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PATHWAYS

Defining the Content of Support Courses for Underprepared Students

The University of Texas at Austin
Charles A. Dana Center

www.dcmathpathways.org

Purpose

Support mathematics faculty in determining the appropriate content for prerequisite and co-requisite courses.

Audience

Math faculty and departmental administrators who are leading math pathways work.

Facilitated by
Paula Talley
Charles A. Dana Center

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Using this webinar

This webinar is designed to convey information and support discussion, reflection, and action.

View this webinar individually or use it with a group to structure discussion and planning. Periodically, there will be prompts for activities, including:

- Discussion/reflection
- Practice
- Plan for action

For each webinar, pause at these points as long as you wish.

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Outcomes

Participants will:
- Understand how content for supports is mapped from the gateway course.
- Practice backwards mapping to define content.

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Dana Center Mathematics Pathways

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Definition of *math pathway*

. . . a mathematics course or sequence of courses that students take to meet the requirements of their program of study.

The concept of math pathways applies to *all* students.

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Dana Center Principles for Pathways

Mathematics pathways are structured so that:

1) All students, regardless of college readiness, enter directly into mathematics pathways aligned to their programs of study.
2) Students complete their first college-level math requirement in their first year of college.

Students engage in a high-quality learning experience in math pathways designed so that:

3) Strategies to support students as learners are integrated into courses and are aligned across the institution.
4) Instruction incorporates evidence-based curriculum and pedagogy.

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Defining Content

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Supporting the desired student experience

Defining the content of prerequisite and co-requisite courses:

- How do we take underprepared students from where they are to a level of preparedness for the college-level course?
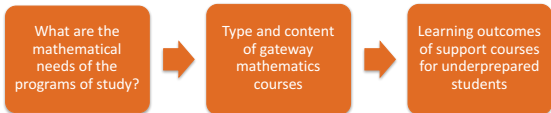

Backward mapping to define content
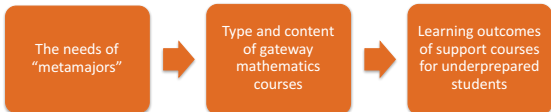
| What are the mathematical needs of the programs of study? | → | Type and content of gateway mathematics courses | → | Learning outcomes of support courses for underprepared students |

Backward mapping to define content

| The needs of "metamajors" | → | Type and content of gateway mathematics courses | → | Learning outcomes of support courses for underprepared students |

Backward mapping

Mathematics Prerequisites for Success in Introductory Statistics

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Activity: Discussion/reflection

Take a few minutes to discuss with your colleagues or reflect individually:

What information did you find that could be used in replicating this process for other courses on your campus?

When you are finished, proceed to the next section.

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Author's Perspective - Roxy Peck

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Mathematics Prerequisites for Success in Intro. Statistics

- Mathematics content linked to content in the introductory statistics course that are dependent on mastery of the mathematics content.
- Grouped mathematics prerequisites into six general categories
  - Numbers and the number line
  - Operations on numbers
  - Sets
  - Equations and inequalities
  - Graphing points and lines in two dimensions
  - Reading tables and graphs and approximating areas

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Justifying Mathematics Prerequisites

Example:

Represent an inequality as an interval on the number line.

Is this needed for statistics?

Why?

- Calculate probabilities for continuous variables
- Understand and interpret confidence interval estimates

Numbers and the Number Line	
Students need to be able to . . .	In order to . . .
Plot points and intervals on the number line	Make and interpret dotplots
Represent an inequality as an interval on the number line	Calculate probabilities for continuous random variables, understand and interpret confidence interval estimates
Find the distance between two points on the number line	Calculate deviations from the mean and calculate z-scores
Round decimals	Calculate numerical summary statistics, test statistics, and confidence intervals
Order decimal numbers	Calculate medians and quartiles, and compare P-values to a significance level

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Justifying Mathematics Prerequisites

Example

Order decimal numbers

Is this needed for statistics?

Why?

Calculate median and quartiles

Compare *P*-value to a significance level

Numbers and the Number Line	
Students need to be able to . . .	In order to . . .
Plot points and intervals on the number line	Make and interpret dotplots
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Additional Preparation for Success

- Exposure to the investigative cycle
  - Pose questions
  - Collect data
  - Analysis
  - Conclusions and new questions

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Additional Preparation for Success

- Experience with real data and real problems
  - Use of technology to solve mathematical problems
  - Experience with modeling

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Model Process for Prerequisites

- Not suggesting that this set of mathematics prerequisites is the DEFINITIVE set or that they are what you should use for your course.

- However, we wanted to encourage people to think about course prerequisites in this way and think that trying to articulate the "why needed for success in statistics" component as prerequisites are developed is a useful model.

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Activity: Discussion/reflection

Take a few minutes to discuss with your colleagues or reflect individually:

Now that you have heard directly from one of the authors, how would you refine your initial thinking for defining prerequisite content?

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Backward mapping to define content

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Backward mapping to define content

Mathematics pathways content:
- What learning outcomes does each gateway math course need to serve the appropriate pathway?
- What are the readiness outcomes for each gateway course?
- What will help underprepared students achieve readiness for the college-level course?

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Slide 25

Backward mapping to define content

Defining the Content:
Content Backmapping Template

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The content of support courses (prerequisite or co-requisite) should be selected based on the skills that students need to be successful in the college-level course. This tool is designed to facilitate the process of backmapping learning outcomes for the support course from the readiness competencies of the college-level course.

To identify learning outcomes for support courses, list the specific skills from the learning outcomes of the college-level course in the first column. In the second column, identify the competencies needed in order to successfully engage in activities that develop the skills in the first column. Those competencies become the descriptors of the learning outcomes of the pre/co-requisite course.

For prerequisite course structures, consider carefully which skills may need to be reinforced in the college-level course or may even be best saved for initial introduction in the college-level course.

An example from a Quantitative Reasoning course is shown below.

Demonstrate procedural fluency with real number arithmetic operations.				
		These skills should be:		
In the college-level course, students will:	Therefore, they need the ability to:	Taught in support course	Reinforced in college level	Taught in college level

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Backward mapping to define content

For prerequisite course structures, consider carefully which skills may need to be reinforced in the college-level course or may even be best saved for initial introduction in the college-level course.

An example from a Quantitative Reasoning course is shown below.

Demonstrate procedural fluency with real number arithmetic operations.				
		These skills should be:		
In the college-level course, students will:	Therefore, they need the ability to:	Taught in support course	Reinforced in college level	Taught in college level
Calculate absolute change.	Select and perform the four basic operations.	X		
Calculate relative change.	Calculate a percentage.	X		
	Interpret a percentage.	X	X	
Compare two budget categories over time.	Calculate absolute and relative change.			X

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Activity: Practice

Tailor this example to fit your course (e.g., algebraic, statistical, quantitative, technical, business, education).

Choose, create, and use models for bivariate data sets.				
		These skills should be:		
In the college-level course, students will:	Therefore, they need the ability to:	Taught in support course	Reinforced in college level	Taught in college level
Create a graphical display.				
Analyze data to determine appropriate model.				
Create the model.				
Use model for prediction.				

What background skills would prepare students to engage successfully in activities related to this SLO?

When you are finished, proceed to the next section.

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Activity: Plan for action

Create a plan for defining the content of support courses for underprepared students. Plan for how you will:

- Move forward to define a comprehensive set of SLOS for the support course at your institution.

When you are finished, proceed to the next section.

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Resources available

The Dana Center Mathematics Pathways Resource site, www.dcmathpathways:

- Learn About: Essential ideas and resources targeted for essential stakeholders
- Take Action: Action steps and resources for institutional and classroom implementation
- Resources:
  - *The Case for Math Pathways*
  - *The Program of Study Briefs*
  - Videos of student and faculty sharing their experiences

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Contact information

- General information about the Dana Center
  www.utdanacenter.org

- Dana Center Mathematics Pathways Resource Site
  www.dcmathpathways.org

- To receive monthly updates about the DCMP, contact us at
  dcmathpathways@austin.utexas.edu

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About the Dana Center

The **Charles A. Dana Center** at The University of Texas at Austin works with our nation's education systems to ensure that every student leaves school prepared for success in postsecondary education and the contemporary workplace.

Our work, based on research and two decades of experience, focuses on K–16 mathematics and science education with an emphasis on strategies for improving student engagement, motivation, persistence, and achievement.

We develop innovative curricula, tools, protocols, and instructional supports and deliver powerful instructional and leadership development.

2016

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