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.

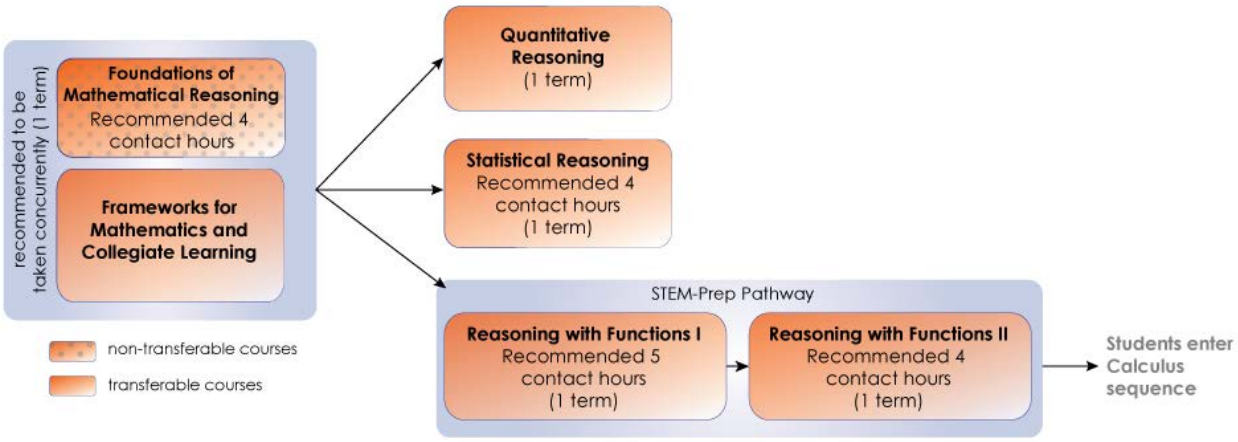
[2] *Productive persistence* was coined by Professor of Mathematics (and Dana Center Director) Uri Treisman. See, for example, David S. Yeager, Jane Muhich, Laura Torres, and Rose Asera. (2010, December 31). Carnegie Foundation for the Advancement of Teaching Summary Report: 90-Day Project: Measures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

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.

[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.

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/nmp-frameworks-mathematics-and-collegiate-learning-course-essentials.