CCSNH
Mathematics Learning Communities Project

A Two-Tiered Strategy for Improving the Mathematical Readiness of Middle-Achieving College-Bound Students

Mathematics Instruction Colloquium
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Background and History

- 2005-2009: Making the Transition from High School to College (phases 1 and 2)
- Phase 1 (2005-2007) goal: determine if gaps existed between the mathematics preparation of students in high school and expectations of mathematical knowledge at the college level; and if gaps do exist, devise a strategy for minimizing/eliminating the gaps.

What did we find?

- The most important factor affecting college graduation (once socioeconomic status was taken into account) was the number and level of mathematics courses taken in high school.
- Quote: "*The highest level of mathematics reached in high school continues to be a key marker in pre-collegiate momentum, with the tipping point of momentum toward a bachelor's degree now firmly above Algebra 2." (Adelman, 2006)*

However, there is an information gap

- While 90% of students will eventually attend college, only 44% take the college preparatory curriculum.
- 51% of high school students surveyed planned to quit taking mathematics as soon as possible.
- It is assumed by many that graduating from high school equates to being ready for college level work, but high school graduation requirements often don't match college entrance requirements.

The result?

- Roughly 40% of all college students need remediation.
- At community colleges nationwide, the numbers jump to 60%;
- at community colleges in NH, it was 70%;
- at community colleges in AZ, it is...??
- The estimated costs of this remediation: $2.5 Billion Dollars Annually (Nationally), $132 Million Dollars Annually (Arizona)

There is a pattern here…somewhere…maybe?

- 11, 20, 21, 21, 23, 24, 25, 26, 26, 27, 28, 30, 31, 33, 33, 33, 35, 40
- Percentage of students determined to be ready for degree credit coursework in mathematics based on placement exam results at six community colleges in New Hampshire between the years 2004 and 2006.
- One C.C. gave their own placement exam; the other five used the ACCUPLACER exam (Elementary Algebra) with a *hypothetical* cut score of 62.
- Combined, the overall average was about **30%**.

High School ACCUPLACER (Pilot) Testing - Spring 2006

Total Juniors Tested:	212
Jrs. scoring ≥ 62 on Accuplacer El. Alg.	52 = 25%
Total Seniors Tested:	187
Sr. Scoring ≥ 62 on Accuplacer El. Alg.	55 = 29%

2007 New Hampshire **NECAP** Grade 11 Mathematics Testing Results

Percentage of Students Testing as:

- Proficient W/Distinction …… 2%
- Proficient in Mathematics…… 26%

Total Testing as Proficient = **28%**

Some other interesting(?) data

- In fall 2009, **44%** of all **CCSNH** math course **Student Registrations** were Developmental, **Not-for-Degree-Credit** enrollments

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- In fall 2009, **Developmental Courses** at **NHTI** comprised **42%** of all **Math Course Sections**
- In fall 2009 The **Pass Rate** at **NHTI** in the Algebra I, Developmental Math Course, was **56%** (“C” Grade or Better)

"Pay Me Now, Or Pay Me Later"

- Developmental math courses cost money…some students take **two or more**
- Often is the student's **Most Difficult**, first-semester course
- These courses may, **Unintentionally**, be acting as a **Filter** rather than a **Bridge** to **College Success**…which means they…
- **Impact Retention**

The Impact?

- 63% of students requiring remedial coursework in mathematics fail to earn college degrees of any kind.

This contrasts greatly with:

- 65% of students NOT requiring remedial coursework in mathematics earn college degrees.

A lot of other data was gathered as well

- This isn't the entire scope of what was found during the research, but it is a basic overview.
- So, the next step seemed to be to decide how to make changes that would positively impact student success in mathematics at the college level.

Phase II (2007-2009)

- Twenty High Schools in the state of New Hampshire participated in a project designed to increase student readiness for college level mathematics.
- Each school was to design their own *Action Plan* based on their local needs.
- Community Colleges continued to play an active role in this project.

One high school decided this…

- To create a Senior Math course designed for the "middle-tier" student to help better prepare them for credit-bearing college-level math courses
- The course, called "Senior Math" would be available to those students who were Seniors and had passed (usually, barely) Algebra II

"Senior Math"

- A Course Based on the 14 CCSNH - Prerequisite Math Competencies
- Algebra Content Focused
- ACCUPLACER Elementary Algebra used as pre-test and post test instrument
- Specifically Offered to HS Seniors Who Are:
  - Non-Math/Science Oriented
  - Middle-Achieving Students

First Semester Results

- 25 students enrolled in the course and took the pretest
- One student (4%) "passed" the pretest
- 21 students took the post test
- 13 (62%) students "passed" the post test
- The one student who passed the pretest scored 119 on the post test.

Also during Phase II

- The CCSNH designed a common threshold math course to be offered in all Community Colleges in the state.
- The course, called "Topics in Applied College Mathematics" (TAC.Math) would be the math course non-STEM majors could take to satisfy their college-level mathematics requirement.
- Printed first edition of "CCSNH Mathematics Requirements: Advisors Handbook"

Phase III (2009-2011)

- The CCSNH began the "Two Tiered Practical Approach to Math Preparedness."
- The goal of this project is to significantly reduce remedial mathematics courses at the college level by attacking the problem at the high school level.

Ending the "Blame Game"

- All Professional Development Activities involve the Joint Participation of CCSNH, High School Math Faculty, High School Administrators, and University Math Faculty involved in the original "MaTHSC" projects.

Two-Tier Practical Approach to Math Preparedness

- Tier One:
  - **"Senior Math"** for Students Needing to Master 14 CCSNH – Prerequisite Math Competencies – not offered for college credit
- Tier Two:
  - Topics in Applied College Mathematics (**TAC.Math**) – CCSNH Common Threshold Math Course for Degree Credit

TAC.Math & Senior Math

- To be Taught Relying On:
  - Critical Thinking Skills Advanced by Costas *Habits of Mind*
  - Utilizing Applied Problem Solving Approaches – *Math in Real Life*
- Focused on Middle-Achieving, Non-STEM major Students

Habits of Mind: Critical Thinking Skills (Examples)

- Developing a "curiosity" about mathematics and to have students seek the "whys" behind the procedures and skills being learned.
- Recognizing that hard work, persistence, and risk-taking are needed when doing mathematics.
- Recognizing the role of estimation and the need to examine the reasonableness of results.
- Recognizing that failure is a fact of life and that to be successful at challenges, one will experience failure, but will, hopefully, learn from it.

CCSNH
Prerequisite Math Competencies

1. Perform operations with signed numbers
2. Simplify algebraic expressions
3. Solve and graph linear equations and linear inequalities
4. Solve formulas for specific variables
5. Apply the rules of exponents
6. Evaluate numerical square roots
7. Translate and solve word problems

Prerequisite Math Competencies (Con't…)

8. Graph linear equations in two variables
9. Find the slope of a line
10. Simplify polynomials
11. Factor polynomials
12. Solve systems of linear equations in two variables
13. Simplify rational expressions
14. Solve quadratic equations by factoring

Senior Math Course – Encouraging Results
ACCUPLACER – Elementary Algebra
Pre and Posttests

Senior Math – Sample Sections – AY 2008-09 & 2009-10

- **63** = Minimum Score for Waiver Admittance to Degree-Credit Math Courses
- **78** = New CCSNH Cut-Score for Admittance to Degree-Credit Math Courses

Sample = 84	Pretest	Posttest	# Change	% point Change	Percent Change
Students Scoring ≥ 63	21 of 84 = 25%	51 of 84 = 61%	30	36	143%
Students Scoring ≥ 78	6 of 84 = 7%	33 of 84 = 39%	27	32	450%

Topics in Applied College Mathematics = ***TAC.Math***

- Common Threshold CCSNH Math Course
  - Survey Course Focused on "Math for College Educated Citizens"
  - Carries Degree Credit
    - Satisfies Math Requirement for Many Majors
    - Widely Transferable
  - To Be Offered Via Project Running Start

TAC.Math
A System-Wide *Threshold* Math Course

- Five Topic Survey Course Influenced by the Content Standards of *Crossroads in Mathematics* (AMATYC)*:*
  - Intro to Problem solving and Critical Thinking
  - Number Theory/Number Systems
  - Algebra: Functions/Modeling/Finance
  - Geometry & Measurement
  - Probability and Statistics

TAC.Math – Student Value as an Offering in Project Running Start

- The "Carrot" to Engage Middle-Achieving HS Seniors in Additional Math Instruction
  - Eliminates (in most instances) Need for Further Placement Testing and Potential Enrollment in Developmental Math Courses
  - Saves **Cost, Time & Discouragement**
  - **Creates Confidence and Momentum to be carried into the Postsecondary Experience = Retention**

Using Accuplacer in the Two-Tier Approach

- Test H.S. Juniors in Spring
- Students Scoring $\geq$ 63 on the Accuplacer Elementary Algebra Admitted to TAC.Math in Fall/ Spring of Senior Year
- Students Scoring Below 63 to Enroll in Senior Math in Fall of Senior Year to Master 14 Competencies
  - Success – Measured by Accuplacer Posttest – Could Yield Invitation to TAC.Math enrollment in Spring of Senior Year (in block schedule)

Phase IV:
2011 - present

College Access Challenge Grant

Five-Year Funding Commitment

- Senior Math and TAC.Math Coaching Teams
  - Focused on Content, Habits and Applied Problem Solving – *Math for the Real World*
  - Site Visits for pre- and post-test, PD, etc.
- Senior Math Teacher's Guide
  - Daily Lesson Planning Outlines
  - Identifies Habits of Mind Utilized

College Access Challenge Grant Added Benefits and Services

- ACCUPLACER Pre and Post Testing Provided at No Cost
- 50% Textbook Purchasing Assistance
  - Senior Math and TAC.Math
- TAC.Math Running Start Scholarships
  - Students Needing Assistance – Up to $100

Summary…

- This project is designed to treat the problem of remedial mathematics *before* students arrive on campus.
- Less remediation = higher retention = higher graduation rates
- Questions?

Thank You for Your Interest

- Reference Materials:
  - www.ccsnh.edu/specproj.html
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