on new information. Many new pieces of information were gathered during Lesson 18—feedback on performance, score on an assessment, and analysis of strategies that have worked and strategies that haven't fostered the outcome you want. Setting intentions for what you will do in the future is one practical way to make sure you use what you have learned. But those changes may also affect the goals you have for yourself. It is important to revisit your goals and modify them. Updating your goals is both a normal and a necessary way to accommodate new learning.

Refer to your Nine Boxes activity and respond to the following questions:

- What progress have you made toward your goals since you completed the Nine Boxes activity?
- What modifications have you needed to make to your goals as the semester progressed? Why?
- What resources did you use to help make progress toward achieving your goals?
- How have you met your goals for the mathematics course since the beginning of the semester? How have you changed your goals for the mathematics course since the beginning of the semester? Why have you made these changes?
- In what way(s) will you modify your goals for this course based on the results of the midterm exam? What resources will you need to tap into in order to achieve these goals?

Appendix 18-E: Revising Your Distributed Study Schedule

Earlier in the semester, you set up a distributed study schedule. You have had time to put that study plan into action and have recently reflected on how the semester has been going for you (both in the self-reflection assignment and in the exam debrief). It is time to reflect on how effective the study schedule has been and to make adjustments. Ongoing adjustments are a natural, necessary part of this process, especially since we are constantly learning more about ourselves, becoming more skilled at using certain strategies, and adjusting to the constant fluctuation in life's time pressures.

Consider the following questions as you revise your schedule. You do not need to write out responses to these questions; use the blank space around the questions to jot notes that you can use when actually revising your calendar.

- Am I attending to the important things in school and in my life?

- Have I made enough time to attend to personal and social needs?

- Have I been setting aside enough time to complete my work? If I set aside too much or too little time, what information was I basing this estimate on? How can I improve my estimation going forward?

- Have I used procrastination self-deceptions to put off doing important work? What deceptions have I been susceptible to? What changes do I need to make going forward so this doesn't happen again?

- Do I need to plan time to seek additional help? What resource should I be reaching out to (instructor, tutor, fellow students)?

- Have I included all activities on my schedule? Have any of the activities I was part of at the beginning of the semester changed?

- What assignments are on the horizon? Knowing what I know about using strategies (e.g., reading before class, taking notes in class, reviewing and revising notes after class, completing practice problems), have I included enough time to do these tasks? Have I clearly marked this time on my calendar so I know what to do when I sit down to study?

(flip page over to see the deliverables for this assignment)

Deliverables

1. Revise your study schedule. Bring a copy of the revised schedule to class with you on the day assigned by your instructor.

2. Answer the following questions:

   a. What changes did you make? Why did you make these changes?

   b. What have you identified as your ideal study space? (Consider location, resources, and personal preferences when responding to this question).

   c. What will be the biggest challenge to sticking with this schedule?

   d. How do you plan on addressing that challenge?

Lesson 19 Update
Working in Groups

Activity 1: Introducing the group presentation assignment
Activity 2: Working in groups

Faculty voices: Activity implementation

- "What was most beneficial was going through the presentation guidelines [Activity 1], page by page, checking for understanding, and checking in on a weekly basis. I continued to reiterate that they had their individual deliverables but would still be graded on their contribution to the group. Because this project involved interaction with the group outside of class, Activity 2 was extremely relevant. It afforded them the opportunity to value the contributions each brought to the group and work through group dynamics to maximize their outcomes."

Lesson 19
Working in Groups

Overview

Community building has been a strong focus of this course. Many students may have already formed study groups, but they may not know how best to benefit from them.

This lesson introduces students to the group presentation project in order to motivate a discussion about quality group work norms.

Students then apply their group work norms as they engage in initial discussion and inquiry about the group presentation topic.

Week: 10 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials: Appendix 19-A

Student Objectives

Develop a process for replacing negative, self-defeating habits with positive habits.

- Students identify habits and beliefs that have interfered with their success and learn to apply metacognitive awareness to plan, monitor, evaluate, and reflect on their learning and to seek and use feedback to improve performance.

Describe how to store and retrieve information from memory.

- Students investigate factors that influence memory as well as specific information-processing and organizing strategies.

Demonstrate effective reading and note-taking strategies that enhance retention and comprehension.

- Students learn and apply strategies for identifying key concepts in lectures and readings, organizing class notes, and increasing reading comprehension.

Resources and Preparation

1. **Background information**
   - Review the group presentation guidelines.
2. **Entry logistics**
   - Have the student attendance sheet prepared for the day.

Materials and Technology Required

None.

3. **Make copies of the following materials for students:**
    - Appendix 19-A: Getting the most out of groups
4. **Activity 1: Introducing the group presentation assignment**
    - Familiarize yourself with the group presentation assignment. Decide how you will assign topics to groups or how you will facilitate their selection of topics.
5. **Activity 2: Working in groups**
    - Brainstorm challenges and activities students may encounter when working in groups. Decide whether there is a specific way you want to organize the discussion as students respond.
6. **Activity 3: Group presentation work**
    - Create a sample list of questions you can share with students (if necessary) to help them identify questions of their own that they would like to answer as part of the group project.
7. **For the next class period:**
    - Confirm with the library representative that he or she will cofacilitate the two lessons supporting students' research for their group presentation projects. Share and co-plan Lessons 20 and 21.

Instructional Plan

Preliminaries

(5 minutes)

- Have students sit with their success teams.
- Collect the homework assignment from Lesson 18 (if you taught that lesson before this one).

Activity 1: Introducing the group presentation assignment

(20 minutes)

Objectives

Students

- Learn about the requirements for the group presentation assignment.

1. **Students gather in their success teams**.
2. **Distribute or have students locate the Group Presentation Instructions.**

3. **Present group project information**:
    - Toward the end of the course, each success team will have the opportunity to teach their peers. Remind students that one of the best ways to test one's knowledge of a concept is to try to teach it to someone else.
    - Benefits of these graded presentations:
        - Opportunity to work effectively as a team.
        - "Deep diving" on a topic that interests them.
        - Opportunity to learn how to give effective presentations. (A guest speaker will be coming a few weeks beforehand to show them how to organize their ideas, use visual aids like PowerPoint, engage their audience, etc.)
        - Students will work (in a future lesson) with the rubrics that set out the expectations they must meet in order to earn a certain grade. Students have previously worked with rubrics for other assignments, but the future lesson will be a more in depth study focused specifically on this assignment.
            - Outline the components of the assignment.
            - Assure students that in the coming weeks they will be given everything they need to prepare for this assignment. Whether they succeed will depend on their level of commitment and effort.
4. **Facilitate a discussion in which: groups decide on a topic that interests them, you provide them with topics from which to choose, or you assign them specific topics.**
    - The Group Presentation Instructions contains guidance for how you can help groups decide on a topic.
    - Students will work (in a future lesson) with the rubrics that set out the expectations they must meet in order to earn a certain grade. Students have previously worked with rubrics for other assignments, but the future lesson will be a more in depth study focused specifically
5. **Ask what questions students have at this point. Emphasize how they will be supported to earn the highest possible grade on this activity:**
    - In a future lesson, a guest speaker will model and discuss effective communication skills and outline everything they need to make A-grade presentations.
    - They will visit the library to learn about the resources available to them there. There will be time during that lesson to begin doing research and learning how to compile the annotated bibliography part of the assignment.
    - They will also receive the rubric, or list of expectations, so they know what to aim for in order to get the highest grade on this activity.
    - They will have additional time in class to work on their presentations as a team.

Activity 2: Working in groups

(25 minutes)

Objectives

Students

- Discuss the features of quality group work and of challenging group work.
- Identify strategies for overcoming group work challenges.

1. **Group discussion: Why be part of a group?**
    - Ask students to share their experiences of being part of a group, either currently or in the past. Ask them to generate criteria for quality group work and also a list of challenges that may arise during group work.
        - Students may go right to listing advantages and disadvantages of being in study groups. Steer the conversation to include all kinds of groups—families, coworkers, volunteer organizations, sport teams, etc. The information in this activity applies to all of these types of interactions, with specific application to study groups (which will be highlighted in Activity 3).
    - Record what students report are the criteria for quality group work and the challenges of working in groups. Possible responses may include the following:
        - Criteria for quality group work
            - Group members feel part of a community.
            - All members are accountable to others, not just themselves.
            - Members apply good listening skills.
            - Workload is shared according to strengths.
            - Concerns and challenges are shared and addressed.
            - Group members encourage and challenge one another to ensure that all group members understand concepts being studied.
            - The group establishes clear goals and timelines.
        - Challenges
            - Finding time to meet as a group.
            - Fear of not being as smart as other students.
            - Lack of connection to other students.
            - Everyone not pulling their weight ("I end up doing all the work myself at the last minute").
            - One person taking over so not everyone gets a chance to lead the group.

- Class discussion: How can we handle some of these challenges? For every group work challenge, there should be a corresponding criterion that, when present, would address that challenge. For example:
  - The challenge of finding time to meet as a group can be addressed by amending the final criterion to include "clear goals, meeting times, and timelines." This does not mean that the criteria need to include 50 items; rather, it may make more sense to collapse several criteria into a broader category such as "Shared goals and accountability."
  - Most importantly, set and commit to good group norms and revisit/revise as needed. For example, at the beginning of a group meeting, members can review the list of norms and identify which norms are in place and which need additional attention.
- Distribute Appendix 19-A: Getting the Most Out of Groups. Initiate a class discussion: What are additional group norms or structures? Use study groups as your example.
  - Identify clear reasons that your group exists.
    - Gathering to study for exam, to stay current on the material, for a semester-long presentation or project?
    - Be as specific as possible. This will help the group stay on track as time goes on. This clarity also helps the group to identify who needs to be a member.
  - Identify group members.
    - Do they need to be here?
    - Have no more than five or six people in your group. Coordinating schedules becomes much more challenging with more people, and each group member needs to have enough work to stay engaged.
  - Clarify expectations and roles of group members.
    - How does work get divvied up?
    - How much time should each member contribute to the group? Each week? Over the whole project?
    - How will meetings be run? What amount of preparation should be completed before meetings?
    - How will you communicate with each other? How often? When?
    - What will it look like to give, receive, and act on constructive feedback in this group?
    - Who contributes what? Roles to consider filling include organizer, note taker, timekeeper, devil's advocate. Perhaps rotate these roles so everyone has an opportunity to take a lead role.

- Schedule meetings—time and location.
  - If the time is not blocked out for meetings, other events will get scheduled. It is easier to cancel a meeting when there is nothing new to discuss than it is to schedule one at the last minute.
- Plan realistic agendas.
  - Set specific outcomes to be accomplished each time you meet. Set an agenda!
  - Allot a small amount of time for whining—all groups will do it, so it is better to plan to have some downtime than to struggle to get to everything on your agenda because you didn't plan ahead.
- Set clear deliverables and deadlines.
  - At the end of the meeting, recap what you accomplished or decided and what the next steps are.
  - Set specific action items. Make sure every team member knows what his or her assignments and deadlines are.
- Evaluate productiveness.
  - Check in on the progress your group is making toward its overall goals.
  - If something is not working, identify why and take action to correct it quickly. Making changes is normal and is a much better alternative than letting the group continue to be unproductive and ultimately not accomplish its goals.

Working in groups can be extremely beneficial to our motivation and overall learning; going into group work with a plan for organizing the group can substantially improve the likelihood of positive experiences and productive outcomes.

Activity 3: Group presentation work

(20 minutes)

Objectives

Students

- Apply group work norms as they begin planning for the group presentations.
- Generate questions they want to answer in their research for the group presentation project.

1. **Announce purpose of activity.**
    - Now that some general group guidelines have been discussed, let's look in detail at one activity that study group members can conduct to support deep processing of the course material.
    - Make connections to shallow and deep learning as well as thinking at higher Bloom's Taxonomy levels (from earlier lessons).
        - Getting to this higher level of thinking can be challenging to do individually; working together, students can identify holes in their knowledge and encourage each other to go deeper with the information.
    - Students have been exposed to this type of questioning activity in the *Foundations for Mathematical Reasoning* course. The goal today is to help students connect the elements of this study activity to the relevant content already covered in this course, as well as to provide time to practice building the questioning skill.
2. **Prompt: What study strategies or course topics studied so far involve questioning?**
    - Responses might include the following:
        - The SQ4R method (converting headings and subheadings into questions).
        - Flash cards (questions on one side, answers on the other).
        - Producing sample test questions.
        - Bloom's Taxonomy (questions at higher levels of thinking).
    - Emphasize that:
        - This activity is an extension of all that they have learned about questioning before.
        - Elaborating on content is important since it helps us process content into our long-term memory.
        - Connecting what we already know to new information is important as well.
        - Verbalizing our thought processes (think-aloud protocols) helps us find the right words—hearing ourselves talk about the material helps us find the right words, makes our thinking concrete instead of abstract, and can help us identify holes in our understanding.

- Sometimes it's hard to know the right questions to ask when working on course material.
- It is also hard to keep pushing to deeper understanding when we think we have learned the material.
- The following technique addresses these issues, especially the last two.

3. **Generate questions about the group presentation topics**.
    - Ask students to quickly review the group norms before beginning this task, reminding them specifically about shared goals and accountability and ensuring that all group members have a voice as they apply questioning strategies to their initial group presentation planning.
    - Have students work with the team to generate as many questions as they can about the topic they will study. At this point, they should not criticize any questions; simply record them. Students may find it helpful to use the Bloom's Taxonomy Graphic Organizer (from Lesson 14: Critical Thinking Strategies and Questions) for this task.
    - Let students know that, during the next two lessons, they will go to the library to begin conducting the research related to their assigned topic, so it is important that they use this time to determine what questions can be investigated at that time.
    - Then have students identify the top 3–4 questions that will most help them design the research of their chosen or assigned topic. Each student needs to have a specific question he or she will investigate on behalf of his or her success team.
    - Circulate among the groups to redirect students toward questions that can be explored in tomorrow's library visit. They will need to find specific peer-reviewed research supporting the conclusions they ultimately present, so they need to identify or generate questions that are likely to yield results.

Wrap-Up

(5 minutes)

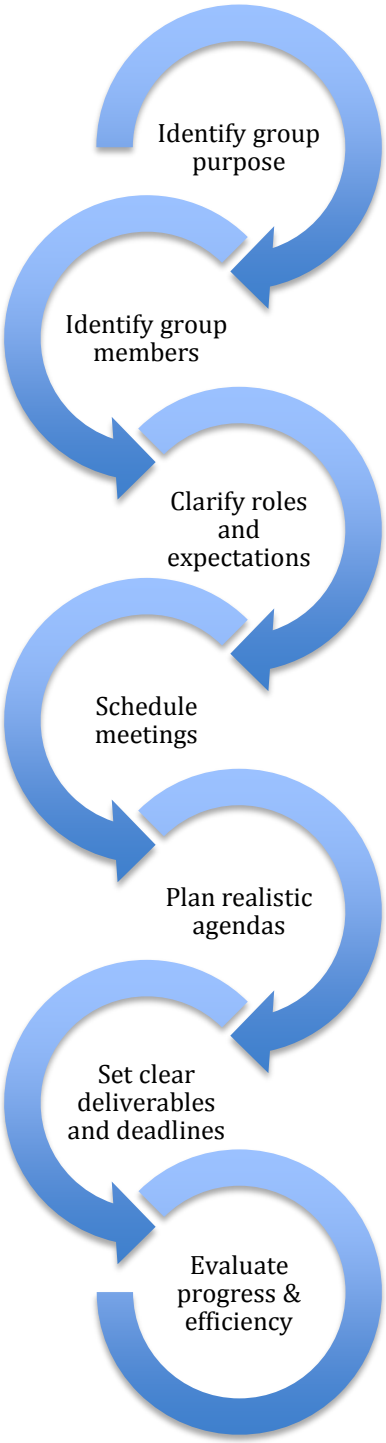
Assign the following:

- Students should identify the web addresses of at least two sources related to the group's presentation topic.

Preview the next lesson:

- Let students know that the next two lessons will be conducted in the library.

Appendix 19-A: Getting the Most Out of Groups



Lesson 20 Update
Site Visit: Library Resources

Update note

See ***Frameworks Course Essentials***[1] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

[1] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Lesson 20
Site Visit: Library Resources

Overview

Earlier in the semester, students were exposed to the importance of connecting to and leveraging various campus resources. In Lesson 2, they took part in a Scavenger Hunt, which took them to the library. In this site visit, students will have the opportunity to visit with one or more of the library staff.

During this visit, students will learn more about library services and how to access both online and offline resources. They will also have the opportunity to start working on an assignment linked to their upcoming in-class presentations.

Week: 10 of 15
No. of Lessons: 2 of 2
Lesson Length: 75 minutes
No. of Activities: 2
Supplementary Materials: Appendices 20-A and 20-B

This lesson gives students the opportunity to familiarize themselves with the academic literature on their selected presentation topic and become active, critical readers. This assignment also embeds their learning from the lesson on critical thinking and Bloom's Taxonomy, with respect to the annotated bibliographies each student must produce.

Lessons 20 and 21 are intended to be co-planned by the course instructor and a campus librarian, with the lesson activities led by the librarian in the library. It is important to co-plan this lesson to ensure that it is aligned with the course objectives and group presentation requirements, and that it is as engaging and hands-on as possible. Instructors can provide support during the lessons by circulating and working with individual students and teams as the need arises. If the librarian is unable to work with students during Lesson 21, the co-planning will ensure the instructor has the information necessary to facilitate that lesson as well.

Key Concepts

Online periodical databases: Digital libraries containing published materials. Databases commonly used are EBSCO's Academic Search Complete (for academic material across disciplines, including access to the Cumulative Index to Nursing and Allied Heath Literature) and ERIC (education-based research).

Search strategies: Processes to identify the most relevant, complete information on a given topic. Specific strategies addressed include advanced search, Boolean operators, keywords, alternative terms, and wildcard/truncation.

Scholarly/academic/peer reviewed article: Written reports of original scholarship conducted by experts and, in the case of peer review, also vetted by other experts to ensure legitimacy of the information.

Credible references: A reliable source of information. To assess reliability, consider how complete and up-to-date the information is, and think about the author's authority and potential biases.

Information literacy: According to the National Forum on Information Literacy, it is the ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand. See more at: http://infolit.org/about-the-nfil/what-is-the-nfil/#sthash.Xn7NqyNH.dpuf.

Student Objectives

Locate and use support center services.

- Students identify and take advantage of support services on campus, including academic advising, career counseling, financial aid services, libraries, disability services, and tutoring services.

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Use technology throughout the course.

- Students use college email to communicate, software to complete assignments, and a technology platform (such as Blackboard) to submit assignments.

Resources and Preparation

1. **Background information**
   - Depending on librarian availability, this lesson may need to be presented out of order. If this is the case, be sure to review the surrounding lessons to make sure students have appropriate background information at the start of this class.
   - Students will be working on group presentations; therefore, they need to have familiarity with the assignment prior to the start of this lesson.
2. **Entry logistics**
   - Determine how you will take attendance in the library. The librarian may want a copy of the roster to ensure that the entire class participates via interactive exercises.

Materials and Technology Required

- Confirm in advance the time and location for the class to meet.
- Coordinate planning of the session with the library staff who will be part of instruction for this lesson.

3. **Make copies of the following materials for students:**
    - Any handouts you and the librarian have planned to distribute.
4. **Activity 1: Be careful who you listen to!**
    - Conduct the activity on yourself and identify questions you will use to help students evaluate the legitimacy of webpages visited throughout the activity.
5. **Activity 2: Using library resources**
    - Share the lesson plans for this lesson and the next with the librarian facilitating this presentation. Co-plan the lesson so that it includes opportunities to engage students in the processes they are learning and connects well with the group presentation project.
    - Provide the outline of topics to cover (Appendix 20-A) and brief the librarian on the group project guidelines. Confirm that he or she is prepared for the self-introduction. Additional resources you can use while co-planning this lesson are included in Appendix 20-B.
6. **Activity 3: Success team work on group presentation**
    - Students should have a few minutes at the end of class to work on identifying research for the group presentation.
7. **For the next class period**
    - The next lesson focuses on proper citations, plagiarism, and annotated bibliographies. Co-plan the next lesson with the librarian so that it includes opportunities to engage students in the processes they are learning.

Instructional Plan

Preliminaries

(5 minutes)

- Ideally, each student should have a computer to use during class. The instructor should have a computer connected to a projection device so everyone can follow along throughout the lesson.
- If possible, have students sit near their success team members.

Activity 1: Be careful who you listen to!

(15 minutes)

Objectives

Students

- Evaluate sources (content relating to/supporting information needs, credibility, bias, distinction between free sites found via search engine and scholarly articles found via library databases).

Note: Launch this activity before turning the class over to the librarian. This activity includes references and discussions of a sensitive nature. Consider the diversity of student needs in your particular classroom and plan for the discussion accordingly.

1. **Invite a student to look up Martin Luther King, Jr. as they would if they were at home.**
    - Safely assume they will use a search engine such as Bing or Google to do this.
    - Note the number of results and sites that appear. Invite comments/opinions regarding the order of the results. Ask what link they would choose and why (selection process).
        - The search for MLK, Jr. nets millions of results. Most people are not aware of how search engines retrieve and sort information. As a result, people typically make their selections from among the first two pages of results.
2. **Have the student navigate to www.martinlutherking.org.**
    - It will be listed on the first page of results. If students have not done so already, solicit feedback about why this site might be an appropriate reference to include in an academic research paper.
    - Explore the content found on the site with the whole class. Again ask if this information would be useful to include in college research.
    - Ask how they would evaluate the site (e.g., bias, opinions, false information).
    - Ask the student to click on webmaster link and talk about what appears.
        - The site appears to be legitimate and targeted toward students, but it is actually operated by www.stormfront.org, "a community of White Nationalists."
        - Ask students what this revelation means. Have them discuss the implications on the accuracy and completeness of the information. Highlight the point that true academic research is not conducted over a standard search engine.
3. **Navigate back to the Martin Luther King, Jr. search page and then to the Wikipedia entry for MLK, Jr.**

4. **Pose the same question to students: Would this site be an appropriate reference to include in an academic research paper?**
    - How would you evaluate the site (e.g., bias, opinions, false information)?
    - Solicit students' experiences using Wikipedia pages and their opinions about the credibility of information.
    - Clarify for students how Wikipedia pages are developed, and ask students to quickly discuss the possible pitfalls of that process.
    - Have students navigate to Wikipedia's risk disclaimer, http://en.wikipedia.org/wiki/Wikipedia:Risk_disclaimer.
    - Point out that these pages are considered inadequate for academic research; however, to the extent that they cite academic research, they may provide a starting point for further exploration and topics to discuss with a librarian.

    When engaged in academic research, we need to be purposeful in evaluating the content we find online. Just because it is presented early in the results does not deem the information more relevant or authoritative/factual. There are biases in much of what is posted on the internet, so we have to work to identify the credible sources.

    ---

5. **Share the value of today's lesson**.
    - Let students know that today's visit to the library will provide useful tools and information to assist them in the process of finding credible resources that are appropriate for an academic research project.
    - A key outcome of this course is students knowing what services are available, when to seek help, and which questions to ask. By the end of class, students should feel comfortable accessing library resources and will know who can help them and what kinds of questions library staff can answer.
    - Since everyone needs to locate and annotate an article that relates to their group presentation topic, today's lesson also provides an opportunity to begin the research step of that process.
    - Introduce the library representative as the expert who will help them navigate this college-level research terrain.

Activity 2: Using library resources

(40 minutes)

Objectives

Students

- Navigate the library's online resources (catalog and databases) using critical thinking skills paired with effective search strategies to access college-level research.
- Use online software that organizes and saves research and generates APA/MLA parenthetical and full citations and bibliography information.

1. **Library representative self-introduction**
    - How he or she came to be in this position
    - His or her favorite thing about the work
    - How math relates to what he or she does in the library (even at a superficial level)
2. **This lesson's presentation should include the following information. (See Appendix 20-A for more details.)**
    - Library resources
    - Research techniques and strategies
        - Finding sources
        - Evaluating sources
        - Storing research citations/information
    - Accessing resources from off campus
3. **As students are engaged in learning about and applying the research techniques and strategies, both the instructor and the library representative should provide guidance to students for how these techniques can help them to determine the specific aspects of the group presentation topic they want to investigate.**
    - In particular, students need to understand that they should research several subtopics within their overarching topic. If possible, provide time for students to search their overarching topic and determine 4–6 subtopics within it.

Activity 3: Success team work on group presentation

(10 minutes)

Objectives

Students

- Work with their success teams to identify subtopics to research and determine who will take responsibility for researching each of the subtopics.

1. **Have students get into their success teams to continue their group presentation planning**. **Let students know they will have the next 10–15 minutes to discuss the following:**
    - Identify specific subtopics within their overarching topic.
    - Determine who will be responsible for investigating each subtopic.
    - Draft an initial plan for identifying relevant research on the overarching topic and corresponding subtopic.
2. **Allow time for students to practice and apply their new skills and begin researching their agreed-upon subtopics**.

Wrap-Up

(5 minutes)

Assign the following:

- Scholarly article: Identify at least one scholarly article related to your assigned topic or the subtopic for which you are responsible.

Preview the next lesson:

- If you will meet in the library again, remind students of the location change. Also remind them to seek the assistance of the library staff, if needed, with this lesson's assignment. They can also navigate to the tutorial or help pages within the various academic databases if the library is closed.

Appendix 20-A: Topics to Be Covered During This Lesson

Library resources

- Reference librarians
  - How they can help with projects and assignments
  - What they can do and what they will not do
- Layout of the library
  - How to find books in the library
  - Interlibrary loan service

What is research?

- Research techniques and strategies
  - Finding sources
    - Using the most appropriate searching tool—databases, search engines, specialized search sites
    - Search phrases—*and*, *or*, *not*, etc.
  - Evaluating sources
    - Authority—expertise of the author and credentials of the publisher
    - Accurate information—Is the information complete?
    - Bias—Is the information stated as fact? Opinion? What is the author's intended purpose in writing?
    - Current—Is the information up to date?
    - Evidence—Are statements supported with appropriate primary and secondary data references? Can you verify those sources?

Accessing resources from off campus

Any pamphlets or other materials covering logistical issues (opening hours, email addresses for librarians dedicated to certain topics, databases, etc.)

Appendix 20-B: Possible Resources to Draw Upon While Co-Planning

Using the most appropriate searching tool and using search features:

- Have students use AutoTrader.com (www.autotrader.com/cars-for-sale) to explore the advanced search functions of a database. Start with a large population (used cars) and have students use critical thinking (automotive needs represent information needs) to narrow their results while increasing relevancy. This is a good segue into using advanced search features in a database to lower results and increase relevance by thinking critically (identifying needs prior to researching).

Demonstrating search strategies:

- Clark College's Information and Research Instruction Suite for two-year colleges (IRIS4-2) has tutorials and activities for engaging students in advanced search strategies. More information is available at http://www.clark.edu/Library/iris/find/search_strategies/search_strategies.shtml.

Evaluating credibility of information:

- Helpful tips for students looking to distinguish scholarly journals from other periodicals are available from Cornell University at http://olinuris.library.cornell.edu/ref/research/skill20.html.

Lesson 21 Update
Using Library Resources and Group Presentation Preparation

Update note

See ***Frameworks Course Essentials***[20] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Appendix 21-B: Possible resources to draw upon while co-planning

Link update

- Critical Thinker Academy's Kevin deLaplante's module on citing sources and avoiding plagiarism is no longer available at ~~www.criticalthinkeracademy.com/how-to-cite-sources-and-avoid-plagiarism.html~~; it, is, however, available with free registration at the link below:

  Kevin deLaplante. (2014). "Improve Your Essay Writing!: Learn how to write a good argumentative essay, cite sources and avoid plagiarism!" In *Critical Thinker Academy.* Retrieved June 15, 2014, from http://training.criticalthinkeracademy.com/course/improve-your-essay-writing

[20] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Lesson 21
Using Library Resources and Group Presentation Preparation

Overview

This lesson continues the library resources exploration that began in Lesson 20. In the last lesson, students investigated the basics of academic search engines and assessed the credibility of sources found on the internet. This lesson introduces students to methods for citing sources and creating an annotated bibliography.

Sharing the planning and presentation of this lesson between a librarian and the instructor is recommended. If a librarian is not available, however, good planning ahead of time will enable instructors to cover the content of this lesson.

Week: 11 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 2

Supplementary Materials: Appendices 21-A and 21-B

Key Concepts

Annotated bibliography: A short paper that includes a summary of, analysis/evaluation of, and reflection on source material (books, academic journals, other scholarly writings, etc.); helps students practice thinking critically about the material they read.

Plagiarism: Using someone else's work without credit, passing it off as one's own. Plagiarism can be intentional or unintentional.

Works Cited/ Bibliography: An organized listing of resources accessed and used during the writing of an academic work.

Citation management software: Tools for collecting, organizing, citing, and sharing research.

Student Objectives

Locate and use support center services.

- Students identify and take advantage of support services on campus, including academic advising, career counseling, financial aid services, libraries, disability services, and tutoring services.

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Use technology throughout the course.

- Students use college email to communicate, software to complete assignments, and a technology platform (such as Blackboard) to submit assignments.

Resources and Preparation

Materials and Technology Required

- Prepare handouts (if applicable) for students.
- Confirm in advance the time and location for the class to meet.
- Coordinate planning of the session with the library staff who will be part of instruction for this lesson.

1. **Background information**
   - Depending on librarian availability, this lesson may need to be presented out of order, as long as students have experienced Lesson 20 prior to this lesson.
   - If this lesson is taught out of order, be sure to review the surrounding lessons to make sure students have appropriate background information at the start of this class.
   - Students will be working on group presentations with any time that remains at the end of class.
2. **Entry logistics**
   - Determine how you will take attendance in the library. The librarian may want a copy of the roster to ensure that the entire class participates via interactive exercises.
3. **Make copies of the following materials for students:**
   - Any handouts you and the librarian have planned to distribute.
4. **Activity 1: Understanding plagiarism, citations, and supporting documentation**
   - As with Lesson 20, share the lesson plans for this lesson and the next with the library staff person facilitating this presentation. Co-plan the lesson so that it includes opportunities to engage students in the processes they are learning and connects well with the group presentation project. If you are working with a different library staff person in the lesson, provide the outline of topics covered in Lesson 20 (Appendix 20-A) and to be covered in this lesson (Appendix 21-A) and brief him or her on the group project guidelines. Confirm that he or she is prepared for his or her self-introduction.
5. **Activity 2: Individual work on group presentation**
   - Students should have 15–20 minutes at the end of class to work in their groups, explore the directives of the annotated bibliography assignment, and ask the librarian any follow-up or clarifying questions.
6. **For the next class period**
   - Confirm the guest speaker who will model effective oral communication and presentation techniques. Share the guidelines for the presentation with him or her (Appendix 22-B).

Instructional Plan

Preliminaries

(5 minutes)

- Circulate to make sure students brought a research article as assigned at the end of the previous lesson. Ascertain the quality of the research articles, but hold off providing information/instruction concerning this assignment until the last 15–20 minutes of class. At that point, you and the librarian will circulate through the lab, offering group instruction (unless a majority of the students have similar concerns, in which case review with the entire class via the overhead projector during the final activity).
- Encourage students to sit near their success team members.

Activity 1: Understanding plagiarism, citations, and supporting documentation

(40-45 minutes)

Objectives

Students

- Share their experiences/reflections/concerns concerning the previous day's homework assignment.
- Identify causes of plagiarism, the forms it can take, and how it can "accidently happen," as well as steps to take to avoid plagiarizing.
- Identify the usefulness of using a standard citation style, identify which style (MLA or APA) their instructor requires for this course, and learn how to create a parenthetical and reference citation as well as a works cited page.
- Set up a citation management account and use it to save research and generate APA/MLA parenthetical and full citations/bibliography.

Note: The course instructor launches this activity and then the library representative facilitates the bulk of the exploration and discussion. It is important to co-plan this lesson to ensure that it is aligned with the objectives for this lesson and group presentation requirements and that it is as engaging and hands-on as possible. For example, engage students in discussing their prior experiences with organizing and documenting academic research sources and have students follow along to complete the sample citations or annotations themselves.

1. **Introduction—Value of today's lesson**
    - In the last lesson, students learned appropriate strategies for identifying and assessing sources used in academic research. The next logical step is to establish strategies for organizing your research and for documenting what each individual source contributes to your overall study of a topic or subtopics.

2. **If you are working with a different library staff person, introduce the library representative.**
3. **If you are working with a different library staff person, have the library representative do a self-introduction.**
    - How he or she came to be in this position
    - Their favorite thing about the work he or she does now
    - How math relates to what he or she does in the library (even at a superficial level)
4. **The library representative's presentation should include the following information. (See Appendix 21-A for more details.)**
    - Supporting documentation
        - Proper citations
        - Plagiarism
    - Organizing your research
    - Creating an annotated bibliography
5. **The presentation should include emphasis on the following:**
    - Preliminary research should be conducted before choosing a topic/subtopic, and ongoing fine-tuning of topic/subtopics is normal and encouraged.
    - Recognize the need to seek help and use support services (e.g., a librarian) to dig deeply into research.
    - Annotating a research article helps readers process the content provided and evaluate the bias and credibility of the information presented.
6. **As students are engaged in learning about and applying the research techniques and strategies, you and the library representative should provide guidance to students for how these techniques can help them complete their group presentation.**

Activity 2: Individual work on group presentation

(20–25 minutes)

Objectives

Students

- Identify articles to use for the group presentation project.
- Practice creating an annotated citation.
- Use citation management software to manage citations.
- Annotate an academic article.

1. **Distribute copies of the group presentation assignment (if students did not bring their copies).**
2. **Provide clear instruction regarding the expectations for the annotated bibliography portion of the group assignment**.
    - Students are to find an article that relates to the topic and subtopic their group decided to present on. This was assigned for homework after the last lesson, but students may need to spend time identifying one now (if they did not do the homework) or identify a new article meeting expectations (scholarly, 5 or more pages in length, not a duplicate of what another group member found, and that is focused on their specific subtopic).
    - Students are to use the provided template to arrange the annotated bibliography (to find the information to answer paragraph 1, 2, and 3) and use citation management software for organizing their research.
3. **Support students as they begin the assignment.**
    - Help groups define specific roles/directives within the group.
    - Work with students/groups needing assistance organizing their topic/subtopics, finding articles, and annotating the articles.

Wrap-Up

(5 minutes)

1. **Assign the following:**
    - Annotated bibliography: Students should finish the annotated bibliography portion of the assignment.
    - Due date: Set an appropriate date for the group to turn in their collective annotated bibliographies.
2. **Preview the next lesson:**
    - Remind students that in the next class they will meet in the usual classroom.

Appendix 21-A: Topics to Be Covered During the Library Visit

Supporting documentation

- Proper citations—citation styles (APA, MLA), importance, elements
- Plagiarism—what it looks like, how it happens, why it is a problem, how to avoid it

Organizing your research

- What research you need based on the task at hand—Are you writing an argumentative or persuasive paper? Research paper? Exploratory paper? Book review?
- Keeping track of citations and documents—why it is important, tools and options available for storing resources online (Zotero, NoodleTools, etc.)

Annotated bibliography—why it is valuable, how to create one, what to include

Appendix 21-B: Possible Resources to Draw upon While Co-Planning

Overall

- Clark College's Information and Research Instruction Suite for two-year colleges (IRIS4-2), available at www.clark.edu/Library/iris/index.shtml.

Plagiarism

- Critical Thinker Academy's Kevin deLaplante's modules, available at www.criticalthinkeracademy.com/how-to-cite-sources-and-avoid-plagiarism.html.
- Holy Family University's Intentional and Unintentional Plagiarism Guide, available at www.holyfamily.libguides.com/content.php?pid=113060&sid=1688232. Additional information on creating parenthetical citations is available at holyfamily.libguides.com/content.php?pid=113060&sid=851653.
- The University of Southern Mississippi's interactive quiz to assess understanding of plagiarism, available at www.lib.usm.edu/legacy/plag/acceptuse1.php

Annotated bibliography

- Purdue Online Writing Lab (OWL): http://owl.english.purdue.edu/owl/resource/614/02 and http://owl.english.purdue.edu/owl/resource/614/03.
- Cornell University Olin & Uris Libraries' *How to prepare an annotated bibliography.* Prepared by Michael Engle, Amy Blumenthal, and Tony Cosgrave; available at http://olinuris.library.cornell.edu/ref/research/skill28.htm.
- Skidmore College, Lucy Scribner Library's *How to write an annotated bibliography*; available at http://lib.skidmore.edu/library/index.php/li371-annotated-bib.

Lesson 22 Update
Effective Oral Communication and Using Evaluation Rubrics

Activity 1: Comparing effective and ineffective presentations

Link update

- Tony Robbins's "Why we do what we do" is no longer available at ~~www.ted.com/talks/tony_robbins_why_we_do_what_we_do.html.~~
  His TED talk is still available at Tony Robbins. (2006, February). "Why we do what we do." *TED2006*. [length: 21:45]. Retrieved June 15, 2014, from http://www.ted.com/talks/tony_robbins_asks_why_we_do_what_we_do

Lesson 22
Effective Oral Communication and Using Evaluation Rubrics

Overview

Week: 11 of 15
No. of Lessons: 2 of 2
Lesson Length: 75 minutes
No. of Activities: 3
Supplementary Materials: Appendix 22-A

This lesson is dedicated to offering students advice, guidance, and practical tools for thinking about and preparing the presentations their success teams will make in upcoming lessons.

Because students are familiar with your presentation style, we suggest that you ask someone from another part of the college to cover Activity 3 content so they can get a different perspective. This person might be found within a center for teaching and learning, the communications department, or other faculty/instructional support offices.

This is also an opportunity for graduates of this student success course to come in and share their perspectives on the course and its impact on their academic career, and impart communication guidelines as well. Any additional handouts on developing and delivering effective and engaging presentations should be developed with the guest lecturer.

The final activity focuses on the grading rubric for the group presentation assignment. Working with the rubric, students will identify what they need to do and show in order to earn a high grade on this assignment.

Key Concepts

Rubric: A tool that clearly provides the criteria for assessing the standard of a student's or team's performance for a given assignment, exam, or project. When shared beforehand with students, a rubric provides transparency for the grading process, particularly for multifaceted, complex activities like presentations.

Student Objectives

Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.

- Students develop written and oral arguments that are insightful, purposefully organized, logically supported, audience appropriate, and effectively delivered.

Resources and Preparation

Materials and Technology Required

- Video clips for Activity 1

1. **Background information**
   - Review the group presentation assignment and prepare to guide oral communication skill development. Be sure to note connections among effective communication and previous course concepts, especially Bloom's Taxonomy.
   - Though it is not mentioned explicitly in this lesson, motivation concepts (such as confidence, effective effort, and focusing on what is within your control) are appropriate here.
2. **Entry logistics**
   - Prepare the student attendance sheet for the day.
3. **Activity 1: Comparing effective and ineffective presentations**
   - Select and cue video clips that demonstrate elements of effective and ineffective presentations.
4. **Activity 2: Using a rubric to stimulate proper planning and levels of thought**
   - Review the group presentation rubric and the associated levels of Bloom's Taxonomy.
5. **Activity 3: Guest presentation—Making effective presentations**
   - Ask the guest presenter how long he or she can spend in the class (for the entire lesson or just part of it). If he or she can be present only part of the time, confirm the location and arrival time. Clarify with the presenter the material to be covered (see Appendix 22-A) and confirm that she or he is familiar with the group presentation rubric students will be using to evaluate the presentation.
6. **For the next class period**
   - The next lesson focuses on the career-planning project and planning for next semester's courses. Gather materials or relevant website links that support students in course and career planning.

Instructional Plan

Preliminaries

(5 minutes)

- Students can sit individually, with a partner, or in success teams.
- Remind students of the due date for their annotated bibliographies.

Activity 1: Comparing effective and ineffective presentations

(20 minutes)

Objectives

Students

- Describe the characteristics of effective and ineffective presentations.
- Analyze video presentations for elements of effective and ineffective presentations.

1. **Distribute one note card to each student.**
2. **Have students brainstorm and write down characteristics of presentations.**
    - On one side, have students write characteristics of presentations they liked or from which they learned a lot.
    - On the other side, have them write characteristics of presentations they did not like or with which they were not engaged.
3. **Demonstrations of engaging and ineffective presentations**
    - As you show the video (see suggestions below), ask students to raise a hand when a characteristic they identified is demonstrated. Have them share the characteristic and explore with them why that element added to or detracted from the message of the presentation.
    - Main points to emphasize in the follow-up:
        - What engages you the most?
        - What do effective communicators do that ineffective ones don't?
        - Why are these particular characteristics important to you?
        - Few people are naturally skilled at this; like most things, becoming an effective communicator takes persistent practice.
        - What connections are there between what effective communicators do and Bloom's Taxonomy, introduced in an earlier lesson? (This idea will be revisited in Activity 2.)
    - Suggested videos include the following:
        - Videos that relate to course content (and demonstrate engaging presentations) that could be shown in small snippets. If you are going to have a student as the guest speaker today, these are good videos. If you are going to have a professional, try to find a video that shows a student giving a good, engaging presentation. Students will benefit from seeing someone like them succeeding on this task.

- Jill Blote Taylor's *Powerful stroke of insight* TED talk wherein she describes her journey from suffering a stroke to rebuilding her brain functioning. Available at www.ted.com/talks/jill_bolte_taylor_s_powerful_stroke_of_insight.html
- Tony Robbins's *Understanding why we do what we do*. Available at www.ted.com/talks/tony_robbins_why_we_do_what_we_do.html
- Steve Jobs's *Doing what you love*. Available at www.ted.com/talks/lang/en/steve_jobs_how_to_live_before_you_die.html
- Daniel Pink's *The puzzle of motivation*. Available at www.ted.com/talks/dan_pink_on_motivation.html

o Videos that demonstrate ineffective presentations or elements thereof
- Poor use of PowerPoint by stand-up comic Don McMillan. Available at www.youtube.com/watch?v=ORxFwBR4smE
- Poor use of PowerPoint rap uploaded by Doug Keeley to YouTube. Available at www.youtube.com/watch?v=_JU48-FVqvQ&feature=related

o Additional videos
- Managing when a presentation doesn't go quite as planned: *When PowerPoint attacks: Presentations gone terribly wrong*, a video of Harvard professor Tim Washer. Available at www.youtube.com/watch?NR=1&feature=endscreen&v=0leoffTxtlE

Activity 2: Using a rubric to stimulate proper planning and levels of thought

(20 minutes)

Objectives

Students

- Study and discuss the group presentation rubric.
- Analyze the rubric for levels of Bloom's Taxonomy.

1. **Have students locate the group presentation grading rubric**.
2. **Explain the function of a rubric**.
   - A rubric gives students direction about what they need to do in order to achieve the grade they want.
   - A rubric clarifies how instructors assess and grade a piece of work, such as an essay or a presentation, and ensures that instructors use the same criteria to grade everyone.

3. **Walk through rubric organization.**
    - What each level illustrates
    - What students need to do in order to produce what will be graded as Inadequate, Average, Good, or Exemplary presentations
        - Make connections back to the discussion from Activity 1—what students themselves identified as engaging and poor presentation qualities.
4. **Success teams activity—Applying Bloom's Taxonomy to the rubric.**
    - Ask students to read through the rubric in their teams and determine which level of thought (from Bloom's Taxonomy) is represented in each level (adequate, good, average, exemplary).
    - Circulate among the groups, asking what their findings were with respect to the levels of thought associated with the four levels of the rubric and redirecting them if they are not on the right track. In general, inadequate and acceptable presentations are at the lowest levels of Bloom's, good presentations are the Application level, and exemplary presentations are the Evaluation or Synthesis levels.
5. **Let students know they will test their understanding of the rubric by using it to analyze the guest presentation.**

Activity 3: Guest presentation—Making effective presentations

(25 minutes—15 minutes presentation plus 10 minutes Q&A)

Objectives

Students

- Apply the group presentation rubric as they observe a guest presenter.
- Evaluate persuasive techniques, both written and oral.

1. **Introduce the guest and outline the purpose of the presentation.**
2. **The guest makes his or her presentation** (see Appendix 22-A for ideas on content to address).
3. **Facilitate question-and-answer period** at the end of the presentation.
4. **Have students discuss, in pairs, their scoring of the presentation using the rubric.**

Wrap-Up

(5 minutes)

Preview what will be covered in the next lesson:

- The next class meeting focuses on the career project and course planning for the upcoming semester. Students should bring all documents related to their career project and any information they have about their course enrollment for next semester. Suggest

that they also bring a copy of their degree audit form. In most cases, this form should be accessible on the college website.

Success team meeting:

- Students should arrange a time for their team to meet in person or online to scope out and structure their forthcoming presentations. Remind them what they have learned about time management and that they are to produce, as a team, a one- to two-page page document with a general outline of the topics they intend to cover, the kind of presentation they are planning to make (PowerPoint, other visuals, talk only), which student will be responsible for which part of the presentation, and an initial timeline for meeting their deadline. Set a deadline for them turn this information in to you.

Appendix 22-A: Elements of Effective Presentations

This outlines what the guest speaker should cover in his or her presentation:

- Effective presentations require preparation and planning. Illustrate this by talking about how you prepared for this talk: How you began the process, what you did, and how long it took you. Be sure to emphasize that a good presentation cannot be created in one session; you need time to think, plan, outline, refine, and rehearse.
- The best presentations don't try to cover everything. Discuss how to select (scope out) your material, how to decide what to include and what not to include (based on what the audience is likely to be most interested in), and the importance of having relevant examples and stories to support each point.
- Organizing what you plan to say. Talk about the importance of immediately engaging the audience and give examples of ways of doing that (e.g., TED talk examples: Begin with something unexpected, inject some humor, be real by making a connection between yourself and the audience). How presentations are no different from a story, book, or movie: They need a beginning, a middle, and an end.
- The different forms of presenting. Include guidelines for using PowerPoint or other visual media and why visual media helpful in keeping participants engaged throughout the entire presentation. Discuss using questions throughout a presentation to encourage the audience to think about and personally relate to the material. Cover why it's off-putting to watch presenters read directly from PowerPoint slides or notecards and how nonverbal messages affect the presentations. Go over the value of sufficient rehearsal and ways to manage presenting material in a group (versus as a single presenter).
- Leaving aside time for Q&A. Suggestions for handling audience questions when presenting as a group; the importance (for credibility as much as anything else) of admitting when you don't know something and promising that you will find out and follow up.

Lesson 23 Update
Career Project Sharing, Course Planning, and Guest Speaker

Update note

See ***Frameworks Course Essentials***[21] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Activity 2: Planning what courses to take next semester

Facilitation note

- Depending on registration dates and times at your institution, it might make sense to do this activity earlier in the semester. Be mindful of the other campus programs directed at helping students identify a program of study and enroll in courses that meet the requirements for their program.
- Encourage students to use institutional resources to find direction for plans of study. Because institutions (and, in many cases, programs within institutions) vary in terms of requirements and how those requirements are communicated to students, there is usually no one template or place to look for this information.

  Faculty members who have taught *Frameworks* report their students have found the necessary information when they consult department chairs, advisors, and student guides. Consider the standard templates your institution could develop to help students within this course identify key information related to programs of study.

  - For specific questions about how mathematics courses may transfer to other (possibly 4-year) institutions, the Dana Center has developed the Mathematics Pathways Transfer Resource at https://dcmathpathways.org/resources/texas-transfer-inventory-guide-2016-17-pdf . Consider sharing this resource with your students to encourage them to bring this information into conversations with their advisors and department chairs.

[21] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Lesson 23
Career Project Sharing, Course Planning, and Guest Speaker

Overview

In this lesson, students will turn in their career projects and engage in reflection and sharing around the experience.

Students will also draft a schedule for the following semester, including identifying and registering for their next mathematics course.

If possible, there will be a guest speaker who will share his or her own career pathway and discuss how he or she applies mathematics.

Week: 12 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 3

Supplementary Materials:
Appendix 23-A

Student Objectives

Identify future college and career pathways.

- Students explore the characteristics and required skills of various career paths and consult with advisors and instructors to determine an appropriate path to follow.

Resources and Preparation

Materials and Technology Required

- Guest presenter may require audiovisual equipment.

1. **Background information**
   - Review the career project expectations and corresponding grading and feedback rubrics.
2. **Entry logistics**
   - Prepare the student attendance sheet for the week.
3. **Make copies of the following materials for students:**
   - Appendix 23-A: Course Schedule Planning Template
4. **Activity 1: Career project sharing**
   - Decide which prompting questions you will ask and, if possible, ask a few students in advance to commit to sharing their career project experiences in this class.

5. **Activity 2: Planning what courses to take next semester**
    - As an exemplar for the students, complete the template with your schedule for next semester (including scheduled office hours, time held for preparing to teach, and time in class).
    - Familiarize yourself with the math courses available next semester in which your students could enroll. Prepare to facilitate conversations about what courses they may want to take and how those courses match up with their individual career paths.
6. **Activity 3: Guest presentation**
    - Share with students (via email, discussion thread, or web link), a brief biography of today's guest speaker.
    - Confirm attendance by the guest speaker and ensure he or she knows when and where to arrive and how to reach you should there be a problem or delay. The speaker will talk about his or her career trajectory for about 10 minutes and then allow about five minutes for Q&A. Remind the speaker that an important part of the talk should address experience with math in college and the extent to which math knowledge is important (even if tangentially) to the work he or she does. Determine if he or she will require any audiovisual equipment.

    Note: If you are unable to schedule a guest presenter for this lesson, provide this time for success teams to discuss/practice their group presentations.
7. **For the next class period**
    - Determine any equipment or materials the first success teams will need for their presentation.

Instructional Plan

Preliminaries

(5 minutes)

- As students arrive, remind them to take out their career projects and the course planning materials they will use to create a schedule for the following semester.
- Check in on groups; collect group presentation information form if you have set this lesson as the deadline.

Activity 1: Career project sharing

(25 minutes)

Objectives

Students

- Identify necessary skills of jobs and characteristics of selected career fields.
- Explain how strengths as a student translate into strengths as an employee.
- Reflect on experiences with the career project.

1. **Whole-class discussion: Career project experience and outcomes**
    - Ask for volunteers who would be willing to share—for just a few minutes—on the following topics:
        - Some of the biggest "ah-has" about themselves and their future direction after finalizing their SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis
        - What skills they will need to develop for their chosen career fields
        - How their strengths as a student can translate into strengths as an employee
        - What are some of the biggest challenges they could face in their chosen field; as a follow up, a strategy they could use to enhance their likelihood of success
    - As students share, relate their responses to course content. Sample connections could be:
        - Highlight the way a student used critical thinking skills when deciding what "evidence" or credible sources to use for their research.
        - Note how a student uses effective communication skills while sharing his or her experience.
        - Point out how the student leveraged the learning from a career assessment (one of their earlier assignments) and how they tapped into helpful on- and off-campus resources.
2. **Collect, from all students, any hard-copy deliverables you assigned.**

Activity 2: Planning what courses to take next semester

(25 minutes)

Objectives

Students

- Create a class and study schedule for the upcoming semester.
- Register for a math course in the upcoming semester.

1. **Distribute copies of the Course Schedule Planning Template (Appendix 23-A).**
2. **Have students pull out their degree audit forms and their individual career project action plans.**
3. **Outline the task (individual work).**
    - Overall goal: To create a class and study schedule for the upcoming semester, with important information about the courses and with initial information on which peers may also be enrolled in the student's section.
    - If students have already registered for classes:
        - Record class information on the bottom of the template.
        - Use the time to begin setting their life schedules for the next semester. Their calendars should include the following:
        - Class meeting times
        - Weekly review time and study time for each class
        - Known recurring work and personal obligations
    - If student have not registered for classes:
        - Use this time to identify courses and sections to register for.
        - Record class information on the bottom of the template.
        - Pencil in a tentative schedule.
        - Set a time to meet with an academic advisor to move registration along.
    - Students should refer back to their degree audit forms and their individual career project action plan to make sure the courses scheduled satisfy requirements of both.
4. **Monitor individual student work.**
    - Try to work with undecided students first; help them use resources (course schedules, web pages, and so on) to identify courses and to begin penciling them into the template.
    - For students who are already registered, begin discussing the math class they are taking next semester. You can have students who have already registered begin

considering some of the questions you will use in the whole-class discussion (prompts listed below).

5. **Whole-class discussion: Selecting math courses for next semester**
    - Sample prompts:
        - What math classes (and sections) are you enrolling in? Is anyone enrolled in the same section?
        - What helpful information do you know about the math instructor you will have next semester? (Keep this discussion positive, redirecting negative perspectives as appropriate.)
        - What might you want to ask your current math instructor to make sure you are prepared for the next semester's course?
6. **Collect completed planning templates.**
    - Each student should turn in a completed copy of the planning template for you to review and hand back.
    - When reviewing these planning templates, focus feedback on the following:
        - Making sure that they are registering for a math class and that the math class selection makes sense given what you know about their future career plans (as gathered from in-class discussions, office hour visits, and their career project assignments).
        - Any potentially troublesome course scheduling (such as planning to be in 6 hours of classes back-to-back or scheduling classes in locations far away from each other without any buffer time to get there).
        - Including study and review time for each class.

Activity 3: Guest presentation

(15 minutes)

Objectives

Students

- Understand how the guest presenter's career trajectory has advanced over the years and the extent to which math knowledge has played a part in the guest's success.

1. **Introduce the guest speaker.**
2. **Outline the discussion task.**
    - Suggest that the speaker answer student questions after talking for about 10 minutes, outlining how he or she reached their position and including discussion about their experience with—and use of—math.

Wrap-Up

(5 minutes)

Success team presentations:

- Students should be finalizing and rehearsing their presentations.

Preview what will be covered in the next lesson(s):

- The next three lessons will focus on the success team presentations.
- Confirm that the first success teams will be ready to present.
- The next lesson(s) will also include time for students to plan for the end of the semester—studying for exams and so on. Ask students to bring their planners, syllabi, and any exam study schedules they may have already made for themselves.

Appendix 23-A: Course Schedule Planning Template

Student Name:_____ **Date:**_____

Course Number	# of Credits	Course Name	Instructor	Location	Classmates

	Monday	Tuesday	Wednesday	Thursday	Friday
8:00–8:30					
8:30–9:00					
9:00–9:30					
9:30–10:00					
10:00–10:30					
10:30–11:00					
11:00–11:30					
11:30–12:00					
12:00–12:30					
12:30–1:00					
1:00–1:30					
1:30–2:00					
2:00–2:30					
2:30–3:00					
3:00–3:30					
3:30–4:00					

	Monday	Tuesday	Wednesday	Thursday	Friday
4:00–4:30					
4:30–5:00					
5:00–5:30					
5:30–6:00					
6:00–6:30					
6:30–7:00					
7:00–7:30					
7:30–8:00					
8:00–8:30					
8:30–9:00					
9:00–9:30					
9:30–10:00					

Lessons 24, 25, and 26 Update
Success Team Presentations and Additional Activities

Update note

Success teams present their research and analysis during Lessons 24, 25, and 26. Activities included in the appendices for these lessons are presented as options so you have the flexibility to tailor the non-presentation time to meet the needs of your students, including their need to prepare for the final exam.

See ***Frameworks Course Essentials***[22] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Appendices 24-A, 25-A, and 26-A:
Optional activities to use during the group presentation lessons: Applying study strategies to math assignments

Faculty voices: Activity implementation

- "Since a group was not ready, I used this activity [Applying study strategies to math]. The students really engaged in this process. They were able to take the time to express something they were struggling with and the other student was able to explain the concept a different way. I think that this activity reinforced the connection between the two courses in a really positive way."

[22] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Appendices 24-A, 25-A, and 26-A:
Optional activities to use during the group presentation lessons: Planning for the final exam
AND
Appendices 24-C, 25-C, and 26-C:
Preparing for the final exam planning form

Faculty voices: Activity implementation

- "This was extremely beneficial since this provided them an opportunity to implement lessons learned from the midterm. The planning form was used during our test review and proved to be a great reflection tool."
- "With my *Frameworks* students, beginning the talk about the Final Exam at this point was beneficial because they seem to become anxious about testing. Sometimes they forget how much they know until we circle back to the concept and then they connect to the content again."

Lesson 24
Success Team Presentations, Day 1

Overview

As many have said, the best way to learn something is to teach it to others. Or, as Albert Einstein commented, "You do not really understand something unless you can explain it to your grandmother."

This lesson provides an opportunity for one or more success teams to share their understanding of their topic with the whole class.

Additional activities are provided in Appendix 24-A as options for use between or after success team presentations.

Week: 12 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 3-4

Supplementary Materials: Appendices 24-A through 24-C

Student Objectives

Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.

- Students develop written and oral arguments that are insightful, purposefully organized, logically supported, audience appropriate, and effectively delivered.

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Resources and Preparation

1. **Background information**
   - Review the course topic(s) that relates to the success team presentation(s). Identify information you feel needs to be highlighted again (consider midterm exam outcome and subsequent discussions with students) and plan for how you will use the Q&A period at the end of the presentation(s) to make sure these ideas surface.
2. **Entry logistics**
   - Prepare the student attendance sheet for the week.

Materials and Technology Required

Check in advance with the student success teams on whether they need audiovisual equipment (for example, a PowerPoint presentation) and/or other materials.

3. **Make copies of the following materials for students:**
   - Appendix 24-B: Student Presentation Grading Rubric (one per student)
4. **Activity 1: Success team presentations**
   - Familiarize yourself with the evaluation rubric and your expectations for performance.
5. **Additional activities**
   - Across Lessons 24–26, you may choose when you would like to use the activities in Appendix 24-A. It is important to include the Planning for the Final Exam activity at least once.
     - Applying Study Strategies to Math Assignments (10 minutes)
     - Guest Presentation (5 minutes)
     - Preparing for the Final Exam (up to 25 minutes)
   - Determine which activities you will include during this lesson and prepare corresponding materials. (See Appendix 24-A.)
   - If you will have a guest speaker, confirm his or her attendance ensure the speaker knows when and where to speak and how to reach you should there be a problem or delay. The speaker will share about his or her career trajectory for about 10 minutes and then allow about five minutes for Q&A. Remind the speaker that an important part of her or her talk should address experience with math in college and the extent to which math knowledge is important (even if tangentially) to his or her work. Determine if the speaker will require any audiovisual equipment.
6. **For the next class period**
   - Determine any material or equipment needs for the next success team presentation(s). If you will have a guest speaker as an additional activity, confirm her or his attendance and audiovisual needs.

Instructional Plan

Preliminaries

(5 minutes)

- Students should sit with their success teams.
- Teams presenting today should organize their materials or equipment so that each is ready to begin without unnecessary delay.

Activity 1: Success team presentations

(40–65 minutes)

Objectives

Students

- Either participate in their success team's presentation and experience what it is like to teach a topic *or* experience being taught by their peers.
- Evaluate the presentation using a rubric.

Note: You can have one or two team presentations today. You will need about 10 minutes to reorient students to the grading rubric and discuss the logistics for the presentations. Each group will have a total 20 minutes for the presentation, including five minutes for Q&A, and you should plan for a few minutes between presentations for the second group to assemble and cue up any audiovisual materials they are using.

1. **Distribute copies of the Student Presentation Grading Rubric (Appendix 24-B).**
    - Each student (including each member of the presenting team) should get one copy.
    - Review the purpose of a rubric.
    - Discuss how you would like students to use the rubric:
        - Circle the most accurate statement for each of the seven categories (Preparation, Information, Organization, etc.) and add up the scores in the final box (Score) for each row.
        - Inform students that they can make brief notes during the presentation, but they should only complete the form at the end of the presentation. The goal for the moment is to give the presenting team their full attention.
2. **Review logistics of the presentation.**
    - Presenters: Let the presenters know if (and how) you will keep them aware of the time. The presentation time parameter is 20 minutes, including the Q&A at the end.
    - Audience members: Provide their full attention and take brief notes.
    - All: After the presentation there will be an additional five minutes for Q&A.
3. **Invite the success team to introduce themselves and get started.**
    - Be sure they start by giving their names and outlining the topic they are covering today.
4. **Monitor presentation and provide support as needed.**
5. **Facilitate the Q&A (if needed).**

6. **Instruct all students to complete the rubric.**

    - Presenters should evaluate their group performance, focusing on how they think their group did on each of the categories.
    - Remind everyone to complete the form by writing in the Group Name, Strategy Topic, and Date.

7. **Collect all the rubric forms.**

    - Discuss when and how student presenters will receive the feedback from these rubrics and how you will be using the feedback in grading.

Additional Activities

(up to 25 minutes)

1. **If you choose to only have one group present during this lesson, use the remaining time for one or more of the activities described in Appendix 24-A.**

Wrap-Up

(5 minutes)

Ask students to engage in a think-pair-share about the three key ideas from at least one of the presentations.

Success team presentations:

- If your group has not yet presented, you should be finalizing and rehearsing your presentations.

Preview what will be covered in the next lesson:

- Confirm that the next success team(s) will be ready to present.
- The next lesson will be similar to this one and may include some time for final exam preparation and planning. Students should bring copies of their study schedules, planning materials, and course syllabi.

Appendix 24-A: Optional Activities to Use During the Group Presentation Lessons

Note: The activities in this appendix are provided as additional support for Lessons 24–26. You can use these activities to round out the time for a given lesson, in between presentations, or as reinforcement of key ideas in the course content or content shared in the presentations.

Applying study strategies to math assignments

(10 minutes)

Objectives

Students

- Work with a partner to apply the study strategies to a current math course assignment or challenge.

1. **Pair up students.**
    - Have students pair up with someone not on their own success team.
2. **Outline task.**
    - Each student should work with their partner to identify a current math assignment or math challenge that each (or both) of them faces.
    - Directly apply the study strategies discussed in earlier lessons, or a success team presentation, to the issue.
    - Each pair should turn in a very brief (5 sentences) summary of each issue they worked on and how they applied course content or group presentation content to the issue(s).
3. **General debrief** (if time permits).
    - Highlight examples of issues and solutions you saw students working on during this activity.

Guest presentation
(15 minutes)

Objectives

Students

- Understand how the guest presenter's career trajectory has advanced over the years and the extent to which math knowledge has played a part in the guest's success.

1. **Introduce the guest speaker.**
2. **Outline the discussion task.**
    - Suggest that the speaker take about 10 minutes to outline how he or she reached the position he or she holds in the community today, including a brief description about experience with—and use of—math. Then answer student questions with any remaining time.

Planning for the final exam
(up to 25 minutes)

Objectives

Students

- Self-regulate and demonstrate metacognitive awareness by planning, monitoring, evaluating, and reflecting on their learning.
- Identify strategies to use in preparing for exams (including organizing notes, creating sample tests, practicing key words, completing and analyzing old exams, eating properly, and getting a good night's sleep).

1. **Distribute Preparing for the Final Exam Planning Form (Appendix 24-C).**
2. **Outline the task** (initial work done individually).
    - Students should use this planning document to organize their plan for preparing for the final exam.
    - Initial work should be done individually; each student should set his or her own goal for performance.
    - Then groups of students can work together to identify relevant attributes or expectations of the final exam and discuss what they have learned from previous exams in this course.

- Students should use their calendars to plan individually for when and where they will study, reaching out to group members if they would like to set up group study times.

3. **Model a plan** (if possible).
    - If you have one on hand or have had time to prepare your own, share a model of a study plan that includes different study strategies across time.
4. **Provide completion instructions.**
    - Students should complete the planning document before the start of the next class. They should bring the form in for you to quickly review.

Appendix 24-B: Instructor and Observer Presentation Rubric

Group Members: _____ **Presentation Topic:** _____

	Inadequate	Acceptable	Good	Exemplary	Score
Preparation	Little or no preparation evidenced.	Some preparation, but little or no rehearsal.	Looked prepared. Worked effectively together as a cohesive unit; had obviously rehearsed.	Considerable thought given to how the material would be presented. Team demonstrated creative and effective ways of working together.	
Information and Organization	Many important elements of information missing. Presentation incomplete or sequencing of material scattered or illogical. Students appeared to be making it up as they went along.	Showed ability to recall and reproduce information as presented in original lesson and lectures. Some sequencing of material evident. Presenters used scripts to keep them on track.	Clearly explained all key themes, each illustrated with its own examples. Comfortable, logical flow of material. The whole team worked effectively to hit all main points within the time allocated.	Drew from sources other than class lectures and notes. Successfully compared and contrasted key themes. Showed ability to evaluate material by developing own points of view and offering personalized examples. Comfortable, logical flow of material. The whole team worked effectively to hit all main points within the time allocated.	
Presentation	Made considerable use of, and read extensively from, notes. Did not make eye contact with the class. Speech unclear and lacking in confidence. Spoken lecture only.	Used some notes or other framework to stay on track. Made intermittent eye contact with audience. Some stumbling. Spoken lecture only.	Little or no use of notes or written materials. Good eye contact. Clear, confident diction throughout. Spoken lecture or basic PowerPoint presentation.	Confident delivery of material throughout. Continual eye contact. Clear, confident diction. Creative and effective use of PowerPoint or other presentation tools included in presentation.	
Q&A and Level of Thought	Unable to answer. Gave incorrect responses or stumbled during questions. Evidence of knowledge mainly; some understanding.	Gave only short, basic responses to questions. Evidence of understanding.	Appeared confident about answering questions, handling them effectively. Evidence of understanding and application.	Showed strong understanding of material, supplementing responses with further examples. Evidence of analysis and evaluation.	
Overall	Failed to fulfill the assignment as instructed.	Completed the assignment as instructed, but no more.	Incorporated elements (such as use of personalized examples) not specifically outlined in assignment.	Demonstrated creativity in both the selection and the comprehensiveness of material and delivered it effectively.	
Additional feedback				**Total Score**	

Appendix 24-C: Preparing for the Final Exam Planning Form

Test plan for: _____ **Date:** _____

Useful goal for my performance:

Everything I know about my upcoming exam:	Examples: number of questions types of questions material to be covered

What have I learned from feedback on other exams in this class?

How will I modify my efforts for this exam?

Lessons 24, 25, and 26 Update
Success Team Presentations and Additional Activities

Update note

Success teams present their research and analysis during Lessons 24, 25, and 26. Activities included in the appendices for these lessons are presented as options so you have the flexibility to tailor the non-presentation time to meet the needs of your students, including their need to prepare for the final exam.

See ***Frameworks Course Essentials***[22] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Appendices 24-A, 25-A, and 26-A: Optional activities to use during the group presentation lessons: Applying study strategies to math assignments

Faculty voices: Activity implementation

- "Since a group was not ready, I used this activity [Applying study strategies to math]. The students really engaged in this process. They were able to take the time to express something they were struggling with and the other student was able to explain the concept a different way. I think that this activity reinforced the connection between the two courses in a really positive way."

[22] The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Appendices 24-A, 25-A, and 26-A:
Optional activities to use during the group presentation lessons: Planning for the final exam
AND
Appendices 24-C, 25-C, and 26-C:
Preparing for the final exam planning form

Faculty voices: Activity implementation

- "This was extremely beneficial since this provided them an opportunity to implement lessons learned from the midterm. The planning form was used during our test review and proved to be a great reflection tool."
- "With my *Frameworks* students, beginning the talk about the Final Exam at this point was beneficial because they seem to become anxious about testing. Sometimes they forget how much they know until we circle back to the concept and then they connect to the content again."

Lesson 25
Success Team Presentations, Day 2

Overview

This lesson follows the same basic outline as Lesson 24. In this lesson, success teams continue their group presentations and audience members provide feedback using a rubric.

This lesson provides an opportunity for one or more success teams to share their understanding of their topic with the whole class.

Additional activities are provided in Appendix 25-A as options for use between or after success team presentations.

Week: 13 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 2

Supplementary Materials: Appendices 25-A through 25-C

Student Objectives

Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.

- Students develop written and oral arguments that are insightful, purposefully organized, logically supported, audience appropriate, and effectively delivered.

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Resources and Preparation

Materials and Technology Required

Check in advance with the student success team on whether they need audiovisual equipment (for example, a PowerPoint presentation) and/or other materials.

1. **Background information**
   - Review the course topic(s) that relates to the success team presentation(s). Identify information you feel needs to be highlighted again (consider midterm exam outcome and subsequent discussions with students) and plan for how you will use the Q&A period at the end of the presentation(s) to make sure these ideas surface.
2. **Entry logistics**
   - Prepare the student attendance sheet for the week.

3. **Make copies of the following materials for students:**
   - Appendix 25-B: Student Presentation Grading Rubric (one per student)
4. **Activity 1: Success team presentations**
   - Familiarize yourself with the evaluation rubric and your expectations for performance.
5. **Additional activities**
   - Across Lessons 24–26, you may choose when you would like to use the activities in Appendix 25-A. It is important to include the Planning for the Final Exam activity at least once.
     - Applying Study Strategies to Math Assignments (10 minutes)
     - Guest Presentations (5 minutes)
     - Preparing for the Final Exam (up to 25 minutes)
   - Determine which activities you will include during this lesson and prepare corresponding materials. (See Appendix 25-A.)
   - If you will have a guest speaker, confirm his or her attendance ensure the speaker knows when and where to speak and how to reach you should there be a problem or delay. The speaker will share about his or her career trajectory for about 10 minutes and then allow about five minutes for Q&A. Remind the speaker that an important part of her or her talk should address experience with math in college and the extent to which math knowledge is important (even if tangentially) to his or her work. Determine if the speaker will require any audiovisual equipment.
6. **For the next class period**
   - Determine any material or equipment needs for the next success team presentation(s). If you will have a guest speaker as an additional activity, confirm her or his attendance and audiovisual needs.

Instructional Plan

Preliminaries

(5 minutes)

- Students should sit with their success teams.
- Teams presenting today should organize their materials or equipment so that each is ready to begin without unnecessary delay.

Activity 1: Success team presentations

(up to 45 minutes)

Objectives

Students

- Either participate in their success team's presentation and experience what it is like to teach a topic *or* experience being taught by their peers.
- Evaluate the presentation using a rubric.

Note: You can have one or two team presentations today. The steps for this activity are the same as for the previous lesson, so you can move through steps 1 and 2 more quickly.

1. **Distribute copies of the Student Presentation Grading Rubric (Appendix 25-B).**
    - Each student (including each member of the presenting team) should get one copy.
    - Review the purpose of a rubric.
    - Discuss how you would like students to use the rubric:
        - Circle the most accurate statement for each of the seven categories (Preparation, Information, Organization, etc.) and add up the scores in the final box (Score) for each row.
        - Inform students that they can make brief notes during the presentation, but they should only complete the form at the end of the presentation. The goal for the moment is to give the presenting team their full attention.
2. **Review logistics of the presentation**.
    - **Presenters:** Let the presenters know if (and how) you will keep them aware of the time. The presentation time parameter is 20 minutes, including the Q&A at the end.
    - **Audience members:** Provide their full attention and take brief notes.
    - **All:** After the presentation there will be an additional five minutes for Q&A.
3. **Invite the success team to introduce themselves and get started.**
    - Be sure they start by giving their names and outlining the topic they are covering today.
4. **Monitor presentation and provide support as needed.**
5. **Facilitate the Q&A** (if needed).
6. **Instruct all students to complete the rubric**
    - Presenters should evaluate their group performance, focusing on how they think their group did on each of the categories.

- Remind everyone to complete the form by writing in the Group Name, Strategy Topic, and Date.

7. **Collect all the rubric forms.**
    - Discuss when and how students will receive the feedback from these rubrics and how you will be using the feedback in grading.

Additional activities

(up to 25 minutes)

1. **Use the remaining time for one or more of the activities described in Appendix 25-A.**

Wrap-Up

(5 minutes)

Ask students to engage in a think-pair-share about the three key ideas from at least one of the presentations.

Success team presentations:

- If your group has not yet presented, you should be finalizing and rehearsing your presentations.

Preview what will be covered in the next lesson:

- Confirm that the next success team(s) will be ready to present.
- The next lesson will be similar to this one and may include some time for final exam preparation and planning. Students should bring copies of their study schedules, planning materials, and course syllabi.

Appendix 25-A: Optional Activities to Use During the Group Presentation Lessons

Note: The activities in this appendix are provided as additional support for Lessons 24–26. You can use these activities to round out the time for a given lesson, in between presentations, or as reinforcement of key ideas in the course content or content shared in the presentations.

Applying study strategies to math assignments

(10 minutes)

Objectives

Students

- Work with a partner to apply the study strategies to a current math course assignment or challenge.

1. **Pair up students.**
    - Have students pair up with someone not on their own success team.
2. **Outline task.**
    - Each student should work with their partner to identify a current math assignment or math challenge that each (or both) of them faces.
    - Directly apply the study strategies discussed in earlier lessons, or a success team presentation, to the issue.
    - Each pair should turn in a very brief (5 sentences) summary of each issue they worked on and how they applied course content or group presentation content to the issue(s).
3. **General debrief** (if time permits).
    - Highlight examples of issues and solutions you saw students working on during this activity.

Guest presentation
(15 minutes)

Objectives

Students

- Understand how the guest presenter's career trajectory has advanced over the years and the extent to which math knowledge has played a part in the guest's success.

1. **Introduce the guest speaker.**
2. **Outline the discussion task.**
    - Suggest that the speaker take about 10 minutes to outline how he or she reached the position he or she holds in the community today, including a brief description about experience with—and use of—math. Then answer student questions with any remaining time.

Planning for the final exam
(up to 25 minutes)

Objectives

Students

- Self-regulate and demonstrate metacognitive awareness by planning, monitoring, evaluating, and reflecting on their learning.
- Identify strategies to use in preparing for exams (including organizing notes, creating sample tests, practicing key words, completing and analyzing old exams, eating properly, and getting a good night's sleep).

1. **Distribute Preparing for the Final Exam Planning Form (Appendix 24-C).**
2. **Outline the task** (initial work done individually).
    - Students should use this planning document to organize their plan for preparing for the final exam.
    - Initial work should be done individually; each student should set his or her own goal for performance.
    - Then groups of students can work together to identify relevant attributes or expectations of the final exam and discuss what they have learned from previous exams in this course.

- Students should use their calendars to plan individually for when and where they will study, reaching out to group members if they would like to set up group study times.

3. **Model a plan** (if possible).
    - If you have one on hand or have had time to prepare your own, share a model of a study plan that includes different study strategies across time.
4. **Provide completion instructions.**
    - Students should complete the planning document before the start of the next class. They should bring the form in for you to quickly review.

Appendix 25-B: Instructor and Observer Presentation Rubric

Group Members: _____ **Presentation Topic:** _____

	Inadequate	Acceptable	Good	Exemplary	Score
Preparation	Little or no preparation evidenced.	Some preparation, but little or no rehearsal.	Looked prepared. Worked effectively together as a cohesive unit; had obviously rehearsed.	Considerable thought given to how the material would be presented. Team demonstrated creative and effective ways of working together.	
Information and Organization	Many important elements of information missing. Presentation incomplete or sequencing of material scattered or illogical. Students appeared to be making it up as they went along.	Showed ability to recall and reproduce information as presented in original lesson and lectures. Some sequencing of material evident. Presenters used scripts to keep them on track.	Clearly explained all key themes, each illustrated with its own examples. Comfortable, logical flow of material. The whole team worked effectively to hit all main points within the time allocated.	Drew from sources other than class lectures and notes. Successfully compared and contrasted key themes. Showed ability to evaluate material by developing own points of view and offering personalized examples. Comfortable, logical flow of material. The whole team worked effectively to hit all main points within the time allocated.	
Presentation	Made considerable use of, and read extensively from, notes. Did not make eye contact with the class. Speech unclear and lacking in confidence. Spoken lecture only.	Used some notes or other framework to stay on track. Made intermittent eye contact with audience. Some stumbling. Spoken lecture only.	Little or no use of notes or written materials. Good eye contact. Clear, confident diction throughout. Spoken lecture or basic PowerPoint presentation.	Confident delivery of material throughout. Continual eye contact. Clear, confident diction. Creative and effective use of PowerPoint or other presentation tools included in presentation.	
Q&A and Level of Thought	Unable to answer. Gave incorrect responses or stumbled during questions. Evidence of knowledge mainly; some understanding.	Gave only short, basic responses to questions. Evidence of understanding.	Appeared confident about answering questions, handling them effectively. Evidence of understanding and application.	Showed strong understanding of material, supplementing responses with further examples. Evidence of analysis and evaluation.	
Overall	Failed to fulfill the assignment as instructed.	Completed the assignment as instructed, but no more.	Incorporated elements (such as use of personalized examples) not specifically outlined in assignment.	Demonstrated creativity in both the selection and the comprehensiveness of material and delivered it effectively.	
Additional feedback				**Total Score**	

Appendix 25-C: Preparing for the Final Exam Planning Form

Test plan for: _____ **Date:** _____

Useful goal for my performance:

Everything I know about my upcoming exam:	Examples: number of questions types of questions material to be covered

What have I learned from feedback on other exams in this class?

How will I modify my efforts for this exam?

Lessons 24, 25, and 26 Update
Success Team Presentations and Additional Activities

Update note

Success teams present their research and analysis during Lessons 24, 25, and 26. Activities included in the appendices for these lessons are presented as options so you have the flexibility to tailor the non-presentation time to meet the needs of your students, including their need to prepare for the final exam.

See ***Frameworks Course Essentials***[22] for more information about the components of this lesson that are essential to implementing the defining features of a learning frameworks course and the components essential to implementing the larger DCMP curricular model.

Appendices 24-A, 25-A, and 26-A:
Optional activities to use during the group presentation lessons: Applying study strategies to math assignments

Faculty voices: Activity implementation

- "Since a group was not ready, I used this activity [Applying study strategies to math]. The students really engaged in this process. They were able to take the time to express something they were struggling with and the other student was able to explain the concept a different way. I think that this activity reinforced the connection between the two courses in a really positive way."

[22]The *Frameworks Course Essentials* document is available via the Dana Center Mathematics Pathways resource site: https://dcmathpathways.org/resources/dcmp-frameworks-mathematics-and-collegiate-learning-course-essentials.

Appendices 24-A, 25-A, and 26-A:
Optional activities to use during the group presentation lessons: Planning for the final exam
AND
Appendices 24-C, 25-C, and 26-C:
Preparing for the final exam planning form

Faculty voices: Activity implementation

- "This was extremely beneficial since this provided them an opportunity to implement lessons learned from the midterm. The planning form was used during our test review and proved to be a great reflection tool."
- "With my *Frameworks* students, beginning the talk about the Final Exam at this point was beneficial because they seem to become anxious about testing. Sometimes they forget how much they know until we circle back to the concept and then they connect to the content again."

Lesson 26
Success Team Presentations, Day 3

Overview

This lesson follows the same basic outline as Lessons 24 and 25. In this lesson, success teams continue their group presentations and audience members provide feedback using a rubric.

This lesson provides an opportunity for one or more success teams to share their understanding of their topic with the whole class.

Additional activities are provided in Appendix 26-A as options for use between or after success team presentations.

Week: 13 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 2

Supplementary Materials: Appendices 26-A through 26-C

Student Objectives

Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.

- Students develop written and oral arguments that are insightful, purposefully organized, logically supported, audience appropriate, and effectively delivered.

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Resources and Preparation

1. Background information

- Review the course topic(s) that relates to the success team presentation(s). Identify information you feel needs to be highlighted again (consider midterm exam outcome and subsequent discussions with students) and plan for how you will use the Q&A period at the end of the presentation(s) to make sure these ideas surface.

2. **Entry logistics**

- Prepare the student attendance sheet for the week.

Materials and Technology Required

Check in advance with the student success team on whether they need audiovisual equipment (for example, a PowerPoint presentation) and/or other materials.

3. **Make copies of the following materials for students:**
   - Appendix 26-B: Student Presentation Grading Rubric (one per student)
4. **Activity 1: Success Team Study-Strategy Presentation**
   - Familiarize yourself with the evaluation rubric and your expectations for performance.
5. **Additional activities**
   - Across Lessons 24–26, you may choose when you would like to use the activities in Appendix 26-A. It is important to include the Planning for the Final Exam activity at least once.
     - Applying Study Strategies to Math Assignments (10 minutes)
     - Guest Presentations (5 minutes)
     - Preparing for the Final Exam (up to 25 minutes)
   - Determine which activities you will include during this lesson and prepare corresponding materials. (See Appendix 26-A.)
   - If you will have a guest speaker, confirm his or her attendance ensure the speaker knows when and where to speak and how to reach you should there be a problem or delay. The speaker will share about his or her career trajectory for about 10 minutes and then allow about five minutes for Q&A. Remind the speaker that an important part of her or her talk should address experience with math in college and the extent to which math knowledge is important (even if tangentially) to his or her work. Determine if the speaker will require any audiovisual equipment.
6. **For the next class period**
   - The next lesson is a review for the final exam. To prepare for this lesson, students should use the Preparing for the Final Exam: Planning Form they worked on in this lesson or earlier lessons. They should come ready to ask questions about the exam content and to work with peers in studying for the exam.

Instructional Plan

Preliminaries

(5 minutes)

- Students should sit with their success teams.
- Teams presenting today should organize their materials or equipment so that each is ready to begin without unnecessary delay.

Activity 1: Success team presentations

(up to 45 minutes)

Objectives

Students

- Either participate in their success team's presentation and experience what it is like to teach a topic *or* experience being taught by their peers.
- Evaluate the presentation using a rubric.

Note: You can have one or two team presentations today. The steps for this activity are the same as for the previous lesson, so you can move through steps 1 and 2 more quickly.

1. **Distribute copies of the Student Presentation Grading Rubric (Appendix 26-B).**
    - Each student (including each member of the presenting team) should get one copy.
    - Review the purpose of a rubric.
    - Discuss how you would like students to use the rubric:
        - Circle the most accurate statement for each of the seven categories (Preparation, Information, Organization, etc.) and add up the scores in the final box (Score) for each row.
        - Inform students that they can make brief notes during the presentation, but they should only complete the form at the end of the presentation. The goal for the moment is to give the presenting team their full attention.
2. **Review logistics of the presentation**.
    - Presenters: Let the presenters know if (and how) you will keep them aware of the time. The presentation time parameter is 20 minutes, including the Q&A at the end.
    - Audience members: Provide their full attention and take brief notes.
    - All: After the presentation there will be an additional five minutes for Q&A.
3. **Invite the success team to introduce themselves and get started.**
    - Be sure they start by giving their names and outlining the topic they are covering today.
4. **Monitor presentation and provide support as needed.**
5. **Facilitate the Q&A** (if needed).
6. **Instruct all students to complete the rubric**
    - Presenters should evaluate their group performance, focusing on how they think their group did on each of the categories.

- Remind everyone to complete the form by writing in the Group Name, Strategy Topic, and Date.

7. **Collect all the rubric forms.**
    - Discuss when and how students will receive the feedback from these rubrics and how you will be using the feedback in grading.

Additional activities
(up to 25 minutes)

1. **Use the remaining time for one or more of the activities described in Appendix 26-A.**

Wrap-Up
(5 minutes)

Ask students to engage in a think-pair-share about the three key ideas from at least one of the presentations.

Preview what will be covered in the next lesson:

- The next lesson will serve as the review for the final exam. Students should come ready to ask questions to clarify their understanding of the content and to work with their classmates to prepare for the final. Students should bring all of the course materials – notes, readings, assignments, etc. – for use during the lesson activity.

Appendix 26-A: Optional Activities to Use During the Group Presentation Lessons

Note: The activities in this appendix are provided as additional support for Lessons 24–26. You can use these activities to round out the time for a given lesson, in between presentations, or as reinforcement of key ideas in the course content or content shared in the presentations.

Applying study strategies to math assignments

(10 minutes)

Objectives

Students

- Work with a partner to apply the study strategies to a current math course assignment or challenge.

1. **Pair up students.**
    - Have students pair up with someone not on their own success team.
2. **Outline task.**
    - Each student should work with their partner to identify a current math assignment or math challenge that each (or both) of them faces.
    - Directly apply the study strategies discussed in earlier lessons, or a success team presentation, to the issue.
    - Each pair should turn in a very brief (5 sentences) summary of each issue they worked on and how they applied course content or group presentation content to the issue(s).
3. **General debrief** (if time permits).
    - Highlight examples of issues and solutions you saw students working on during this activity.

Guest presentation

(15 minutes)

Objectives

Students

- Understand how the guest presenter's career trajectory has advanced over the years and the extent to which math knowledge has played a part in the guest's success.

1. **Introduce the guest speaker.**
2. **Outline the discussion task.**
    - Suggest that the speaker take about 10 minutes to outline how he or she reached the position he or she holds in the community today, including a brief description about experience with—and use of—math. Then answer student questions with any remaining time.

Planning for the final Exam

(up to 25 minutes)

Objectives

Students

- Self-regulate and demonstrate metacognitive awareness by planning, monitoring, evaluating, and reflecting on their learning.
- Identify strategies to use in preparing for exams (including organizing notes, creating sample tests, practicing key words, completing and analyzing old exams, eating properly, and getting a good night's sleep).

1. **Distribute Preparing for the Final Exam Planning Form (Appendix 24-C).**
2. **Outline the task** (initial work done individually).
    - Students should use this planning document to organize their plan for preparing for the final exam.
    - Initial work should be done individually; each student should set his or her own goal for performance.
    - Then groups of students can work together to identify relevant attributes or expectations of the final exam and discuss what they have learned from previous exams in this course.

- Students should use their calendars to plan individually for when and where they will study, reaching out to group members if they would like to set up group study times.

3. **Model a plan** (if possible).
    - If you have one on hand or have had time to prepare your own, share a model of a study plan that includes different study strategies across time.
4. **Provide completion instructions.**
    - Students should complete the planning document before the start of the next class. They should bring the form in for you to quickly review.

Appendix 26-B: Instructor and Observer Presentation Rubric

Group Members: _____ **Presentation Topic:** _____

	Inadequate	Acceptable	Good	Exemplary	Score
Preparation	Little or no preparation evidenced.	Some preparation, but little or no rehearsal.	Looked prepared. Worked effectively together as a cohesive unit; had obviously rehearsed.	Considerable thought given to how the material would be presented. Team demonstrated creative and effective ways of working together.	
Information and Organization	Many important elements of information missing. Presentation incomplete or sequencing of material scattered or illogical. Students appeared to be making it up as they went along.	Showed ability to recall and reproduce information as presented in original lesson and lectures. Some sequencing of material evident. Presenters used scripts to keep them on track.	Clearly explained all key themes, each illustrated with its own examples. Comfortable, logical flow of material. The whole team worked effectively to hit all main points within the time allocated.	Drew from sources other than class lectures and notes. Successfully compared and contrasted key themes. Showed ability to evaluate material by developing own points of view and offering personalized examples. Comfortable, logical flow of material. The whole team worked effectively to hit all main points within the time allocated.	
Presentation	Made considerable use of, and read extensively from, notes. Did not make eye contact with the class. Speech unclear and lacking in confidence. Spoken lecture only.	Used some notes or other framework to stay on track. Made intermittent eye contact with audience. Some stumbling. Spoken lecture only.	Little or no use of notes or written materials. Good eye contact. Clear, confident diction throughout. Spoken lecture or basic PowerPoint presentation.	Confident delivery of material throughout. Continual eye contact. Clear, confident diction. Creative and effective use of PowerPoint or other presentation tools included in presentation.	
Q&A and Level of Thought	Unable to answer. Gave incorrect responses or stumbled during questions. Evidence of knowledge mainly; some understanding.	Gave only short, basic responses to questions. Evidence of understanding.	Appeared confident about answering questions, handling them effectively. Evidence of understanding and application.	Showed strong understanding of material, supplementing responses with further examples. Evidence of analysis and evaluation.	
Overall	Failed to fulfill the assignment as instructed.	Completed the assignment as instructed, but no more.	Incorporated elements (such as use of personalized examples) not specifically outlined in assignment.	Demonstrated creativity in both the selection and the comprehensiveness of material and delivered it effectively.	
Additional feedback				**Total Score**	

Appendix 26-C: Preparing for the Final Exam Planning Form

Test plan for: _____ **Date:** _____

Useful goal for my performance:

Everything I know about my upcoming exam:	Examples: number of questions types of questions material to be covered

What have I learned from feedback on other exams in this class?

How will I modify my efforts for this exam?

Lesson 27 Update
Dear Frameworks

Activity 1: Dear Frameworks

Faculty voices: Activity implementation

- "I did not tell them that the 'Dear Frameworks' activity was the review for the final until after we had done the activity. The students felt successful on the activity and then I told them how the final exam would consist of scenarios for them to diagnose, just like we had just practiced. They seemed very confident in their abilities to do this type of thinking."

Content note: Activity alternative

- Instead of using the scenarios in Appendix 27-B as a start, instructors have had students reflect on their growth during the semester by writing a letter to "a student" who will enroll in the course in the following semester. This alternative allows the activity to be more self-reflective for students, but could limit the extent to which the activity is a review of all the content of the course.

Lesson 27
Dear Frameworks

Overview

In Lesson 1, students participated in an activity in which they identified challenges that could creep up and influence their performance in college and campus resources they might use to overcome the challenges. Now, with a semester of experiences under their belts and armed with an arsenal of knowledge—of, among other things, motivation, how the brain processes and stores information, why we procrastinate—and contacts in different campus offices, students are prepared to revisit some of the common scenarios they and their peers encounter. This time they will be able to analyze the underlying causes and identify possible strategies to use in handling each situation.

Week: 14 of 15

No. of Lessons: 1 of 2

Lesson Length: 75 minutes

No. of Activities: 2

Supplementary Materials: Appendices 27-A through 27-C

This lesson also serves as preparation for the final exam that students will complete in the next lesson. Thus, connection among all course concepts is an important aspect of the lesson activity.

Key Concepts

No new key concepts are introduced. Students should use the key concepts that have been defined in previous lessons throughout this lesson.

Student Objectives

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.

- Students develop written and oral arguments that are insightful, purposefully organized, logically supported, audience appropriate, and effectively delivered.

Resources and Preparation

Materials and Technology Required

None

1. **Background information**
   - Review the major concepts discussed in the course.
2. **Entry logistics**
   - Select some relevant quotes and affirmations that students will see when they enter the classroom, to help get them into a good state of mind for reflection.
   - Prepare the student attendance sheet.
3. **Make copies of the following materials for students:**
   - Appendix 27-A: "Dear Frameworks" Instructions
   - Appendix 27-B: "Dear Frameworks" Scenarios
4. **Activity 1: Dear Frameworks**
   - Review the test and identify any areas you feel you need to remind students to prepare for.
5. **Activity 2: Final Final Exam Question & Answer**
   - Review the test and identify any areas you feel you need to remind students to prepare for.
6. **For the next class period**
   - Students will take the final exam in Lesson 28. If you decided to have students complete the essay questions before arriving in class, determine the logistics of how you want the assignment to be submitted.

Instructional Plan

Preliminaries

(5 minutes)

- Students should work in groups for the activities in this lesson. You can have them work with their success teams or with a different small group.
- Set the tone for the day:
  - Throughout the course of the semester, students have developed a deeper knowledge of the tools they possess that they can draw on to help them experience success in college and in the professional world. This lesson provides an opportunity to share this knowledge with others and help students who may encounter similar challenges.

- The activity will require students to use the critical thinking skills they have developed throughout the course as they analyze information and create responses.
- These activities also serve as a review for the final exam. Students should be making as many connections among the material as possible and testing themselves to use course terminology in their responses.

Activity 1: Dear Frameworks

(60 minutes)

Objectives

Students

- Analyze common college student issues and propose alternatives, using content covered in this course, for how students can handle the situations.
- Create a tangible artifact for delivering the analysis and recommendations.

Note: Instructors should feel free to add to or alter the scenarios provided in Appendix 27-B, especially if there is a particularly salient issue in your class or on your campus. You can also choose whether you want each group to focus on a different scenario or to respond to the same scenario. Also, consider making arrangements for the student work to be used by the college somehow. Perhaps the group-created responses to these scenarios can be showcased on the campus website to help other students who may face these issues.

1. **Distribute Appendix 27-A: "Dear Frameworks" Instructions and Appendix 27-B: "Dear Frameworks" Scenarios.**
2. **Outline the task.**
    - Encourage students to use all notes, readings, and assignments they have completed during the semester.
    - Remind groups to use good group norms and set a plan for how they will use their time for this project.
    - *Facilitation note*: Appendix 27-C is provided for your reference; it is intended to be a resource for you to see how course content can be connected to the scenario. It is not intended to be an example of what a deliverable for the activity will look like.
3. **Groups report out: Have groups share their analyses and recommendations.**
    - To give groups the most time to work, it may not be feasible for all groups to present consecutively; you may want to select a few to present or to have the groups rotate around to other tables to see other groups' work.

4. **Transition to the next activity:**
    - Making these kinds of connections among course material is the high level thinking students have developed during the semester. It is important to demonstrate this kind of thinking on the final exam.

Activity 2: Final exam question and answer

(10 minutes)

Objectives

Students

- Ask any lingering questions they have about the final exam

1. **Open the floor for students to ask questions about course content or about the structure of the final exam.**
2. **Provide any final reminders you feel are necessary regarding the exam.**

Wrap-Up

(5 minutes)

Assign the following:

- Collegiate Learning Questionnaire: Remind students to complete the Collegiate Learning Questionnaire. They completed the same questionnaire at the beginning of the semester and should follow the same procedures to complete it as a post-assessment. Students should

Preview the next lessons.

- In the next lesson, students will take the final exam. If you decided to have students complete the essay questions before arriving in class, be clear with reminders about the logistics of how you would like the assignment submitted.
- In Lesson 29, students revisit using a process for evaluating exam performance. Remind students to bring in their notes from the midterm exam debrief and ask them to consider how the process might be improved during a second application.

Appendix 27-A: "Dear Frameworks" Instructions

Your task: Analyze the information provided in the scenario and propose alternatives for how you think the student can handle the situation.

Deliverable: Some tangible expression of your analysis and recommendations. Be creative! Here are some ideas:

- A written response from the perspective of an advice columnist in the newspaper
- A series of tweets/hashtags with the analysis and recommendations
- Conducting an interview with a panel of student respondents (capture the video or audio on your phone so you can turn it in)
- Drawing an infographic

Address the following in your analysis and recommendations:

- How can this event affect your academic success?
- What might this student do to move forward? Why are you making these recommendations?
- What resources should be tapped into? Why are you making these recommendations?
- What can the student do to stay motivated? Why are you making these recommendations?

As you are doing your analysis and making your recommendations, keep the following in mind:

- You will need to make inferences about the student and the situation. Be sure to include a brief explanation of the inference you made and why it is an appropriate inference given the scenario.
- Be specific, include course concepts, and use course-specific terminology. Include information presented during the group presentations as well.
- Remember, everyone has different interests and resources, so you should try to give multiple options a student can try so he or she can choose the best option for the situation.

Appendix 27-B: "Dear Frameworks" Scenarios

Dear Frameworks,

I have never thought of myself as a math student, but I know I need to complete the math requirement for my degree plan. I've heard about the Foundations for Mathematical Reasoning course, but I'm a little worried about taking it because I heard that the course isn't like other math courses. I am worried I will struggle with this math course like I have struggled with math in the past. What should I do?

— Wobbly on Foundation

Dear Frameworks,

I just returned to college after taking a few years off to work full time. Just after midterm exams, I slipped on a crack in the sidewalk and broke my arm. (My cat is typing this note to you right now.) I needed to have surgery and was in the hospital for a week because of the accident. I'm not quite sure how I'm going to make it to the end of the semester. What should I do?

— One Arm

Dear Frameworks,

I am a first-year student and I just got my first writing assignment grade in my history class back. Even though I have never been good at history and I'm not really that excited about the course, I was still shocked to get a C- on the assignment. I think my instructor graded my assignment unfairly. What should I do?

— History Repeating Itself

Dear Frameworks,

I work full time and I am a full-time student. Just as the semester began, my boss told me that the company is reducing staff and that I will no longer have a job. I'm not sure when I will lose my job, but I'm losing sleep and not sure how this is going to impact my college hopes. Can you help me think through what I should do?

— Full-Time Anxious

Dear Frameworks,

I am taking 15 credit hours this term and am also working part time on campus in the admissions office. During midterm time of the semester, I got really busy and ended up copying part of my sociology writing assignment from a blog posting I read online. I know it wasn't right, but I'm not sure what to do about it now. Can you help me figure out why it happened and what I can do to prevent it from happening in the future?

— Learning from My Past

Appendix 27-C: "Dear Frameworks" Scenario Rough Example

Using one of the scenarios contained in Appendix 27-B, a rough example of some of the ideas students may come up with is outlined below. Given the many different options students can choose to deliver their analysis and recommendations, their response should not look like the listing provided here. This example is provided for instructor use in helping frame the inferences and the level of connections students are expected to make.

Scenario

Dear Frameworks,

> I am a first-year student and I just got my first writing assignment grade in my history class back. Even though I have never been good at history and I'm not really that excited about the course, I was still shocked to get a C– on the assignment. I think my instructor graded my assignment unfairly. What should I do?
>
> — History Repeating Itself

Analysis: How can this event affect "History's" academic success?

- Since it is her first semester and she didn't do well on an assignment, she may start to feel like she doesn't *belong* in college.
- She has a *fixed mindset* about her capabilities in history, given that she says she has never been good at history.
- She has *low self-efficacy* for history classes (based on her prior experiences in history) and may see this experience as an indication that she isn't good at college writing either.
- She didn't go to the campus writing center to get help with this assignment; she wouldn't have been so surprised by her grade if she had gotten help before she turned the assignment in.

Recommendations: What might "History" be able to do to? What resources should she tap into? What can she do to stay motivated? How will these recommendations be helpful?

- Recognize that the transition to college can be rocky for everyone; she is not alone.
- She should talk to a fellow student who understands more about how the brain works – how information is perceived, how short-term and long-term memory works, and how our mindsets impact our motivation.
- When she goes to office hours, be sure to ask questions that help her understand why the answers are correct and incorrect; just asking for the "right" answers isn't the same as knowing why.
- Find something interesting about history as it might relate to her career; try to use the assignments to get better at aspects that will be important for your job.

Lesson 28 Update
Final Exam

Update note

Sample exam questions are available from the Dana Center. Please contact Nancy Stano at nk.stano@austin.utexas.edu or the DCMP staff in general at dcmathpathways@austin.utexas.edu to request this resource.

Lesson 28
Final Exam

Overview

The final exam for this course is an opportunity for students to demonstrate their knowledge of and ability to apply the course content.

The exam should be designed to give students the opportunity to demonstrate deep knowledge of the course material and the higher-level thinking skills outlined in the lesson on critical thinking. The exam should also be constructed additional opportunity for students to reflect on their ability to apply this content to their academic lives and career plans.

Week: 14 of 15

No. of Lessons: 2 of 2

Lesson Length: 75 minutes

No. of Activities: 1

Supplementary Materials: None

Student Objectives

Employ critical thinking skills when approaching challenging tasks.

- Students formulate questions, hypothesize and test hypotheses, draw inferences, interpret evidence, formulate conclusions, evaluate accuracy and credibility of evidence, and identify diverse approaches to issues.

Demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.

- Students develop written and oral arguments that are insightful, purposefully organized, logically supported, audience appropriate, and effectively delivered.

Identify and apply effective strategies to use before, during, and after taking an exam.

- Students develop strategies for preparing for exams, taking exams, and reviewing performance.

Resources and Preparation

Materials and Technology Required

- Sufficient copies of the exam for each student
- Sufficient copies of the Scantron sheets for each student.
- Box of pencils (for completing the Scantron sheets).
- Paper for essays

1. **Background information**
   - Have the final exam ready for students. Be prepared to answer students' questions about specific elements of the exam.
2. **Entry logistics**
   - Select some relevant quotes and positive affirmations that students will see when they enter the classroom—to remind them to maintain focus and positivity for this final exam.
   - Have the student attendance sheet for that week prepared.
3. **Make copies of the following materials for students:**
   - Final exam.
4. **Activity 1: Pre-exam centering exercise**
   - Decide which strategies you will use to help students calm their minds and establish a positive attitude before testing.
5. **Activity 2: Final exam**
   - You may want to provide scratch paper for students to use during the exam.
6. **For the next class period**
   - Students should bring copies of all their journal entries in order to participate in the in-class course reflection exercise.

Instructional Plan

Preliminaries

(5 minutes)

- Students will work individually for this entire lesson.
- If you decided to have students complete the essay portion of the final exam in preparation for class, announce how and when you would like students should turn in the assignment.

Activity 1: Pre-exam centering exercise

(5 minutes)

Objectives

Students

- Engage in centering activities to support student success with the midterm exam.

1. **Use this time to allow tardy students to enter the room and get settled and to help students mentally center themselves before the exam.**
2. **Establish a calm, confident environment. Some exercises you can lead students through include the following:**
    - Ask students to close their eyes and take several deep, cleansing breaths (breathe in through their nose to the count of four and expel all the air through their mouths to the count of five, as noisily as they like).
    - Suggest they do a mental body check to identify any areas of tension and to loosen up with some shoulder circles or leg/arm stretches.
    - Suggest they anchor themselves by controlling their internal dialogue, using a mantra like, “I am going to do well on this test” or “I have prepared wonderfully for this test.” No matter what they use as an affirmation, ask that they begin the test in a positive frame of mind.
    - Remind students to think of this experience as an opportunity both to demonstrate their knowledge and to apply some of the test-taking approaches learned in this course.
    - Ask students to remain quietly seated, practicing deep breathing and positive, affirmative thinking (perhaps even with their eyes closed) while you hand out the exam paper (and Scantron sheets, if you are using them).

Activity 2: Final exam
(60 minutes)

Objectives

Students

- Complete the in-class portion of the final exam.

1. **Recap final instructions:**
    - The amount of time students have to complete the in-class portion of the exam.
    - Any warnings you will give on how much testing time remains.
    - How you want students to turn in their exams to you.
    - Any additional testing rules you may have.

Wrap-Up
(5 minutes)

Assign the following:

- **Course work review:** Students take time to reread each of their journal entries and look at their notes and assignments, reflecting on what has changed for them, in preparation for an in-class activity during the next lesson.

Preview the next lesson:

- Inform students that in the next lesson they will have an opportunity to reflect on their academic and career progress throughout the semester, so they will need to bring copies of all their journal entries to class and be prepared to write a new, future story about their academic and career success

Lesson 29
Final Exam Debrief

Overview

In Lesson 18, students constructed a process for reflecting on their performance on an exam and applied that process to debrief their midterm exam. This lesson provides an opportunity revisit that process, reflect on the effectiveness of the process, update the process, and apply it a second time.

While students may have felt uncomfortable during the Lesson 18 debrief, they should feel much more at ease during this debrief. This reflection has been introduced as a normal part of the classroom culture, and students themselves have created the process they are going to use to debrief. Students should be more confident in assessing what preparation activities worked for them and what areas they still need to work on.

Week: 15 of 15
No. of Lessons: 1 of 2
Lesson Length: 75 minutes
No. of Activities: 2
Supplementary Materials: Appendices 29-A and 29-B.

The lesson also provides an opportunity for students to look forward to next semester and plan for the next likely application of this debrief process in an academic setting: classes next semester.

Key Concepts

Debrief: A process used to analyze a sequence of outcomes of an event after the event has happened.

Student Objectives

Identify and apply effective strategies to use before, during, and after taking an exam.

- Students develop strategies for preparing for exams, taking exams, and reviewing performance.

Resources and Preparation

Materials and Technology Required

- Answer key for the final exam
- Students' individual Scantron sheets
- Sample of A-grade essays or list of key concepts expected of high-scoring essays

1. **Background information**
   - Review the debrief process the class established in Lesson 18 and note any changes to the process you think students identified during their initial application of the process. Refresh your memory of the different types of debrief activities typical in various career paths, especially those students brought up during discussion in Lesson 18.
2. **Entry logistics**
   - Select some relevant quotes and affirmations that students will see when they enter the classroom, to help get them into a good state of mind for reflection.
   - Prepare the student attendance sheet.
3. **Make copies of the following materials for students:**
   - Sample of A-grade essays or list of key criteria for high-scoring essays
   - Appendix 29-A: Exam debrief report
4. **Activity 1: Recap the review process**
   - Prepare to guide students' review of the collaboratively built exam debriefing process.
5. **Activity 2: Apply your review process**
   - Review the test, identify common errors, and identify any specific pieces of feedback you want to make sure individual students have as part of the debrief.
6. **For the next class period**
   - In Lesson 30, students will interact with each other as though 10 years have passed and they are meeting up again for a class reunion. Preview Lesson 30 instructions (especially Appendix 30-B) so you can provide more detailed information about what they should expect.

Instructional Plan

Preliminaries

(5 minutes)

- Students should sit with their success teams. During Activity 2, they will work independently.
- Set the tone for the day.
  - Reflecting on our performance has been a theme throughout the course; but reflection is not a once-and-done event. Ongoing application of the process and review of the process itself is important.
  - Remind students that reflection is not about "what I did wrong." Reflection is about identifying specific areas for improvement so you can focus on controllable behaviors—e.g., "I can work on this with my study group, the course instructor, teaching assistant, math tutor, etc."

Activity 1: Recap the review process

(35 minutes)

Objectives

Students

- Review the collaboratively constructed process for debriefing an event.
- Identify revisions necessary to continually improving this process.

Note: In this activity, students review and revise the debriefing process they collaboratively designed and implemented in Lesson 18. In Activity 2, students will apply the process to debrief their final exam. Their goal for the debrief is to identify what they will continue to do or what they will change in order to get their desired result. Students should be taking notes throughout this activity so they have the information needed to implement the process during the next activity.

1. **Have students reconstruct the debriefing process they used to debrief the midterm exam.**
   - What steps were outlined for this process? What are other important things can you recall being important parts of this process?
   - *Facilitation note*: You can have students work in trio groups to reconstruct the process and provide an opportunity for groups to compare their reconstructions. Alternatively, you could post the visual representation of the process the group created during Lesson 18 and focus this activity more on making revisions to the process.

2. **Distribute Appendix 29-A: Exam debrief report.**
    - Students can use this handout as a guide for the remainder of Activity 1 and for Activity 2.
    - This debrief report is expanded from the report students used in debriefing their midterm exam. Sections prompting reflection on the reflection process changes and feelings during implementing it a second time have been added.
3. **Have students revise the debriefing process.**
    - Students should use the first box on Appendix 29-A to note revisions they would like to make to the process. You can opt to have students discuss some of the revisions in a large group, but ultimately each student should implement the changes they feel are most appropriate for them—students should not uniformly be applying the same exact process.
    - Example prompts to help students brainstorm revisions include "What parts of the process worked well?" "What changes should be made now that you are implementing it for a second time?" "Why will these changes make the process more effective?"
4. **Transition to next activity**:
    - Tell students that they should continue to refine the process each time they implement it. The next activity has students using the revised process to review their final exam.

Activity 2: Apply your review process

(25 minutes)

Objectives

Students

- Analyze their test performance.
- Identify trends they observe about their performance.
- Set intentions to guide future actions—continuing to do what has worked well and modifying strategies that have not contributed to the desired outcome.
- Compare their experience debriefing the final exam with their experience debriefing the midterm exam.

1. **Hand back student final exams.**
    - Make sure to have copies of the correct answers and any grading rubrics available for students to reference. Have samples of A-grade student essays or a list of key concepts expected of high-scoring essays available.

2. **Discuss common errors or issues you saw consistently across the class set of final exams.**
    - Balance out the feedback by including at least one positive thing you noted and one correction you would like students to make.
3. **Students apply process to reviewing final exam.**
    - During the midterm debrief, students recorded their steps and their thoughts as they applied the process. You can ask students to repeat this recording if it is appropriate for your students, but it is not necessary.
    - Instruct students to continue making notes about applying this process on Appendix 29-A.
    - Use Appendix 29-B as a guide as you circulate and work individually with students as they complete the debriefs. The ideas contained in this resource will help you prompt students to dig deeper into their analysis and hone in on the underlying contributors to their performance.
4. **Collect the final exam, any related answer keys you distributed, and the completed Exam Debrief Report.**

Wrap-Up

(5 minutes)

Preview the next lesson:

- In the next lesson, students will interact with each other as though 10 years have passed and they are meeting up again for a reunion. Consider distributing the talking points outlined in Appendix 30-A so students can prepare for class, getting into the right mindset and thinking through what their life will be like in 10 years.

Appendix 29-A: Exam Debrief Report

What revisions to the process do you think are necessary? *Use your previous experience implementing the process to identify improvements you think will help you better identify trends in your work and their underlying causes.*

What trends did you find? *(e.g., I found that I did well on questions in the following categories… I found I spent too much time on questions I was unsure of. I found that I did not write with the level of detail my instructor expected of me.)*

Write three to five positive intention statements that reflect concrete strategies based on your findings. *(e.g., I will take two minutes at the start of the exam to review the test in its entirety in order to make good use of my time.)*
1
2
3
4
5

Compare your experience debriefing the final exam with your experience debriefing the midterm exam. Consider discussing similarities and/or differences in your motivation for completing the debrief, *the emotions you felt as you worked through the process, and the trends in your performance you identified.*

Appendix 29-B: Instructors' Guide for Eliciting Students' Identification of Exam Performance Reflection Questions

The following questions are examples of what students should identify to help them dig deeper into *why* they earned full credit or lost points on exam questions. They are provided here to help you prepare for eliciting this thinking from your students during Activity 2.

Did you study the information covered in this question?

If yes:

- What resources and strategies did you use to identify that this information was important?
- How can you continue to use this information in the future?

If no:

- How can you be more proactive in discovering what content will be covered on the test?
- What resources and strategies can you use to identify the information likely to be covered on the exam (e.g., course syllabus, classmates, tutors, instructor)?

Did you study the information covered on the test, but still got the question wrong?

If yes:

- What kind of strategies did you use to learn this information? Were you relying on short-term memory devices or did you work to move the information into long-term memory by using organization and elaboration strategies?
- What kind of self-assessment can you apply as you are studying to make sure you are understanding *and* remembering the information?

If no:

- Were you 100% confident in your response when you marked it?
- Was this an easy problem for you, or was it a little more challenging?
- Did your expectation about how deeply you would need to know this content match the depth called for by this question?

Did you do poorly on one type of question (such as multiple choice, essay, problem solving)?

If yes:

- What type of question did you struggle with?
- How did you study for this specific type of question?
- How can using Bloom's Taxonomy help you prepare for this type of question in the future?

If no:

- What strategies did you use for each type?
- How did they differ?

Did you follow directions?

If yes:

- What guidewords and key terms in the directions turned out to be most helpful?

If no:

- Did you read the directions?
- Was something in the directions unclear?
- What guidewords and key terms would have been helpful?
- What process could you use while testing to make sure you are following directions?

Did you lose points because you just did not answer the question?

If yes:

- Did you run out of time? What elements of the exam situation led to your running out of time? How might you better plan your time management on future tests?
- Did you overlook the question or the specific part of the question you didn't answer?

If no:

- How did you allocate your time across the questions? Is there anything you would tweak about this time allocation going forward?
- Did you almost miss answering any part of this question? How did you catch yourself? What can you do in the future to make sure you answer all of parts of the question?

Did you know the material but made careless mistakes (such as calculation errors)?

If yes:

- Were you rushing?
- Did you stop to carefully consider what the question was asking?
- Did you double check your answers and proofread carefully before submitting your test?

If no:

- Were there any close calls?
- How did you avoid making careless errors?

Did you panic and become too stressed to answer any of the questions, even those for which you knew the answer?

If yes:

- What caused you to panic?
- Was it something you could control in the moment?
- What can you do in the future to address the cause you think triggered the panic?

If no:

- Why do you feel you did not panic?
- Do you feel that this not panicking is something stable—that is, is it something that you will be able to do again in the future?

Lesson 30
Where Will You Be in 10 Years?

Overview

Week: 15 of 15
No. of Lessons: 2 of 2
Lesson Length: 75 minutes
No. of Activities: 1
Supplementary Materials: Appendices 30-A and 30-B

Over the past 15 weeks, this course has focused on four key themes associated with student success: Community Building, Student Motivation, Study Strategies, and Finding Direction in College.

In this final lesson, all four themes come together in an activity that celebrates not where students are now, but where they intend to be in 10 years' time. This atypical end-of-semester party is inspired by a goal-setting exercise outlined by The National Institute for Staff and Organizational Development (NISOD) in *Innovation Abstracts*, Volume XXXIV, Number 11. This exercise is available in Appendix 30-B.

In this final activity, instead of talking about what they hope to accomplish in the future, students will talk about future events as if they have already happened. As the NISOD document says, "It is more about *who they are* and *who they want to become*," which can have a powerful effect on individual and group motivation.

All that remains to be said is: Let's party like it's 2023!!

Student Objectives

Develop and pursue useful goals.

- Students set, monitor, and adjust long-term personal, professional, academic, and social goals.

Apply strategies to maintain motivation.

- Students maintain their motivation by focusing on controllable academic behaviors and using strategies to monitor and manage their attitudes, emotions, and thoughts when facing challenging tasks or academic setbacks.

Identify future college and career pathways.

- Students explore the characteristics and required skills of various career paths and consult with advisors and instructors to determine an appropriate path to follow.

Resources and Preparation

Materials and Technology Required

- Party supplies
- Appendix A – Talking points for 10-year reunion party conversation
- Appendix 30-B

1. **Background information**
   - Familiarize yourself with the activity (see Appendix 30-B) and the suggested talking points for conversations (Appendix 30-A). Consider the entire semester and determine which course concepts or ideas you want to be sure to emphasize one last time.
2. **Entry logistics**
   - Rehearse greeting students as though 10 years have passed; be prepared to model the expected dialogue.
3. **Make copies of the following materials for students:**
   - Appendix 30-A: Talking points for your 10-year reunion party
4. **Activity 1: Let's party like our (successful) future is now: The 10-year class reunion**
   - Write some talking points on the flip chart to keep the party conversation focused on the main purpose of this reunion: to share in each others' successes (see Appendix 30-A).
   - Create a celebratory atmosphere in your classroom.
   - Remind students by email that they can dress up for the party as much as they like. Also tell students that the moment they step into the room, it is no longer a classroom but their 10-year class reunion in 2023 (or later) and that they should talk, using the present tense, about who they are in 2023 and how they reached their goals since graduating college.

Instructional Plan

Activity 1: Let's party like our (successful) future is now: The 10-year class reunion

(50 minutes)

Objectives

Students

- Embody their possible selves in 10 years' time, conversing in a way that brings their intended educational, career, and life goals into the present moment.

1. **Welcome students.**
    - Welcome students as if you haven't seen them in 10 years. Invite them to grab some food and a beverage (if you have chosen to provide refreshments).
2. **Act as master of ceremonies once all students are present.**
    - Catch them up on what your life has been like the past 10 years, where you are now in your career, and how thrilled you are to share in their successes.
    - Point out that to keep the conversation flowing (and you will be mingling throughout the next hour or so), you have some suggested talking points on the flip chart (see Appendix 30-A for list of potential topics).
3. **Students gather and converse.**
    - Mingle among them, gently reminding them to use the present tense (not "I hope to become an electrical engineer" but "I am an electrical engineer"). You can also help make connections among students whose work may overlap in the future.
4. **Monitor the energy level and engagement of the students.**
    - If conversations appear to be waning, put on some music, blow up some balloons, and try to keep the party atmosphere light and fun.
    - To quiet everyone, you could invite volunteers to share some of the big and small successes from the past (imaginary) 10 years.
5. **Bring the event to a close (students will only be too happy to get out of class early!).**

Wrap-Up

(5 minutes)

Make end-of-semester announcements you wish to make to the whole class, including an invitation to visit you in the future and to come to you with questions they may have in future semesters.

Appendix 30-A: Talking Points for Your 10-Year Reunion Party

1. What are you doing now?
2. Who is your employer? Where are you located?
3. What does your job involve? What are you responsible for?
4. How has this career/job benefited your lifestyle (travel; opportunities for promotion)?
5. What do you love most about your job (not just the money you make)?
6. What did you feel like when you graduated from college? How did you celebrate?
7. What did you do directly after graduating from college? How did you get to be doing what you're doing today?
8. What other qualifications (certificates, degrees, accreditations) did you achieve after leaving school?
9. Tell me something about your family (partner, children, etc.).
10. What do you like to do in your spare time? (Hobbies, volunteering, etc.)
11. What do you remember most about the Student Success course we all took together?
12. What do you tell people about that course and how it helped you reach the level of success you've achieved today?
13. What skill or strategy that we learned in the course do you use even today in your work?
14. What do you think about math now that you've successfully completed your education? How does math contribute to the work you do today?
15. Where did you go for your last vacation? Where are you planning to visit next?
16. Do I seem different from how I was when we were in class together? In what ways?
17. What's the best thing that's happened to you in the past 10 years?
18. What big goal are you looking forward to accomplishing next?
19. Ten years ago, when we were still attending that student success course, how much did you think you'd be where you are today?
20. What do you think you'll be doing in another 10 years?

Appendix 30-B: NISOD Innovation Abstracts Activity (used with permission)

Volume XXXIV, Number 11

NISOD INNOVATION ABSTRACTS

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LET'S PARTY LIKE OUR (SUCCESSFUL) FUTURE IS NOW: THE 10-YEAR CLASS REUNION AS A GOAL-SETTING EXERCISE

One of the most challenging tasks college students face is defining and developing educational goals that align with their dream career. These students who never define an end or career goal often lose all motivation and drop out of college. Some students do have a specific career dream; unfortunately, it is often not grounded in any understanding of the education or training required to meet it. Overwhelmed by the work required, when students do not see the end in sight quickly, they lose momentum. Even worse, they complete a certificate or degree only to find out that the dream was not what they expected it to be. As educators, we know that having a clear view of what awaits and developing specific career-oriented milestones is important for students' retention and success in college, and even, perhaps, their satisfaction in their chosen career.

NO DEVELOPED GOAL = NO MOTIVATION = NO RETENTION

It is not uncommon to have students research their chosen career and type up a report or give an oral presentation. However, a more fun and interactive way to engage students and help them with the daunting task of defining and developing goals is by hosting a mock ten-year class reunion in the classroom. The purpose of the ten-year reunion is to get students thinking realistically about their future education, profession, lifestyle, and family, and to have fun while doing it. The 10-Year Class Reunion Exercise is a very effective way to encourage students to plan their future educational milestones, visualize their goals, learn about their chosen profession, and understand how their chosen profession will affect their lifestyle and family.

The visual stimulation and present-tense language may also increase self-esteem. There is a difference between saying "I hope to be a nurse" and saying "I am a nurse." Using present-tense language and thinking can help students move to long-term thinking and plan for their future. This can have a positive impact on students' levels of motivation, and it can be very empowering. This type of activity moves beyond naming the title of their career and how much money they will make. It is more about *who they are* and *who they want to become*. Role-playing a future-self can be very therapeutic, as students may consciously acknowledge some of their primary motivators (internal or external).

There are many variations and different ways to develop a 10-year reunion assignment. This activity can be used in a first-year experience course, a trio program, career counseling, and an introductory course for a particular discipline.

One way of operationalizing the assignment is to set up a short field trip to the library. There, the library staff can introduce students to such resources as the card catalog, the Occupational Outlook Handbook, and other online occupational sources. Students receive a handout, prior to going to the library, with a list of possible questions to answer about their future life. It is best to really encourage them to think about details. For example, one question that worked very well was to ask them how they would need to dress for their chosen career. This simple question forced them to confront the realities of professional life, ie. scrubs, heel-and-hose for meetings, etc. Another question that was a "reality-check" for many students was the one referring to location. Students need to think early in their college career about the fact that some degree pursuits and careers could take them far from home and their geographic comfort zone. The following list summarizes the areas that the questions covered. [A complete copy of the assignment can be obtained by emailing either of the authors.]

- Employer and prospective employers and in what city these employers are likely to be found
- Job title/ description
- Typical everyday tasks
- Salary
- What do you like about your job? (something other than money)

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- Attire
- Educational institutions attended
- Certificates and degrees attained
- Advancement and future aspirations or education required
- Family, marriage, kids, etc.
- Commute
- Hobbies
- Volunteerism

Variations

The assignment can be varied for each discipline. For a major's course, students could prepare by interviewing someone on their desired career path. They could be encouraged to think in depth about the possibilities of advancement within that major or how that degree could serve as a "springboard" into a variety of employment opportunities. Students often have a very limited view of career options within a chosen career (i.e., "all history majors teach") and have not really thought about the other options available to them. The assignment can be adapted to fit each student personally and for virtually any course or program. A course in a modern language, such as French, could look at all the careers where an understanding of a foreign language would be an essential or an asset. Alternatively, they could simply complete this assignment orally and explain their future to other students *en Francais*. For a very scholarly course, the students could produce a list of pertinent books they will have read in the first 10 years of their career.

The Reunion Party

After the students have done their research and had time to think about the list of questions, it is party time. We all know how to party—it usually involves food and a lot of laughter. The laughter starts as students use the "present tense" for the year 2022. And there is a lot more laughter as students supply pictures of their dream house and cars or even their spouses. Some of the students at Texarkana College even brought their high heels in their back packs to slip on for the big class day. The National Park students were even curious to find out where the instructor would be in 10 years! Sharing can be done orally or through PowerPoint, and a paper can also be required (to work on their writing skills).

Assessing the 10-Year Reunion Party Assignment

Neither of the authors has assessed this specific assignment through a survey. However, Texarkana College and National Park Community College have collected statistics on retention in their College Success/Seminar Courses (the incubator of this assignment). Statistics show a significant difference in retention if students participate in such a course—a course which centers on goal setting and wise decision making for future careers and life. Retention data for National Park Community College for first-time, full-time students who took College Seminar are available at http://www.oncourseworkshop.com/Data.htm. For data on Texarkana College's Quality Enhancement Plan (which is centered on College Success classes), go to https://www.texarkanacollege.edu/PDFFiles/InstitutionalResearch/QEP/QEPImpactReport.pdf.

Measuring the success of the specific assignment can be done in several different ways. Students could complete a debriefing form that addresses the intended purpose of the assignment and whether or not students perceived that they met that objective, if they enjoyed the assignment, and if they thought it was useful or helpful. The assignment could be evaluated by comparing the number of students who declared a major before and after the assignment, or by giving the assignment near registration time to determine if the students who completed the assignment did indeed register. Of course, other variables would affect the assessment. However, if students were surveyed to see what factors influenced their re-enrollment, this assignment could be included as one of the possible factors.

Summary

The 10-Year Reunion Assignment is a pleasant way to encourage students to define and develop goals. The present-tense language encourages self-esteem and reflection. The specifics of the assignment can be useful in a variety of ways on campus, from counseling to TRIO to College Success to introductory courses. Data resulting from courses that focus on goal setting and decision making have shown that such an emphasis encourages retention.

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Suanne D. Roueche, Editor
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Frameworks for Mathematics and Collegiate Learning

Fall 2013

[Your School Name Here]

Instructor:
Email:
Phone:
Office Hours:

Welcome!

Well done! By enrolling in this course, you are showing that you take your college experience seriously and intend to become a learner who takes responsibility for his/her academic success.

I hope that you will not only learn a lot in this course, but also find it fun and engaging. Each lesson is made up of a series of different activities, so you won't be expected to listen to me lecture the whole time! In fact, I hope that you and the other members of the class will work with me to create a fulfilling class experience—by fully participating in the discussions, being an active member of the various peer-group activities, and communicating to me your thoughts and suggestions about the material I am about to share with you.

This course will be challenging only for anyone who refuses to bring 100% commitment to each lesson. That's not you . . . so let's look forward to your earning an A!

Course description

This course has been designed to give you a different experience than what you may have experienced in other courses. Specifically, this course offers:

- A welcoming environment.
- A strong community-building component, including establishing trust with the instructor and clarifying course expectations in a fun, inclusive way.
- Ways to stimulate motivation for attendance and participation.
- Ways of onnecting the purpose of this course (both for math success and overall success in college) with your personal interests and future direction.

Course topics covered include goal setting, effective time management, note-taking strategies, how to undo bad academic habits, test-taking strategies, how to read a math textbook, and much, much more.

Required readings/supplies

In addition to the books and supplies listed below, I will occasionally distribute reading assignments. You are required to read all assigned material. The reading load is not designed to

be heavy. As with any lecture or discussion material, reading material is fair game for exams, quizzes, or in-class discussions. You should bring the course textbook to class each class session.

- Book information
- A 2 to 2 ½" thick binder with four tabs: syllabus, journals, notes, assignments/quizzes

Learning environment

Your enrollment in this class acknowledges that you intend to learn the course material. Behaviors that would impede the learning process will not be permitted. These behaviors include, but are not limited to, reading newspapers or books, text messaging, surfing the web, answering cell phones, and talking out of turn. If you are not sure what is appropriate, please ask me. Students are responsible for knowing and following common sense rules of behavior. I am committed to creating and maintaining an open, productive, intellectually engaging learning environment. Disruptive students will be instructed to leave the classroom. This is college, so warnings will not be issued. Please also read the Respectful Classroom Behavior document (Syllabus Appendix B) for more information about appropriate behaviors and classroom expectations.

Objectionable material warning

This is a college course, and you should know that anything is fair game. The college classroom is a unique place in society in which any ideas, opinions, and perspectives are welcome and should be shared, respectfully. You may find some of the material offensive. There will not be any inappropriate language.

Learning outcomes

By the end of this semester, through class lectures, videos, discussions, in-class activities, and a variety of written and other assignments, you will increase your written and oral communication skills, critical thinking abilities, and toolbox of study strategies.

High-level course objectives

Students

- demonstrate a positive mindset toward learning and maintain motivation.
- develop a process through which they change negative, self-defeating habits into positive habits.
- make personal connections with peers, their instructor, and other campus support personnel.
- develop and pursue useful goals.
- demonstrate organization of time and study materials.
- describe how to store and retrieve information from their memory.
- demonstrate effective reading and note-taking strategies that enhance retention and comprehension.

- distinguish effective test-taking strategies to be used before, during, and after taking a test.
- employ critical thinking skills when approaching challenging tasks.
- demonstrate written and oral communication that is appropriate to context and that effectively conveys meaning and logic.
- identify future college and career pathways.
- locate and use support center services.
- use technology throughout the course.

Course requirements

You are required to complete all assignments, participate in class discussions (including those involving your Success Team and Expert Group), and submit all written work according to the stated deadline. College instructors expect students to spend time outside of class reading, writing, and studying course material. Specifically, for every hour you are in class, you need to study for two to three hours. This means working on this class material for approximately 100 hours outside of class. This is college!

The breakdown of the course requirements is as follows:

25%	Assignments	Ongoing
15%	Participation	Ongoing
15%	Midterm Exam	See attached
15%	Final Exam	See attached
15%	Career Project	See attached
15%	Group Presentation	See attached

Semester grades will be earned as follows:

90% and above	A
80 %–89%	B
70 %–79%	C
60%–69 %	D
59.9% and below	F

Assignments (20% of semester grade)

The biggest single percentage of points for this course comes from completing regular assignments. These assignments will vary—they include, for example, journal entries, time management plans, exam debriefs, and goal-setting outlines—and they will offer many opportunities for you to apply what we are studying in class immediately. Completing these assignments on time and thoroughly will earn you full credit.

A special note about journal assignments: Journaling in this course is designed to help you reflect on the course material and your experiences outside of class and college and to stimulate insights into becoming a more successful learner overall. See Syllabus Appendix C for information about how journal entry writing is graded. Please type your journal (see "Guidelines

for written work.") When your journal is returned to you, please put it in your binder. Further instruction on the value of journaling and feedback will be given throughout the course.

Participation (15% of your final semester grade)

Your participation grade will be based on your informed contributions to classroom discussions and exercises. You will participate in graded activities in every lesson. Some of these might take place outside of the designated classroom (e.g., in the computer lab or the library). Participation grades will be based on the following:

- **Level of engagement/listening skills:** You (almost always, sometimes, rarely, almost never, OR never or very, very rarely) engage with course lectures, discussions, and activities with eye contact, taking notes, and makes thoughtful contributions.
- **Behavior:** You (almost always, sometimes, rarely, almost never, OR never or very, very rarely behave appropriately (e.g., demonstrate active listening during lectures; show respect to the differing view of group members, etc.) in the classroom.
- **Preparation:** You (almost always, sometimes, rarely, almost never, OR never or very, very rarely) come to class with a pen, paper to take notes, and having read any necessary information to provide informed comments to course discussions and activities.
- **Collaboration:** You (almost always, sometimes, rarely, almost never, OR never or very, very rarely) collaborate (or work in groups) in appropriate and fair ways.

Points will be earned as follows:

4 points, almost always (80-100% of the time)

3 points, sometimes (60-79% of the time)

2 points, rarely (40-59% of the time)

1 point, almost never (20-39% of the time)

0 points, never or very, very rarely (0-19% of the time)

If you interact with me outside of class—coming to in-person or virtual office hours and/or communicating via email and demonstrate interest in doing well in this course, you can earn up to four additional points.

A special note about attendance:

Attendance is mandatory. You are expected to attend every class, to arrive on time, and to remain the entire period. You need to be here in order to participate in in-class activities! It is your responsibility to find out what you missed in the case of an absence. In college there is no such thing as an "excused absence." You may miss two classes without any penalty to your grade. For each absence over two, you will lose points off your final grade as follows:

3 absences – 2 points

4 or 5 absences – 5 points

6 or 7 absences – 8 points

8 or more absences – Failed class

Students who have eight or more absences will automatically receive an F for the semester!

Attendance is so crucial for success that if you miss no more than one class, you will receive an extra 5% on your final grade. This means that if your final course average is 85% (B), your final grade could be increased to 90% (A).

Projects (both projects combined are worth 30% of your final semester grade)

You will complete two projects this semester: an individual career project and a group presentation project. More details about each project will be given in class at the appropriate time.

Exams (each exam is worth 15% of your final semester grade)

You will complete two exams this semester, a midterm and a final exam. The essay portions of the exams will be completed outside of class and brought to class on exam day. The multiple-choice parts of the exams will be conducted in class. More details will be given in class, including how to prepare to ace these exams. Exams may not be taken or submitted late—no exceptions.

Guidelines for written work

In-class assignments must be completed in blue or black ink—work completed in any other color or in pencil will not be graded. In-class work must also follow standard English usage—including complete sentences. Of course, you are not expected to create polished in-class work.

Out-of-class written assignments must have one-inch margins on all four sides, be double spaced, and be done in the Times New Roman font, size 12. Please note that correct spelling and grammar and a clear, easy-to-read writing style all count toward your grade. Use professional, formal, college English (i.e., no text-message language, contractions, clichés, or slang, for example).

After graded work is handed back, take some time to review my feedback. Letting the feedback soak in for 24 hours before approaching me with questions and comments gives you an opportunity to reflect and come into the conversation with an open mind, rather than being emotionally fired up about your grade. You should prepare clear and specific questions before inquiring about why a certain grade was assigned to your work. Grades will be changed only if I made mistakes.

Late work policy

Since a core focus of this course is to prepare you for experiences in higher education and/or your future in the workplace, completing work on time, in accordance with the good time-management skills you will learn in this course, is considered highly desirable and an important habit to develop. For this reason, points can be deducted for late work. If you are having trouble completing an assignment on time, please contact me as soon as possible. If possible, I want to work with you so you can submit the assignment without losing points.

Academic honesty

This college assumes that students eligible to perform on the college level are familiar with the ordinary rules governing proper conduct, including academic honesty. The principle of academic honesty is that all work presented by you is yours alone. Academic dishonesty, including but not

limited to cheating, plagiarism, and collusion, shall be treated appropriately. Please refer to the college's Student Guide for more information. Turnitin.com, Safe Assign, and other technologies will be used, as necessary, to ensure academic honesty.

You must complete all work independently unless otherwise instructed. Plagiarism, cheating, or any related offensives will result in an automatic zero for that assignment—no exceptions, no excuses!

Withdrawals

If for any reason you need to drop the course, it is your responsibility to inform me officially (i.e., in writing) in a timely manner. If you are considering dropping, please try to meet with me to discuss your options. I may be able to help you find solutions to some of the challenges that may be affecting your progress in class. If I can help, I would like to! Ultimately the decision is yours; therefore, I will not drop students for any reason. All students who remain in the course will receive a grade based on their performance. The last day to withdraw is [*insert date here*].

Accommodations

This college is committed to providing equal educational opportunities to every student. We offer services and technologies, including counseling, tutoring, special equipment and software, for individuals with special needs and capabilities. Please contact [*insert contact name, email, and phone*] for further information. Students must notify the instructor of any accommodations needed during the first week of class.

Email

Communicating with others via email is an important skill to succeed in today's world. I will communicate important class-related information via email, so it is important that you check your official college email often.

It is critical to know your audience when communicating in this medium. When you communicate with your instructor or your peers, you should be mindful of how your message may be interpreted. Please consider the following guidelines when communicating with instructors:

1. Appropriate salutation (e.g., Dear Mrs. Smith)
2. Brief introduction of yourself (especially important early on in the semester) so the instructor knows who you are
3. Subject heading that includes identifies the class and indicates the general nature of your communication (e.g., "Question about Career Project")
4. Polite closing (e.g., Thanks, Best Wishes, Sincerely, Cheers, etc.).
5. Short, to-the-point message
6. Proofread, proofread, proofread!
7. Avoid slang, text-message language, and acronyms (e.g., LOL).
8. Avoid sending an email when you are angry or upset.

Disclaimer

THE COURSE INSTRUCTOR RESERVES THE RIGHT TO MAKE CHANGES TO ANY PART OF THE COURSE REQUIREMENTS, ASSIGNMENTS, POLICIES, DEADLINES, CONTENT, ETC. You are responsible for keeping track of any and all changes. The instructor assigns grades based solely on performance, not on effort or anything else. If you anticipate any difficulty meeting course requirements or deadlines, you should contact the your instructor well in advance. If an emergency should happen (e.g., hospitalization), formal documentation is required, and the instructor will be more than happy to help the student to complete the course successfully.

Copyright protection

Final words

I am delighted you have chosen to enroll in *Frameworks for Mathematics and Collegiate Learning*! I commend you for placing such importance on doing well in college and on developing skills that will not only potentially improve your grades and standing in college, but also ensure you become a lifelong learner.

Syllabus Appendix A: Tentative Course Calendar

Unless otherwise noted, we will follow the tentative course calendar shown below. This is not a comprehensive list of topics, just a glance at what will be covered. More details will be given in class at the appropriate time.

1. Introductions; building the foundation for our success
2. Finding the support to be successful
3. The plastic brain and smart thinking
4. Getting ahead with Better Note Taking
5. Tackling technology fears and frustrations
6. Meeting and academic advisor and career counselor
7. Building success teams and identifying your impact on the world
8. Creating motivating goals and the Career Project
9. Managing priorities and time
10. Metacognition
11. Building a better memory – focus on attention and deep processing
12. Building a better memory – focus on elaboration and organization
13. Identifying important information as you read
14. Critical thinking
15. Preparing to do well on exams
16. Where we've been, where we're going
17. Midterm exam
18. Midterm exam debrief
19. Working in groups
20. Library resources
21. Using library resources and introducing the group presentation project
22. Effective oral communication and using evaluation rubrics
23. Career project sharing and course planning
24. Success team presentations
25. Success team presentations
26. Success team presentations
27. Reviewing course material
28. Final exam
29. Final exam debrief
30. Looking forward 10 years

Syllabus Appendix B: Respectful Classroom Behavior

We all benefit when:

- Everyone feels comfortable and free to share their thoughts in a safe and supportive environment. Please consider this before challenging, questioning, or contradicting the input of other students.
- All students understand they are being listened to in their own time, in their own way. This includes students who may speak more slowly or take a longer time to articulate their thoughts than you. Please do not interrupt a student who is still speaking; wait until they have finished before making your contribution to the discussion.
- We actively listen to other's opinions and insights.
- Contributions made to discussions are thoughtful, supported by examples (to make the meaning clearer) or evidence (e.g., sharing the original source).
- We are willing to take risks in sharing opinions that might be different than those ascribed to by the majority. Diversity of thought is as much a classroom asset as other, more established forms of diversity!
- You do not just accept without comment when the instructor says something you do not understand or agree with. No instructor minds being intellectually challenged, as long as it is done respectfully.
- Someone asks a question. Because chances are, someone else in the class wanted the answer, too, but was too shy or nervous to ask. So asking questions does the whole class a favor.
- We choose to engage fully in class discussions. Let's make them as lively and rich as possible—this is your responsibility as well as the instructor's.

Additional points to consider regarding contributing to class discussions:

- If you thought of something after class ended, take the opportunity to raise the issue in an online thread (Blackboard or equivalent).
- Remain open-minded! It is a myth that smart people stick to their original views. In fact, the smartest people are those who are willing to be swayed by reasoned argument and revise their views and opinions accordingly.
- Take the opportunity to continue class discussions in your success teams and/or study groups. The more you actively work with the material we cover, the more embedded in your long-term memory it will be.
- Remember, the richness of this course experience, for you and for your peers, depends on your playing an active role in discussions. Speak up!

Syllabus Appendix C: Journal/Informal Writing Rubric

Student's Name: _____ Lesson # and Topic: _____ Date: _____

	Inadequate	Good	Exemplary	Explanatory Feedback
Introduction of Topic	Topic is not immediately introduced.	Topic is immediately introduced. The introduction previews or hints at major points in the reflection.	Introduction is unique and interesting. Introduction gives some direction as to where the reflection will go.	
Internalization	No connection or reference to the lesson.	References to the lesson are present with minimal depth.	Clear and relevant references to the lesson and/or topic presented in class are present.	
Reflection	Does not draw from experiences to connect to the topic.	Minimal discussion of experiences related to the prompt are present.	Meaningful appreciation for the topic exhibited by clear examples, anecdotes, and ideas related to the topic are present.	
Application and Connection	No connections made between this topic and other topics in class.	Connections made between this topic and other topics in class.	Connections made between this topic and other topics in class. Considerable thought given to how this topic connects to matters outside of class.	
Overall Cohesion and Clarity	Unclear or difficult-to-understand writing and/or requires significant editing to make sense.	The writing makes sense and is not obstructed by grammar or usage errors.	The journal is compelling to read and has few (if any) grammar or usage errors.	
Additional Feedback				

Syllabus Appendix D: Exam Short Essay Grading Rubric

Student's Name: _____ Response #: _____ Date: _____

	Inadequate	Acceptable	Good	Exemplary	Score
Introducing the Topic	First paragraph does not clearly indicate the topic of the written response.	Topic of the written response is introduced in the first paragraph.	Topic of the written response is clearly introduced in the first paragraph. Introduction previews or hints at major points in the response.	Introduction grabs the reader's attention in a unique and interesting manner. Introduction previews or hints at the major points that follow in the response.	
Addressing the Question	The written response does not address the question asked.	The written response addresses only a few parts of the question asked.	The written response addresses a majority of the parts of the question asked. The written response is the appropriate length (250–500 words).	The written response addresses every component of the question asked. The written response is the appropriate length (250–500 words).	
Depth of Response	The written response does not reference topics of learning from the course.	The written response demonstrates a cursory understanding of the topics presented thus far but may lack detail.	The written response shows some understanding of the topic presented in the lesson.	The written response clearly demonstrates the student's depth of understanding about ideas and concepts presented in the course thus far.	
Applying and Connecting	No connections are made between the topic and what has been learned thus far in the course. Little or no application of the topic's learning is evident.	Some connections are made between the topic and what has been learned thus far in the course. Some application of the topic's learning is evident.	Explicit connections are made between the topic and what has been learned thus far in the course. Explicit details and examples that suggest application-level understanding are included.	Considerable thought to what has been learned in the course is included. Well-developed and clear responses demonstrate application-level understanding. Depth and complexity are evident throughout the written response.	
Writing and Clarity	The writing is difficult to understand and/or requires significant editing to make sense.	The writing is readable and clear.	The writing makes sense and is not obstructed by grammar or usage errors.	The response is compelling to read and has few (if any) grammar or usage errors.	
Additional Comments				**Total Score**	

Frameworks for Mathematics and Collegiate Learning Syllabus Quiz

Student Name: _____

1. What is the course instructor's office phone number?
2. On what day(s) and time(s) are office hours held?
3. List three course objectives that are of most interest to you.
4. What percentage overall will result in a C grade for the semester?
5. True or False? For any false statement, please correct the statement.
   a. Attendance is crucial for success in this course.
   b. Both the midterm and final exam are completed entirely in class.
   c. Written work can be handed in using green and red ink.
   d. Assignments can be handed in up to three weeks after the due date.
   e. Any student who attends class, takes good notes, completes assignments, and studies outside of class should receive a good grade in this course.
6. What are the criteria for receiving maximum points for participation?
7. How many absences will result in an automatic F grade for the semester?
8. What are the two projects you will complete during the semester?
9. What percentage of your final grade will accrue for completing your journal assignments?
10. Whose responsibility is it to officially notify the instructor that you are dropping the course?
11. In what two ways can you gain extra points?
12. How are you expected to present your typed assignments?

Frameworks for Mathematics and Collegiate Learning Syllabus Contract

I (insert full name) _____

confirm that I have read and understood the syllabus for Frameworks for Mathematics and Collegiate Learning and fully commit to adhering to the instructions given, including appendices.

Signed: _____

Date: _____

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Instructions for Career Project

In order to succeed, millennials reported they need to pursue higher education, obtain transferable skills, hold a variety of jobs and perhaps even pursue multiple career paths. The research also shows that millennials would like their work to be personally meaningful.

—*How the Recession Shaped Millennial and Hiring Manager Attitudes About Millennials' Future Careers*, 2011[1]

Purpose

This project is intended to help you step more confidently into the future, career-wise. In keeping with current trends, you are encouraged to think less about a specific job and more about career clusters—areas that offer a variety of opportunities for your skills, talents, and interests as you move through college and beyond. Use this opportunity to shift your perceptions toward becoming more of who you can be (remember the concept of *possible selves*/*possible lives*). See this project as an opportunity for self-exploration and investigation into career options you might not otherwise have considered.

Directions

Drawing on all the activities and resources you have completed in class—visiting the Career Center, talking with academic advisors and career counselors, thinking about the impact you want to make on the world around you, and your life goals—you will research a career field, analyze data about that field, and develop an action plan for achieving your goal

This project has three distinct assignments:

- Identify possible career paths by completing the *Possible Selves/Possible Lives* Mind Map and Reflection.
- Analyze one of the possible selves mind-map branches by completing a SWOT (strengths, weaknesses, opportunities, and threats) analysis.
- Develop an action plan based on the results of the SWOT analysis.

This project will be completed independently and mostly outside of class. You will need to take advantage of campus resources (having one-on-one conversations with an academic advisor, taking one or more career-related assessments, talking to a career counselor about researching career fields, and so on) in order to complete the project assignments.

[1] Alexandra Levit with Dr. Sanja Licina. (2011). *How the Recession Shaped Millennial and Hiring Manager Attitudes about Millennials' Future Careers*. Chicago, IL: Career Advisory Board, presented by DeVry University. Retrieved January 4, 2013, from www.careeradvisoryboard.org/public/uploads/2011/10/Future-of-Millennial-Careers-Report.pdf.

Possible Selves/Possible Lives Mind Map and Reflection

Due date: _____

Grading

This assignment is worth a total of _____ points. Your grade is based on the degree to which you discuss the themes/patterns you see and what you have learned about yourself.

Instructions

1. Complete a *Possible Selves*/*Possible Lives* Mind Map (see examples at the end of these instructions). Use your notes from the class discussion about the impact you want your life to have on the world around you to get started.
    a. If you have trouble coming up with possible selves, visit the career center and work with a career counselor. A counselor can help you fill out a career assessment, which should provide some ideas for you to consider.
2. Write a one-page reflection on your *Possible Selves* / *Possible Lives* Mind Map. Discuss the following:
    a. What themes/patterns do you see across the possible selves you've identified?
    b. What branch of your mind map are you most committed to pursuing? *You will focus the remainder of this career project on this branch, so choosing the path you are most invested in will make sure this project is a good use of your time and resources.*
    c. What motivates you to pursue this particular branch?
    d. List any specific questions you have about this branch/career field that you want to find answers to in the remainder of this project. *Try to identify at least one question you want to investigate.*

Deliverables

You should turn in the following documents:

- Mind map
- Reflection

SWOT (strengths, weaknesses, opportunities, and threats) Analysis

Due date: _____

Grading

This assignment is worth a total of _____ points. Your grade is based on the degree to which you demonstrate that you have done the background research into your career field and have thoughtfully analyzed internal and external factors that influence your career prospects. Each section of your analysis should be at least one page long.

Instructions

1. Write one paragraph of background information about the career field you are focusing this analysis on. What is the field and what are the basic qualifications of entering this field?
2. Complete the four sections of your SWOT analysis for this field; make sure your responses are specific to the career field you are analyzing.

Internal / Personal Factors	External / Objective Factors
STRENGTHS • What relevant skills, talents, abilities, education, qualifications, and experiences do you already have? • Why do you consider these to be important for this future direction you are exploring?	**OPPORTUNITIES** • What have you discovered about the openings available in this field? What is the potential salary range? What evidence can you provide to verify that? • What opportunities are currently available on the websites of the identified company or companies? What specific education, skills, and abilities are they looking for? • Who do you know who is in this career field already?
WEAKNESSES • What gaps in your skills, talents, abilities, education, qualifications, and experiences do you have that might concern a recruiter? • How motivated are you to address these gaps? How long might it take to address the costs and what might it cost (e.g., additional credentials, advanced degree, and so on)?	**THREATS** • What changes are likely to happen within this field over the next 1 to 3 years? Is it in a growth area or is it in an area where downsizing and other unhelpful changes are happening? • How competitive is this field? What qualifications might other candidates have that would give them an edge over you? • Might this field involve relocating or other changes to your current lifestyle?

Additional resources that provide data relevant to this analysis include:

- Mapping Your Future, available at www.mappingyourfuture.org. (Click on the CareerShip tab.)
- Bureau of Labor Statistics, available at www.bls.gov/ooh.

Deliverable

You should turn in the following document:

- SWOT analysis

Action Plan

Due date: _____

Grading

This assignment is worth a total of _____ points. Your grade is based on the degree to which you have shown evidence of fully exploring, reflecting upon, and creating a plan of action to pursue your selected future career (including future coursework and higher education, where relevant). You should produce a 3-4 page report for this assignment.

Instructions

1. Use your SWOT analysis to set three goals that you can work toward that will help you move forward on this career path.
2. Outline the specific **actions** you intend to take to reach these goals. The following prompts are provided to help you identify important information to address in your action plan, but they are not the only questions you should be answering with this action plan.
    a. What college courses do you need (and intend) to take to ensure you are a compelling candidate in this field? How often are these course offered and in what semester will you be taking these courses?
    b. What final GPA are you planning to achieve and how will this GPA improve your attractiveness to recruiters in this field?
    c. How do you plan to address the issue of an advanced degree or further qualifications, if relevant to this career area?
    d. Demonstrate that you have thought through the possible changes to your current lifestyle highlighted in your research (e.g., moving to a new location; the working hours involved; the amount of travel required, and so on). How do you intend to address those issues?

Additional resources that provide data relevant to this assignment include:

- Class notes about goal setting
- Previous possible selves mind map and SWOT analysis

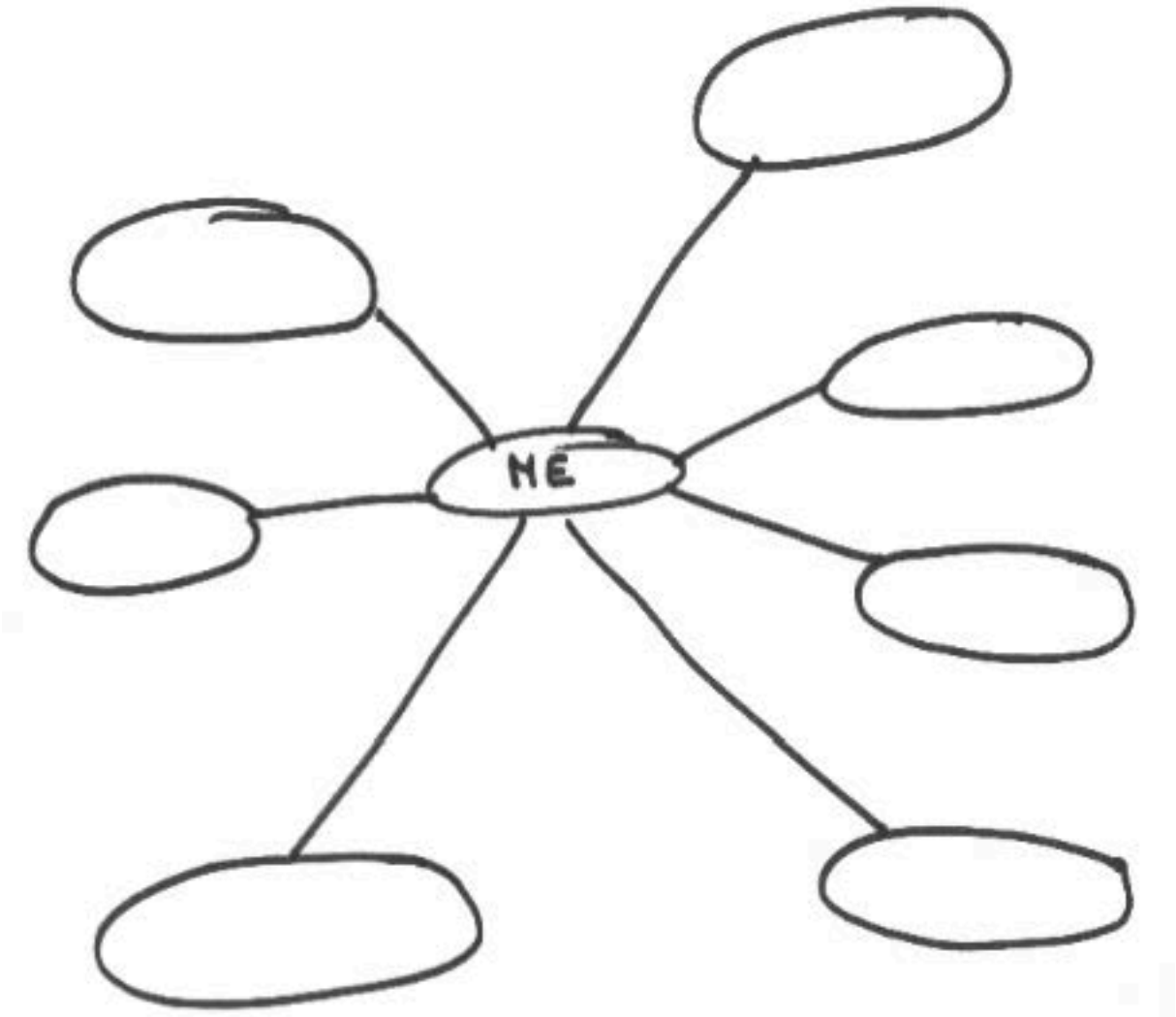
Deliverable

You should turn in the following document:

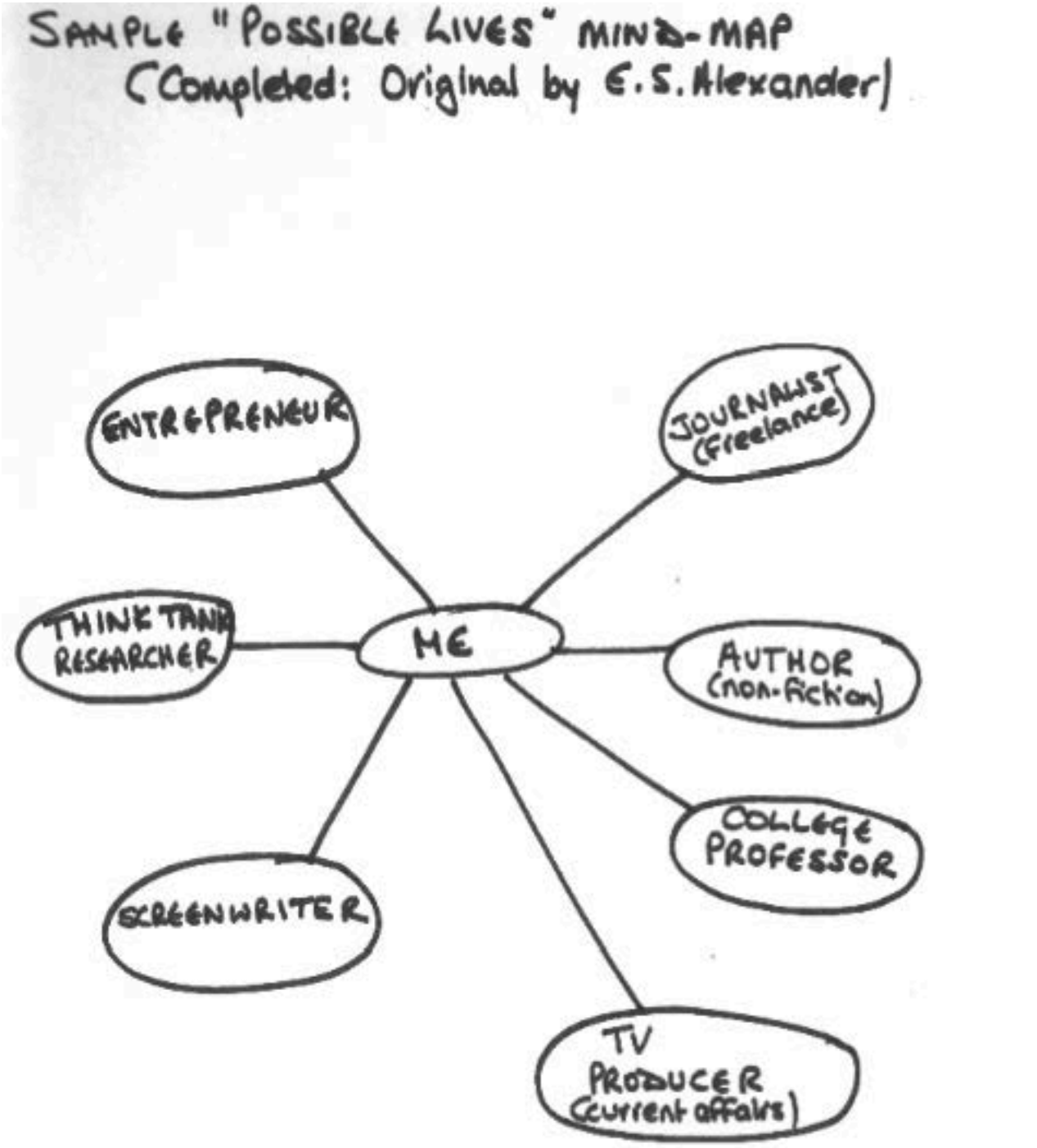
- Action plan

Career Project: Possible Selves / Possible Lives Mind Map (Blank)

SAMPLE "POSSIBLE LIVES" MIND-MAP (BLANK)
Original by E.S. Alexander



Career Project: Possible Selves/ Possible Lives Mind Map (Completed)



Career Project: SWOT Analysis Rubric

Student's Name: _____ **Date:** _____

	Inadequate	Acceptable	Good	Exemplary	Score
Introducing the Topic	Student is unclear about the topic of the essay and/or does not include the field he or she is investigating in the first paragraph.	Student introduces the field he or she is writing about in the first paragraph.	Student clearly introduces the topic of the essay in the first paragraph and also includes details to prepare the reader for what comes ahead.	Student grabs the reader's attention in a unique and interesting manner in the introduction and offers clear direction for what will be coming next.	
Strengths	Student does not discuss his or her strengths and/or how these might impact future success in a career goal.	Student includes relevant skills, talents, etc., that contribute to his or her potential success in this field.	Student makes connections between his or her relevant skills, talents, etc., and those necessary to have success in this field.	Student uses great detail in matching skills he or she possesses to the requisite skills for that career path.	
Weaknesses	Student does not discuss his or her weaknesses and/or how these might impact future success in a career goal.	Student includes a discussion of gaps or weaknesses that might impact success in this field.	Student discusses potential gaps and his or her motivation for addressing these in order to succeed in this field.	Student discusses potential gaps in detail and includes a plan for how to seek assistance to address these gaps in order to succeed in this career path.	
Opportunities	Student does not offer substantive details about the industry he or she is interested in pursuing.	Student includes minimal information about industry opportunities.	Student draws on current data and/or talks with experts in the desired field and links this information to his or her career goals.	Student includes current data and/or talks with experts in the desired field and makes explicit connections between that data and his or her career trajectory in that particular field.	
Threats	Student does not address potential changes present or possible in the future in this field.	Student includes minimal information about potential changes occurring in the chosen field.	Student includes some information about potential changes occurring in the chosen field.	Student includes a great deal of information about potential changes occurring in the chosen field and discusses how these directly impact him or her.	
Writing and Clarity	The writing is difficult to understand and/or requires significant editing to make sense.	The writing is readable and clear.	The writing makes sense and is not obstructed by grammar or usage errors.	The writing is compelling to read and has few (if any) grammar or usage errors.	
Additional Comments				**Total Score**	

Instructor Notes for Facilitating the Career Project

Mind Maps

A mind map is a way of graphically representing information so you can more easily see patterns within the information. This note-taking strategy is discussed in more detail in week 7. Mind maps are used in this project to help students brainstorm the many different ideas they may have for future career paths.

Some years ago, psychologists came up with the term *possible selves* to describe what we might become or would like to become at some point in the future, in order to help us set appropriate goals. Later authors (see Chapter 5 of Katharine Brooks's 2009 book *You Majored in What? Mapping Your Path from Chaos to Career*) changed to term to *possible lives*.

Often our goals are informed by our self-identified skills and abilities, and we often limit ourselves to options that align with our perceived skills and abilities. However, our options are often much broader than we realize—either because our beliefs limit us or we haven't been curious enough and explored all our options.

Creating a mind map, like completing career assessments available through career service centers, helps expand the possibilities. Previous classwork identifying the impact we want to have on the world also helps expand the realm of possible career choices.

SWOT (strengths, weaknesses, opportunities, and threats) analysis

SWOT analysis is a common strategic planning tool used in organizations to help with setting goals, crafting vision statements, and identifying gaps in a company's resources or an individual's skill set.

The SWOT analysis assignment is intended to set students up for success by helping them anticipate and address obstacles or challenges in advance, rather than discovering them when it may be too late to address them.

You might want to share with students this humorous definition of the mid-life crisis: Finding that you climbed the ladder of job success only to discover it was up against the wrong wall.

Putting in time and effort early in your college career to understand the field you think you want to enter and analyze how your personal talents and preferences fit with the demands of that field helps ensure that you choose the pathway that's right for you. It'd be a real shame to spend years studying to become a teacher or lawyer or physical therapist only to discover, once you begin working in that field, that it's not fulfilling or enjoyable for you after all!

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Success Group Presentation Update

Update note

The *Frameworks* Success Group Presentation is in the section of *Frameworks* called Additional Materials.

This group project is intended to give students the opportunity to identify a course content area to investigate further, to analyze resources, and to present this information to their peers— that is, in essence, to demonstrate learning by doing the work and by teaching others. The suggested group project is structured into four distinct parts:

- Determine topic and appropriate subtopics
- Gather and analyze research by completing an annotated bibliography
- Develop and deliver an in-class presentation
- Reflect on the project

The most common challenges reported by faculty teaching this project came in the first two parts: determining topics and appropriate subtopics, and gathering and analyzing research by completing an annotated bibliography.

Some students struggled to identify topics with robust literature bases. Others selected a topic with a robust research base but chose extremely complex reading material to analyze. Still others chose appropriate topics, but struggled to go beyond restating the content that had previously been covered in class. The group presentation project's learning goal—to strengthen student analytical skills and deepen their understandings—was undermined by the frustration some students experienced at these difficulties.

To alleviate some of this frustration, we developed the following two additional options:

- Success Group Presentation Update: Option A: Book study: Instructor Information
- Success Group Presentation Update: Option B: Guided questions and suggested resources: Instructor Information

And retained the original option:

- Success Group Presentation Update: Option C: Use the materials as written: Instructor Information

Each of the two new options and the retained original option include different levels of scaffolded support and illustrate some of the modifications instructors can make so this project meets the needs of their students and is aligned with other campus initiatives.

The topics represented in these scaffolding supports are not exhaustive—there are many more ideas that your students may want to research. We used feedback from *Frameworks* faculty to identify the most common topics students were interested in and gathered resources relevant to those topics. We hope in future to update this tool to include additional topics and resources.

We *did not* change the four-part structure of the group presentation project. As you modify the

project, however, you may find it necessary to modify the assignments as well. Maintaining or expanding the four-part structure supports students by helping them break down a larger, longer-term task into smaller, manageable parts.

This resource includes grading rubrics, which you can modify to include your specific expectations for your students. Carefully consider how you allocate points within each level; stringent point allocation could negatively affect student motivation if they feel they cannot successfully earn high marks according to the rubric.

Success Group Presentation Update
Option A: Book study
Instructor Information

Option A: Book study

With this option, students analyze information from a book written for a mainstream audience. While the option enables students to conduct a more thorough analysis of a single work, it limits the application of other research techniques that students have learned. (Other options for this project give students more opportunities to apply various research techniques.)

The following list offers some ideas for texts that could be used for this assignment:

Author	**Book**
Carol Dweck	*Mindset: The New Psychology of Success.* NY: Ballantine Books, 2006.
Chip Heath and Dan Heath	*Switch: How to Change Things When Change Is Hard.* NY: Broadway Books, 2010.
Art Markman	*Smart Thinking: Three Essential Keys to Solve Problems, Innovate, and Get Things Done.* NY: Perigee, 2012.
Daniel H. Pink	*Drive: The Surprising Truth About What Motivates Us.* NY: Riverhead Books (a division of Penguin), 2011.
Timothy D. Wilson.	*Redirect: The Surprising New Science of Psychological Change*. NY: Allen Lane, 2011.

Ideas for implementation:

- Select one book for the whole class to read. Create multiple scenarios and have each group analyze one scenario using information from the whole book.
- Select one book for the whole class to read. Create one scenario and have each group analyze that scenario using the information from a specific chapter in the book.
- Select one book for the whole class to read. Have each group select one chapter from the book and create a synthesis of the material within that chapter and the material studied earlier in the semester.
- Let each group select their own book, with no more than one group per title. Design one overarching question for each group to address using the information contained in their book.

Naturally, there are many ways you can modify this activity to enable students to analyze

additional information related to course content and make connections among the course topics.

The following pages contain sample handouts you could distribute to students to support this project option.

As you modify this option to meet your student's needs, please share your ideas with the Dana Center Mathematics Pathways group at dcmathpathways@austin.utexas.edu so we can continue to improve these materials.

Topic and Subtopic Selection

Due date: _____

Grading

This assignment is worth a total of _____ points. Your grade is based on the degree to which you identify a general theme and select an appropriate number of subthemes to explore.

Information

1. Consider all of the topics we have explored in class this semester. What topic(s) really interest your group members? What topics would you like to know more about? Additionally, what topic(s) do you feel are important to explore in connection with your own mathematics study?
2. Work with your instructor to make sure there is enough existing research to support your chosen topic. Some ideas are wonderful but also so new that established researchers haven't had time to do empirical work in the field that will be helpful for you.
3. Decide on a few good starting points for subtopics right now. As you gather research, you will end up refining your subtopic selection further. This further refinement is expected, but it is important to have some focus as you start conducting research.

Deliverable

You should turn in the following:

- Topic and subtopic selection

Writing an Annotation for a Resource

Due date: _____

Grading

This assignment is worth a total of _____ points. Your grade is based on the degree to which you give complete information in your annotation and on how clearly you demonstrate how the information in the resource you annotated connects with the content we have studied in this class.

Instructions

1. Each group member is responsible for completing an annotation for the chapter their group has chosen. Once each individual has created an annotation, the group will collaborate to create one annotation from the group.
2. The outline below can help guide you as you annotate the chapter. *(Note: The prompts listed below will help you cover all the important points, but you are highly encouraged to think beyond these questions and include any other information you think is relevant.)*
    a. Paragraph 1: **Summarize** what the resource says about your topic.
        i. What is this article all about (restate in your own words)?
        ii. What are the most important points to include in an accurate summary?
    b. Paragraph 2: **Analyze and evaluate** the chapter (remember Bloom's Taxonomy!).
        i. What is the source of the material?
        ii. Who is the author and what are their credentials?
        iii. How relevant are these credentials to the topic they are writing about?
        iv. Do you consider the findings to be biased or objective?
        v. Who is the intended audience for this chapter?
    c. Paragraph 3: **Reflect** on how this material can be applied to college coursework.
        i. How can the material be directly applied to the needs of college students who are looking to become more successful in their studies?
3. After the group annotation is complete, your group should write a one-page summary of the process you used to move from individual annotations to the group annotation. This summary should discuss how you worked as a group to create the annotation, how you decided which information to include and which to exclude in the final group annotation, and how this process helped enhance your understanding of the chapter material.

Deliverables

You should turn in the following documents:

- Individual annotation
- Group annotation
- Reflection on the process you used to move from individual to group annotation.

In-Class Presentation

Due date: _____

Grading

This assignment is worth a total of _____ points.

Instructions

1. This is a team effort; each member must participate, and each member should be prepared to present all parts of the presentation. The presentation gives your team an opportunity to share with your peers what you have learned in your research and how you have applied this knowledge.
2. Your presentation should demonstrate effective use of oral communication strategies. The 20-minute (total) presentation should be designed to roughly address the following outline:
    - **Introduction:** What is the topic and why is it important to success in college? (1 minute)
    - **Understanding**: What are the most salient facts, concepts, and other information about this topic that your audience needs to know? You may want to briefly recap previous class discussion about the topic, but the majority of this time should be spent elaborating on the concept and discussing the additional information your team identified as important from your chapter selection. (5 minutes)
    - **Application:** How can the information you have learned about your topic be applied effectively to the study of mathematics? (4 minutes)
    - **Illustrations:** What examples can you share from your own experience(s) to show how what you have learned can contribute to success in mathematics and/or other courses? Bring in artifacts of how you have used these strategies. Artifacts could include notes, papers, worked problems, annotated readings, written schedules—any kind of visual aid that can help your group communicate its ideas to your peers. (5 minutes)
    - **Q&A:** Be prepared to answer questions about your presentation. Consider how you are planning to show teamwork in handling questions from your peers. (5 minutes)

Deliverables

You should deliver the following:

- 20-minute presentation
- Any artifacts you used during the illustration part of the presentation

Reflection

Due date: _____

Forms needed

Note: *these forms may be found at the end of Success Group Presentation Update Option C: Use the materials as written: Instructor Information.*

- Group project: Instructor and observer presentation rubric
- Group project: Peer assessment rubric
- Group project: Self-assessment rubric

Grading

This assignment is worth a total of _____ points. You will receive full credit if you give feedback on each presentation and on each of your team members and complete your self-reflection.

*** I reserve the right to adjust your grade, however, if your team members provide feedback that indicates that you did not contribute to the project. ***

Instructions

1. For each in-class presentation:
   - Take notes using the instructor and observer presentation rubric.
   - Use these notes to complete an overall reflection at the end of the last group presentation.
2. After all the groups present:
   - Use your notes to write a one-page reflection on the following:
     What are the top three ideas the author of this book wanted to communicate?
     What connections do these three ideas have to other content we have studied in this course?
3. After your group presents:
   - Fill out the feedback forms (peer assessment rubrics) for your team members.
   - Fill out the self-reflection form (self-assessment rubric).

Deliverables

You should deliver the following:

- One-page reflection on the overall project (attach the feedback forms you completed as each group presented)
- One feedback form (peer assessment rubric) for each of your team members
- One self-reflection form (self-assessment rubric)

Success Group Presentation Update
Option B: Guided questions and suggested resources
Instructor Information

Option B: Guided questions and suggested resources

In this option, students analyze information from a variety of sources. The option includes sample questions that groups can address and resources to get them started.

We used feedback from faculty members to identify the most common topics students were interested in so we could gather selected relevant resources. These resources include peer-reviewed research articles, blog posts, podcasts, and TED talks. We hope in future to continue expanding this tool to include additional topics and resources.

Please share with us at dcmathpathways@austin.utexas.edu the resources you and your students identify, so we can continue to improve these materials.

Various ideas for implementation:

- Each group selects a question from the following list. They use the provided resources to conduct an analysis and respond to the question. Students individually complete an annotated bibliography for a resource (or set of resources) and then, as a group, compile a response to the question that incorporates their individual analyses.
- Students individually select from the list a few resources they are interested in using for the project. They conduct individual analyses and then, as a group, identify a common theme or idea that emerges from their individual study of the resources.
- Groups identify a question they are interested in answering (not using the provided list); then they select resources from the provided list to analyze and use to answer the question.

There are countless other modifications of this activity that will provide an opportunity for students to analyze additional information related to course content and make connections among the course topics.

Consider making changes to the assignment instruction form based on the kind of analysis you expect students to conduct.

For example, if you opt to have groups choose a question and you provide them with a few resources to get started, you may want to make changes to the first assignment (choosing a topic) within the project.

Because there are many possible variations within this option, we have not recreated the student assignment sheets specifically for this option. Some of the assignments could require little change; others will need to be modified.

Guiding questions and suggested resources

What effect does an *entity* (fixed) versus *incremental* (growth) theory of intelligence have on learning and achievement?

Resources to draw upon:

- Choina, Alicia, & McInroy, Rebecca. [article]. (2014 February 21). "Why all praise is not created equal." *Two Guys On Your Head*. [Podcast by Dr. Art Markman and Dr. Bob Duke.] Retrieved June 15, 2014, from http://kut.org/post/why-all-praise-not-created-equal
- Duckworth, Angela Lee. (2013 April). "The key to success? Grit." *TED Talks Education*. [Video; about 6 minutes]. Retrieved June 15, 2014, from http://www.ted.com/talks/angela_lee_duckworth_the_key_to_success_grit
- Dweck, C. S., & Master, A. "Self-theories motivate self-regulated learning." In Schunk, D. H., & Zimmerman, B. J. (2008), *Motivation and Self-Regulated Learning: Theory, Research, and Application* (pp. 31–51). New York, NY: Routledge.
- Garlick, D. (2002). "Understanding the nature of the general factor of intelligence: The role of individual differences in neural plasticity as an explanatory mechanism." [Review]. *Psychological Review, 109*(1), 116–136.
- O'Rourke, N., Haimovitz, K., Ballweber, C., Dweck, C. S., & Popovic, Z. (in press). "Brain points: A growth mindset incentive structure boosts persistence in an educational game." *Proceedings of the ACM Conference on Human Factors in Computing Systems* (CHI 2014). Toronto, Canada. Retrieved June 15, 2014, from http://www.academia.edu/6250126
- Yorke, M., & Knight, P. (2004) "Self-theories: some implications for teaching and learning in higher education." *Studies in Higher Education, 29* (1), 25–37.

How does our memory affect performance and learning?

Resources to draw upon:

- Doolittle, Peter. (2013 June). "How your 'working memory' makes sense of the world." *TED Global*. [Video; about 9 minutes]. Retrieved June 15, 2014, from https://www.ted.com/talks/peter_doolittle_how_your_working_memory_makes_sense_of_the_world
- Doolittle, Peter E., & Mariano, Gina J. (2008 October). "Working memory capacity and mobile multimedia learning environments: Individual differences in learning while mobile." *Journal of Educational Multimedia and Hypermedia, 17*(4), 511–530.
- Markman, Arthur B., Maddox, W. Todd, & Worthy, Darrell A. "Choking and excelling under pressure." *Psychological Science, 17*(11), 944–948.
- McInroy, Rebecca. [article]. (2013 October 28). "When our brains go on autopilot." *Two Guys On Your Head.* [Podcast by Dr. Art Markman and Dr. Bob Duke.] Retrieved June 15, 2014, from http://kut.org/post/when-our-brains-go-autopilot
- McInroy, Rebecca. [article]. (2014 January 24). "Debunking myths behind different learning styles." *Two Guys On Your Head.* [Podcast by Dr. Art Markman and Dr. Bob Duke.] Retrieved June 15, 2014, from http://kut.org/post/debunking-myths-behind-different-learning-styles
- Mueller, Pam A., & Oppenheimer, Daniel M. (2014 June). "The pen is mightier than the keyboard: Advantages of longhand over laptop note taking." *Psychological Science, 25*(6), 1159–1168 [Published online before print April 23, 2014, doi: 10.1177/0956797614524581]
- Seckel, Al. (2004 February). "Visual illusions that show how we (mis)think." *TED 2004.* [Video; about 14 minutes]. Retrieved June 15, 2014, from http://www.ted.com/talks/al_seckel_says_our_brains_are_mis_wired
- Streep, Peg. (2014 April 21). "Your brain is nagging you. Here are 5 ways to make it stop: The science behind intrusive thoughts." *Psychology Today*. Retrieved June 15, 2014, from http://www.psychologytoday.com/blog/tech-support/201404/your-brain-is-nagging-you-here-are-5-ways-make-it-stop
- Streep, Peg. (2014 May 28). "4 reasons you can't trust yourself: Unconscious biases make us lousy witnesses and judges of our own lives." *Psychology Today*. Retrieved June 15, 2014, from http://www.psychologytoday.com/blog/tech-support/201405/4-reasons-you-cant-trust-yourself
- Whitbourne, Susan Krauss. (2014 May 27). "The hidden dangers of smartphone cameras: New research makes the case for keeping your camera in your pocket." *Psychology Today*. Retrieved June 15, 2014, from http://www.psychologytoday.com/blog/fulfillment-any-age/201405/the-hidden-danger-smartphone-cameras

How adaptive is the brain?
To what extent can the brain adapt after traumatic injury?

Resources to draw upon:

- Annenberg Learner. (2011). "A tale of two cases: Brooke and Nico." From Unit 1, "We all have different brains," in *Neuroscience in the Classroom: Making Connections*. Annenberg Learner: Teacher resources and professional development across the curriculum. Retrieved June 15, 2014, via http://www.learner.org/courses/neuroscience/videos/videos.html [Click on Unit 1, then scroll to the bottom of the Unit 1 page.]
- Immordino-Yang, Mary Helen. (2007 June). "A tale of two cases: Lessons for education from the study of two boys living with half their brains." *Mind, Brain, and Education, 1*(2), 66–83.
- Merzenich, Michael. (2004 February). "Growing evidence of brain plasticity." *TED 2004.* [Video; about 23 minutes]. Retrieved June 15, 2014, from http://www.ted.com/talks/michael_merzenich_on_the_elastic_brain
- An additional resource that might be worth browsing is some of the research cited on the commercial "brain games" website *Luminosity*. At the following link you may find completed research, ongoing research and a bibliography http://www.lumosity.com/hcp/research

What do we know about the power of habits and forming or breaking them that can add to academic success?

Resources to draw upon:

- Butler, Deborah L., & Cartier, Sylvie C. (2004 September). "Promoting effective task interpretation as an important work habit: A key to successful teaching and learning." *Teachers College Record*, *106*(9), 1729–1758.
- Choina, Alicia, & McInroy, Rebecca. [article]. (2014 March 14). "How our brains process time." *Two Guys On Your Head*. [Podcast by Dr. Art Markman and Dr. Bob Duke.] Retrieved June 15, 2014, from http://kut.org/post/how-our-brains-process-time
- McCann, Erin J., & Turner, Jeannine E. (2004). "Increasing student learning through volitional control." *Teachers College Record*, *106*(9), 1695–1714.
- Neal, David T., Wood, Wendy, & Quinn, Jeffrey M. (2006 August). "Habits—A repeat performance." *Current Directions in Psychological Science, 15*(4), 198–202.
- Rogers, Donna, & Swan, Karen. (2004). "Self-regulated learning and internet searching." *Teachers College Record*, *106*(9), 1804–1824.
- University of Texas at Austin Communications. (2012 April 9). "Meet a Game Changer: Art Markman." *UT Game changers*. [Video; about 2 and a half minutes.] Retrieved June 15, 2014, from http://www.utexas.edu/know/2012/04/09/game_changers_markman

What can be done to sustain motivation?

Resources to draw upon:

- Ellis, Shmuel, Carette, Bernd, Anseel, Frederik, & Lievens, Filip. (2014 February). "Systematic reflection: Implications for learning from failures and successes." *Current Directions in Psychological Science, 23*(1), 67–72.
- Margolis, Howard, & McCabe, Patrick. (2006 March). "Improving self-efficacy and motivation: What to do, what to say." *Intervention in School and Clinic, 41*(4), 218–227.
- Pink, Dan. (2009 July). "The puzzle of motivation." *TEDGlobal 2009.* [Video; about 18 minutes.] Retrieved June 15, 2014, from http://www.ted.com/talks/dan_pink_on_motivation
- Pink, Dan. (2013 February 26). "The surprising truth about moving others." RSA: Royal Society for the encouragement of Arts, Manufactures and Commerce. [Audio; about an hour, or video highlights; about 18 minutes.] Retrieved June 15, 2014, from http://www.thersa.org/events/audio-and-past-events/2013/the-surprising-truth-about-moving-others
- Rounds, James, & Su, Rong. (2014 April). "The nature and power of interests." *Current Directions in Psychological Science, 23*(2), 98–103.
- Ryan, R. M., & Deci, E. L. (2000 January). "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78.
- Schrift, Rom Y., & Parker, Jeffrey R. (2014 March). "Staying the course: The option of doing nothing and its impact on postchoice persistence." *Psychological Science, 25*(3), 772–780.
- Steger, Michael. (2013, March). "What makes life meaningful." *TEDxTalks: TEDxCSU.* [Colorado State University.] [Video from an independently organized TEDx event; about 17 minutes.] Retrieved June 15, 2014, from http://tedxtalks.ted.com/video/What-Makes-Life-Meaningful-Mich;search%3Atag%3A"tedxcsu
- Woodruff, Althea L., & Schallert, Diane L. (2008). "Studying to play, playing to study: Nine college student atheletes' motivational sense of self." *Contemporary Educational Psychology, 33*, 34–57.

Questions to consider:

- **What effect does an *entity* (fixed) versus *incremental* (growth) theory of intelligence have on learning and achievement?**
- **How does our memory affect performance and learning?**
- **How adaptive is the brain? To what extent can the brain adapt after traumatic injury?**
- **What do we know about the power of habits and forming or breaking them that can add to academic success?**
- **What can be done to sustain motivation?**

Resources to draw upon:

- Annenberg Learner. (2011). "A tale of two cases: Brooke and Nico." From Unit 1, "We all have different brains," in *Neuroscience in the Classroom: Making Connections*. Annenberg Learner: Teacher resources and professional development across the curriculum. Retrieved June 15, 2014, via http://www.learner.org/courses/neuroscience/videos/videos.html [Click on Unit 1, then scroll to the bottom of the Unit 1 page.]
- Butler, Deborah L., & Cartier, Sylvie C. (2004 September). "Promoting effective task interpretation as an important work habit: A key to successful teaching and learning." *Teachers College Record, 106*(9), 1729–1758.
- Choina, Alicia, and McInroy, Rebecca. [article]. (2014 February 21). "Why all praise is not created equal." *Two Guys On Your Head*. [Podcast by Dr. Art Markman and Dr. Bob Duke.] Retrieved June 15, 2014, from http://kut.org/post/why-all-praise-not-created-equal
- Choina, Alicia, and McInroy, Rebecca. [article]. (2014 March 14). "How our brains process time." *Two Guys On Your Head*. [Podcast by Dr. Art Markman and Dr. Bob Duke.] Retrieved June 15, 2014, from http://kut.org/post/how-our-brains-process-time
- Duckworth, Angela Lee. (2013 April). "The key to success? Grit." *TED Talks Education*. [Video; about 6 minutes.] Retrieved June 15, 2014, from http://www.ted.com/talks/angela_lee_duckworth_the_key_to_success_grit
- Doolittle, Peter. (2013 June). "How your 'working memory' makes sense of the world." *TED Global*. [Video; about 9 minutes]. Retrieved June 15, 2014, from https://www.ted.com/talks/peter_doolittle_how_your_working_memory_makes_sense_of_the_world
- Doolittle, Peter E., & Mariano, Gina J. (2008 October). "Working memory capacity and mobile multimedia learning environments: Individual differences in learning while mobile." *Journal of Educational Multimedia and Hypermedia, 17*(4), 511–530.
- Dweck, C. S., & Master, A. Self-theories motivate self-regulated learning. In Schunk, D. H., & Zimmerman, B. J. (2008), *Motivation and Self-Regulated Learning: Theory, Research, and Application* (pp. 31–51). New York, NY: Routledge.
- Ellis, Shmuel, Carette, Bernd, Anseel, Frederik, & Lievens, Filip. (2014 February). "Systematic reflection: Implications for learning from failures and successes." *Current Directions in Psychological Science, 23*(1), 67–72.
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- Immordino-Yang, Mary Helen. (2007 June). "A tale of two cases: Lessons for education from the study of two boys living with half their brains." *Mind, Brain, and Education, 1*(2), 66–83.
- Margolis, Howard, & McCabe, Patrick. (2006 March). "Improving self-efficacy and motivation: What to do, what to say." *Intervention in School and Clinic, 41*(4), 218–227.

Resources to draw upon:

- Markman, Arthur B., Maddox, W. Todd, & Worthy, Darrell A. "Choking and excelling under pressure." *Psychological Science, 17*(11), 944–948.
- McCann, Erin J., & Turner, Jeannine E. (2004). "Increasing student learning through volitional control." *Teachers College Record, 106*(9), 1695–1714.
- McInroy, Rebecca. [article]. (2013 October 28). "When our brains go on autopilot." *Two Guys On Your Head.* [Podcast by Dr. Art Markman and Dr. Bob Duke.] Retrieved June 15, 2014, from http://kut.org/post/when-our-brains-go-autopilot
- McInroy, Rebecca. [article]. (2014 January 24). "Debunking myths behind different learning styles." *Two Guys On Your Head.* [Podcast by Dr. Art Markman and Dr. Bob Duke.] Retrieved June 15, 2014, from http://kut.org/post/debunking-myths-behind-different-learning-styles
- Merzenich, Michael. (2004 February). "Growing evidence of brain plasticity." *TED 2004.* [Video; about 23 minutes]. Retrieved June 15, 2014, from http://www.ted.com/talks/michael_merzenich_on_the_elastic_brain
- Mueller, Pam A., & Oppenheimer, Daniel M. (2014 June). "The pen is mightier than the keyboard: Advantages of longhand over laptop note taking." *Psychological Science, 25*(6), 1159–1168 [Published online before print April 23, 2014, doi: 10.1177/0956797614524581]
- Neal, David T., Wood, Wendy, & Quinn, Jeffrey M. (2006 August). "Habits—A repeat performance." *Current Directions in Psychological Science, 15*(4), 198–202.
- O'Rourke, N., Haimovitz, K., Ballweber, C., Dweck, C. S., & Popovic, Z. (in press). "Brain points: A growth mindset incentive structure boosts persistence in an educational game." *Proceedings of the ACM Conference on Human Factors in Computing Systems* (CHI 2014). Toronto, Canada. Retrieved June 15, 2014, from http://www.academia.edu/6250126
- Pink, Dan. (2009 July). "The puzzle of motivation." *TEDGlobal 2009.* [Video; about 18 minutes.] Retrieved June 15, 2014, from http://www.ted.com/talks/dan_pink_on_motivation
- Pink, Dan. (2013 February 26). "The surprising truth about moving others." RSA: Royal Society for the encouragement of Arts, Manufactures and Commerce. [Audio; about an hour, or video highlights; about 18 minutes.] Retrieved June 15, 2014, from http://www.thersa.org/events/audio-and-past-events/2013/the-surprising-truth-about-moving-others
- Rogers, Donna, & Swan, Karen. (2004). "Self-regulated learning and internet searching." *Teachers College Record, 106*(9), 1804–1824.
- Rounds, James, & Su, Rong. (2014 April). "The nature and power of interests." *Current Directions in Psychological Science, 23*(2), 98–103.
- Ryan, R. M., & Deci, E. L. (2000 January). "Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78.

Resources to draw upon:

- Schrift, Rom Y., & Parker, Jeffrey R. (2014 March). "Staying the course: The option of doing nothing and its impact on postchoice persistence." *Psychological Science, 25*(3), 772–780.
- Seckel, Al. (2004 February). "Visual illusions that show how we (mis)think." *TED 2004.* [Video; about 14 minutes]. Retrieved June 15, 2014, from http://www.ted.com/talks/al_seckel_says_our_brains_are_mis_wired
- Steger, Michael. (2013, March). "What makes life meaningful." *TEDxTalks: TEDxCSU.* [Colorado State University.] [Video from an independently organized TEDx event; about 17 minutes.] Retrieved June 15, 2014, from http://tedxtalks.ted.com/video/What-Makes-Life-Meaningful-Mich;search%3Atag%3A"tedxcsu
- Streep, Peg. (2014 April 21). "Your brain is nagging you. Here are 5 ways to make it stop: The science behind intrusive thoughts." *Psychology Today*. Retrieved June 15, 2014, from http://www.psychologytoday.com/blog/tech-support/201404/your-brain-is-nagging-you-here-are-5-ways-make-it-stop
- Streep, Peg. (2014 May 28). "4 reasons you can't trust yourself: Unconscious biases make us lousy witnesses and judges of our own lives." *Psychology Today*. Retrieved June 15, 2014, from http://www.psychologytoday.com/blog/tech-support/201405/4-reasons-you-cant-trust-yourself
- University of Texas at Austin Communications. (2012 April 9). "Meet a Game Changer: Art Markman." *UT Game changers*. [Video; about 2 and a half minutes.] Retrieved June 15, 2014, from http://www.utexas.edu/know/2012/04/09/game_changers_markman
- Whitbourne, Susan Krauss. (2014 May 27). "The hidden dangers of smartphone cameras: New research makes the case for keeping your camera in your pocket." *Psychology Today*. Retrieved June 15, 2014, from http://www.psychologytoday.com/blog/fulfillment-any-age/201405/the-hidden-danger-smartphone-cameras
- Woodruff, Althea L., & Schallert, Diane L. (2008). "Studying to play, playing to study: Nine college student atheletes' motivational sense of self." *Contemporary Educational Psychology, 33*, 34–57.
- Yorke, M., & Knight, P. (2004) Self-theories: some implications for teaching and learning in higher education. *Studies in Higher Education, 29* (1), 25–37.
- An additional resource that might be worth browsing is some of the research cited on the commercial "brain games" website *Luminosity*. At the following link you may find completed research, ongoing research and a bibliography http://www.lumosity.com/hcp/research

Success Group Presentation Update
Option C: Use the materials as written
Instructor Information

Option C: Use the materials as written

The original form of this project is always an option. Some experienced *Frameworks* faculty used this option with success and you may have by this point in the course scaffolded other course assignments to prepare your students for the level of self-direction needed to complete the project as written here.

The following pages contain sample handouts you could distribute to students to support this project option.

As you modify this option to meet your student's needs, please share with us at dcmathpathways@austin.utexas.edu your ideas so we can continue to improve these materials.

Instructions for the Group Presentation: Digging Deeper into Course Concepts

Purpose

One of the best ways to demonstrate that you have learned material is to teach it. Similarly, applying ideas you are studying in one context to other content areas helps solidify your understanding of the material. The group presentation project gives your success team an opportunity to dig deeply into a specific course topic and deliver a 15-minute presentation on it to your classmates, followed by a 5-minute question-and-answer session.

This project also offers valuable experience in working cohesively as a team, doing academic research, preparing an annotated bibliography, and developing good communication (presentation) skills. You will have an opportunity to give feedback to other student presenters about their presentations, and you will have an opportunity to give feedback about your own group's experiences working on the project.

Directions

This project has four distinct parts:

- Determine topic and appropriate subtopics
- Gather and analyze research by completing an annotated bibliography
- Develop and deliver an in-class presentation
- Reflect on the project

Class time will be devoted to completing some of these activities (determining topic and appropriate subtopics, gathering research), but you will also be responsible for working on this project individually and as a group outside of class. You will need to take advantage of resource staff—a librarian, your instructor, and so on—in order to complete the project assignments.

Topic and Subtopic Selection

Due date: _____

Grading

This assignment is worth a total of _____ points. Your grade is based on the degree to which you identify a general topic (or theme) and select an appropriate number of subtopics (or subthemes) to explore.

Information

1. Consider all the topics we have explored in class this semester. What topic(s) really interest your group members? What topics would you like to know more about? Additionally, what topic(s) do you feel are important to explore in connection with your own mathematics study?
2. Work with your instructor to make sure there is enough existing research to support your chosen topic. Some ideas are wonderful, but new enough that established researchers haven't had time to do empirical work in the field that will be helpful for you.
3. Decide on a few good starting points for subtopics right now. As you gather research, you will end up refining your subtopic selection further. This further refinement is expected, but it is important to have some focus as you start conducting research.

Deliverable

You should turn in the following:

- Topic and subtopic selection

Annotated Bibliography

Due date: _____

Grading

This assignment is worth a total of _____ points. Your grade is based on the degree to which you select appropriate articles, give complete information in the annotations, and demonstrate how the articles work together to support the overall presentation you are developing.

Instructions

1. Each group member is responsible for identifying one scholarly article from the library's database or using online search strategies to gather information on your group's topic. Be sure to use the strategies and knowledge you gained in the library exploration lesson to aid your search. Each article you find must come from a reputable academic journal (e.g., *The Journal of Personality and Social Psychology*) and be a minimum of five pages long.
2. For each article, write an annotated bibliography entry. Each group member should take the lead for one entry. The outline below to guide you. *(Note: The prompts listed below will help you cover all the important points, but you are highly encouraged to think beyond these questions and include any other information you think is relevant.)*
    a. Paragraph 1: **Summarize** what the article says about your topic.
        i. What is this article all about (restate in your own words)?
        ii. What are the most important points to include in order to accurately summarize the article?
    b. Paragraph 2: **Analyze and evaluate** the article (remember Bloom's Taxonomy!).
        i. What is the source of the material?
        ii. Who is the author and what are their credentials?
        iii. How relevant are these credentials to the topic the author(s) are writing about?
        iv. Do you consider the findings to be biased or objective?
        v. Who is the intended audience for this article?
    c. Paragraph 3: **Reflect** on how this material can be applied to college coursework.
        i. How can the material be directly applied to the needs of college students who are looking to become more successful in their studies?
3. After the individual articles are annotated, your group should write a one-page summary of the research you've done so far. This summary should discuss how each article has been useful in clarifying your presentation topic and how the articles relate to each other.

Deliverables

You should turn in the following documents:

- Annotated bibliography and one-page summary
- Articles used in the annotated bibliography

In-Class Presentation

Due date: _____

Grading

This assignment is worth a total of _____ points.

Instructions

1. This is a team effort; each member must participate. The presentation gives your team an opportunity to share with your peers what you have learned in your research and how you have applied this knowledge.
2. Your presentation should demonstrate effective use of oral communication strategies. The 20-minute (total) presentation should be designed to roughly fit the following outline:
    - **Introduction:** What is the topic and why is it important to success in college? (1 minute)
    - **Understanding**: What are the most salient facts, concepts, and other information about this topic that your audience needs to know? You may want to briefly recap previous class discussion about the topic, but the majority of this time should be spent elaborating on the concept and discussing the additional research your team has done. (See step 1, above). (5 minutes)
    - **Application:** How can the information you have learned about your topic be applied effectively to the study of mathematics? (4 minutes)
    - **Illustrations:** What examples can you share from your own experience(s) to show how what you have learned can contribute to success in math and/or other courses? Bring in artifacts of how you have used these strategies. Artifacts could include notes, papers, worked problems, annotated readings, written schedules—any kind of visual aid that can help your group communicate its ideas to your peers. (5 minutes)
    - **Q&A:** Be prepared to answer questions about your topic. Consider how are you planning to show teamwork in handling questions from your peers. (5 minutes)

Deliverables

You should deliver the following:

- 20-minute presentation
- Any artifacts you used during the illustration part of the presentation

Reflection

Due date: _____

Forms needed

Note: *these forms may be found at the end of Success Group Presentation Update Option C: Use the materials as written: Instructor Information.*

- Group project: Instructor and observer presentation rubric
- Group project: Peer assessment rubric
- Group project: Self-assessment rubric

Grading

This assignment is worth a total of _____ points. You will receive full credit if you give feedback on each presentation and on each of your team members and complete your self-reflection.

*** I reserve the right to adjust your grade, however, if your team members provide feedback that indicates that you did not contribute to the project. ***

Instructions

1. For each in-class presentation:
   - Fill out the feedback form (instructor and observer presentation rubric).
   - Hand in this form at the end of the presentation.
2. After your group presents:
   - Fill out the feedback forms (peer assessment rubrics) for your team members.
   - Fill out the self-reflection form (self-assessment rubric).

Deliverables

You should deliver the following:

- Feedback forms (instructor and observer presentation rubrics) for each in-class presentation
- One feedback form (peer assessment rubric) for each of your team members
- One self-reflection form (self-assessment rubric)

Success Group Presentation Update

Group presentation appendix: Guidelines for writing an annotated bibliography*

First paragraph: Begin the first paragraph by summarizing what the article says about your topic AND subtopic(s); for example, *critical thinking* AND *college student*s AND *problem solving*.

What are the most important points you need to draw out in order to accurately summarize the findings of this research? Feel free to use the citation's abstract as a reference, but be sure to read the whole article and summarize it using your own words so you don't inadvertently plagiarize.

Second paragraph. In this paragraph, you will analyze and evaluate the research. Be sure to note the source of the material (i.e., the journal's title along with the journal's mission[1]).

It is also important that you note the author(s) and his/her credentials, along with how relevant these credentials are to the topic.

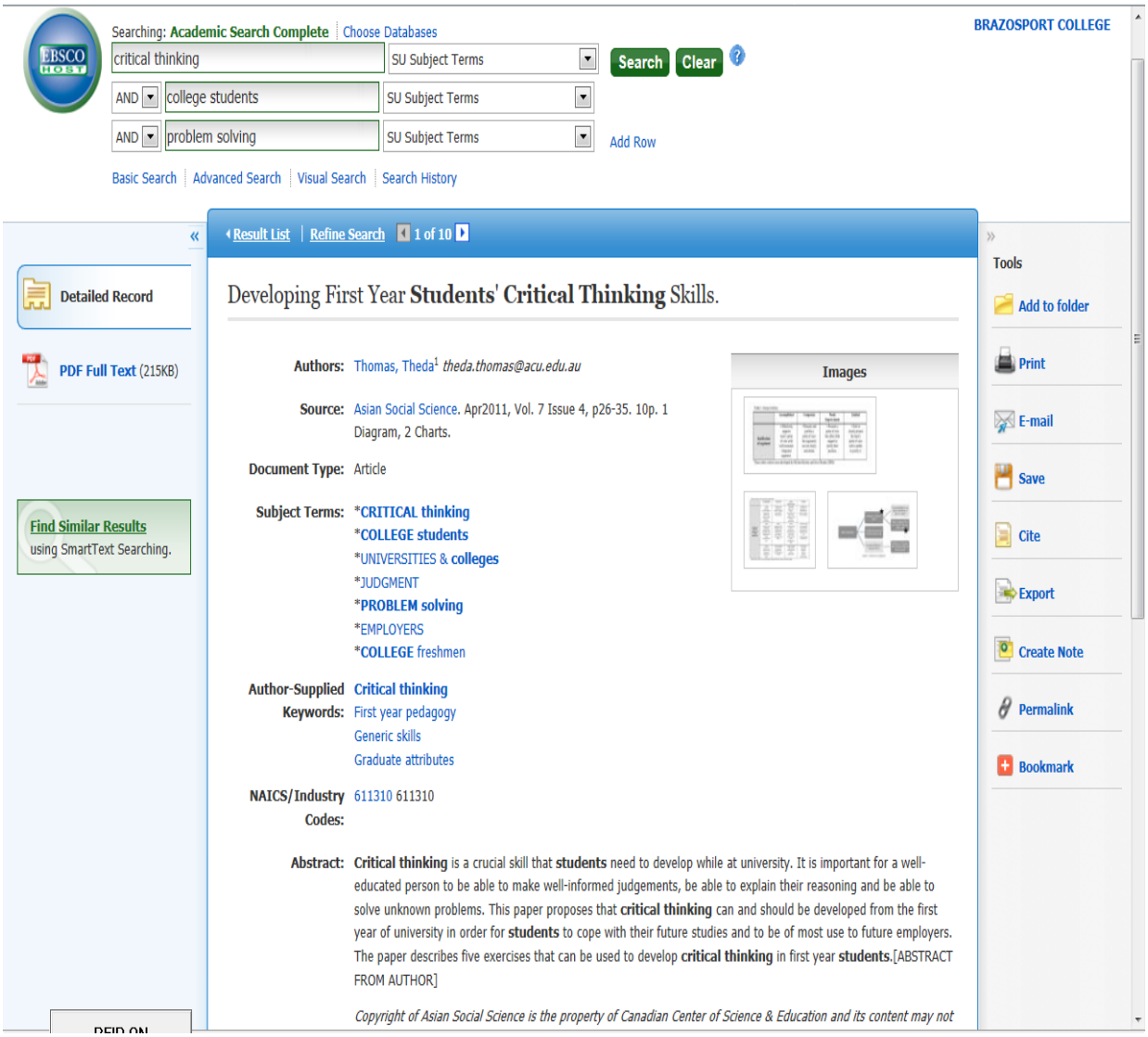
You can investigate the author's qualifications in several ways.

First, review other articles the author has written (do an author search in the database). Usually you will find the author has a special focus, and the articles you find will reflect this focus.

Second, the article will often note the author's place of employment, where you can find the author's biographical information. In this paragraph you should also note whether you consider the findings to be biased or objective and offer evidence to support your conclusion. Finally, identify the intended audience for this article.

Third paragraph. In the third paragraph, reflect on how article's information can be applied to college coursework. Be sure to note to what extent the material can be directly applied to the needs of college students who are looking to become more successful in their studies. Also expand on how useful this article has been in helping you clarify your presentation topic. If it hasn't proved useful, detail why not.

[1] See, for example, the mission of the *Asian Social Science* journal, here http://www.ccsenet.org/journal/index.php/ass.



From Theda Thomas. (2011 April). “Developing First Year Students' Critical Thinking Skills.” *Asian Social Science*, *7*(4), 26-35. Found using *Academic Search Complete*, 2013May9.

Group project: Instructor and observer presentation rubric

Group Members: _____ **Presentation Topic:** _____

	Inadequate	Acceptable	Good	Exemplary	Score
Preparation	Little or no preparation evidenced.	Some preparation, but little or no rehearsal.	Looked prepared. Worked effectively together as a cohesive unit; had obviously rehearsed.	Considerable thought given to how the material would be presented. Team demonstrated creative and effective ways of working together.	
Information and Organization	Many important elements of information missing. Presentation incomplete or sequencing of material scattered or illogical. Students appeared to be making it up as they went along.	Showed ability to recall and reproduce information as presented in original lesson and lectures. Some sequencing of material evident. Presenters used scripts to keep them on track.	Clearly explained all key themes, each illustrated with its own examples. Comfortable, logical flow of material. The whole team worked effectively to hit all main points within the time allocated.	Drew from sources other than class lectures and notes. Successfully compared and contrasted key themes. Showed ability to evaluate material by developing own points of view and offering personalized examples. Comfortable, logical flow of material. The whole team worked effectively to hit all main points within the time allocated.	
Presentation	Made considerable use of, and read extensively from, notes. Did not make eye contact with the class. Speech unclear and lacking in confidence. Spoken lecture only.	Used some notes or other framework to stay on track. Made intermittent eye contact with audience. Some stumbling. Spoken lecture only.	Little or no use of notes or written materials. Good eye contact. Clear, confident diction throughout. Spoken lecture or basic PowerPoint presentation.	Confident delivery of material throughout. Continual eye contact. Clear, confident diction. Creative and effective use of PowerPoint or other presentation tools included in presentation.	
Q&A and Level of Thought	Unable to answer. Gave incorrect responses or stumbled during questions. Evidence of knowledge mainly; some understanding.	Gave only short, basic responses to questions. Evidence of understanding.	Appeared confident about answering questions, handling them effectively. Evidence of understanding and application.	Showed strong understanding of material, supplementing responses with further examples. Evidence of analysis and evaluation.	
Overall	Failed to fulfill the assignment as instructed.	Completed the assignment as instructed, but no more.	Incorporated elements (such as use of personalized examples) not specifically outlined in assignment.	Demonstrated creativity in both the selection and the comprehensiveness of material and delivered it effectively.	
Additional feedback				**Total Score**	

Group project: Peer assessment rubric

Your Name: _____ Group Topic: _____ Date: _____

Group Member's Name: _____

Question	Answer/Explanation	Points/Total possible points
What did this group member contribute during the preparation stage of this project?		**/30**
What role did the group member play during the presentation? Did the group member prepare for the speaking portion of the presentation? Did the group member answer questions during the Q&A?		**/30**
Did the group member uphold good group practices? *Such practices include participating in planning meetings about projects, meeting deadlines set by the team, and clearly communicating with team members about the project.* Did the group member treat other group members with respect and support them as necessary?		**/30**
What are your overall impressions of this group member's contributions to the project?		**/10**
	Total Score	**/100**

Group project: Self-assessment rubric

Your Name: _____ Group Topic: _____ Date: _____

Question	Answer/Explanation	Points/Total possible points
What did you contribute during the preparation stage of this project?		**/30**
What role did you play during the presentation? How did you prepare for the speaking portion of the presentation? Did you answer questions during the Q&A?		**/30**
How did you uphold good group practices? *Such practices include participating in planning meetings about projects, meeting deadlines set by the team, and clearly communicating with team members about the project.* Did you treat other group members with respect and support them as necessary? Give examples.		**/30**
On a scale from 1 to 10 (with 10 being the best) how do you rate your overall contribution to the project? Why?		**/10**
	Total Score	**/100**