



Education  
Advisory  
Board

Community College Forum

# Reengineering Developmental Math

A Practical Approach to Accelerating Student Success

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# Supporting Members in Best Practice Implementation

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## Beyond This Publication

We see this publication as only the beginning of our work to assist members in reengineering developmental math. Recognizing that ideas seldom speak for themselves, our ambition is to work actively with Forum members to decide which practices are most relevant for your organization, to accelerate consensus among key constituencies, and to save implementation time.

For additional information about any of the services below—or for an electronic version of this publication—please visit our website ([eab.com](http://eab.com)), email your organization's dedicated advisor, or email [researchedu@advisory.com](mailto:researchedu@advisory.com) with "Reengineering Developmental Math" in the subject line.



### **Implementation Road Map and Tools**

Throughout our profiles of best practices, this symbol will alert the reader to a few of the many corresponding tools and templates available in the "Implementation Toolkit Resource Center." These tools, along with additional online resources, are available on our website at [eab.com](http://eab.com).



### **Recorded and Private-Label Webconferences**

Our website includes recordings of two hour-long webconferences walking through the practices highlighted in this publication. Many of our members convene their teams to listen to recordings together; Forum experts are also available to conduct private webconferences with your team.



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Members may contact the consultants and analysts who worked on any report to discuss the research, troubleshoot obstacles to implementation, or run deep on unique issues.



### **Custom Research Inquiries**

In addition to the research available in this publication, our custom research staff is also available to answer questions of particular interest to your campus. Projects typically include literature searches, profiles of peer practitioners, and vendor analyses.



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# Institutions Examined in Our Research

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Aims Community College  
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Alcorn State University  
Lorman, MS

Algonquin College of Applied  
Arts and Technology  
Ottawa, ON

American River College  
Sacramento, CA

Anne Arundel  
Community College  
Arnold, MD

Austin Community College  
Cedar Park, TX

Austin Peay State University  
Clarksville, TN

Bakersfield College  
Bakersfield, CA

Bergen Community College  
Paramus, NJ

Bossier Parish  
Community College  
Bossier City, LA

Broward College  
Fort Lauderdale, FL

Bucks County  
Community College  
Feasterville, PA

Capital Community College  
Hartford, CT

Centennial College  
Toronto, ON

Central Arizona College  
Coolidge, AZ

Central Piedmont  
Community College  
Charlotte, NC

Cerro Coso Community College  
Ridgecrest, CA

Chattanooga State  
Community College  
Chattanooga, TN

Clackamas Community College  
Oregon City, OR

Cleveland State  
Community College  
Cleveland, TN

Colorado Mountain College  
Glenwood Springs, CO

Columbus State  
Community College  
Columbus, OH

Community College of  
Baltimore County (CCBC)  
Baltimore, MD

Community College of  
Rhode Island  
Warwick, RI

Cosumnes River College  
Sacramento, CA

CSU East Bay  
Hayward, CA

CSU Humboldt State University  
Arcata, CA

CSU Northridge  
Northridge, CA

CUNY Community College  
New York, NY

Cuyahoga Community College  
Cleveland, OH

Davidson County  
Community College  
Johnson City, NC

De Anza College  
Franklin, CA

Delaware County  
Community College  
Dover, PA

Delgado Community College  
Greenville, LA

Denver Community College  
Denver, CO

Diablo Valley College  
Dickinson, CA

East Georgia College  
Swainsboro, GA

Eastern Gateway  
Community College  
Cincinnati, OH

Eastern Iowa Community  
College District  
Richmond, IA

El Paso Community College  
El Paso, TX

Essex County College  
Newark, NJ

Everett Community College  
Everett, WA

Fayetteville Technical  
Community College  
Fayetteville, NC

Foothill College  
Los Altos Hills, CA

Gainesville State College  
Oakwood, GA

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Toronto, ON

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Aberdeen, WA

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Community College  
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Community College  
Harrisburg, PA

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Waterloo, IA

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Hamburg, WA

Honolulu Community College  
Honolulu, HI

Horry – Georgetown  
Technical College  
Conway, SC

Housatonic Community College  
Bridgeport, CT

Houston Community  
College System  
Houston, TX

Hudson Valley  
Community College  
Troy, NY

Humber College  
Toronto, ON

Iowa Central  
Community College  
Fort Dodge, IA

Iowa Western  
Community College  
Council Bluffs, IA

Itawamba Community College  
Fulton, MS

Ivy Tech Community  
College System  
Bloomington, IN

Jackson State  
Community College  
Jackson, TN

Kapi'olani Community College  
Honolulu, HI

Kaua'i Community College  
Lihue, HI

Kent State University  
Kent, OH

Kern Community  
College District  
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of Technology  
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Danville, WI

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Leesburg, FL

Langara College  
Vancouver, BC

Lee College  
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Community College  
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Long Beach, CA

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Community College  
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Community College  
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Community College  
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Technical College  
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Technical College  
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Community College  
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Willmar, MN

Rio Salado College  
Tempe, AZ

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Sacramento, CA

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Windsor, ON

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San Bernardino Community  
College District  
San Bernardino, CA

San Diego City College  
San Diego, CA

San Diego Miramar College  
San Diego, CA

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San Francisco, CA

San Jose State University  
San Jose, CA

Santa Barbara City College  
Santa Barbara, CA

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Santa Monica, CA

Seattle Central  
Community College  
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St. Louis Community College  
St. Louis, MO

Stark State College  
North Canton, OH

Tacoma Community College  
Tampa, WA

Tallahassee Community College  
Tampa, FL

Tarrant County College  
Hurst, TX

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Temple, TX

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Madison, WI

**Wor-Wic Community College**  
Salisbury, MD

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Cleveland State Community College

# Top Lessons From the Study

## The Challenge: Elevating Developmental Student Success with the Resources at Hand

### Developmental Math Greatest Barrier to National Completion Goals

Once a low-profile offering, developmental math has been forced into the public spotlight by the completion agenda, earning names such as the “Bridge to Nowhere” and the “Bermuda Triangle of Higher Education.” College leaders agree these gloomy labels ring true, with over half of community college entrants testing into developmental math coursework and only a small fraction of these students ever progressing to college-level math, let alone earning a college credential.

### Change Ourselves, Before Change Is Thrust Upon Us

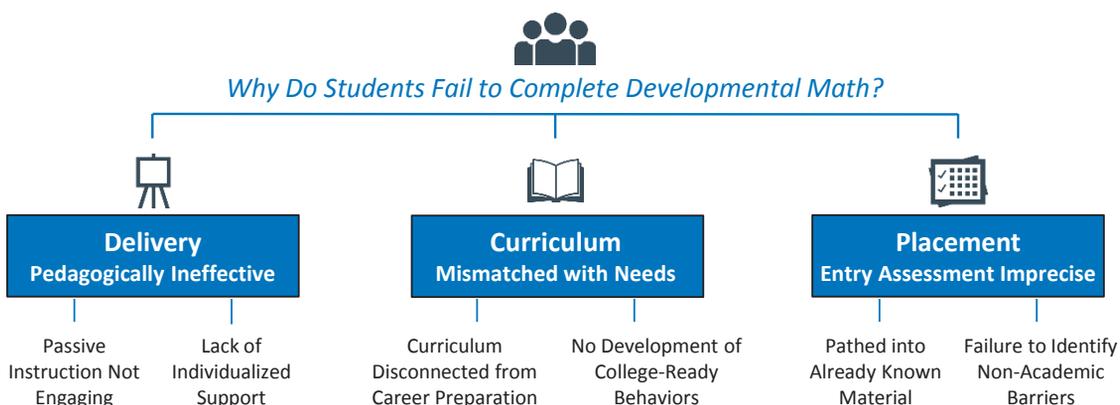
There has never been a better time to invest in reengineering developmental math; a surge of foundation grants for math redesign efforts has put much-needed funds on the table, lowering the cost of experimentation. While the rewards for innovation are high, the costs of inaction are even higher. Colleges failing to achieve developmental math completion gains independently are increasingly subject to top-down directives from the state. Unfortunately, these uniform mandates often perform far worse than college-led efforts.

### Members’ Charge to the Forum—What Works, What Doesn’t, and Where to Invest?

New funds and the specter of top-down intervention have fueled countless developmental math pilots, building a towering library of lessons learned. Members’ charge to the Forum was to approach the weighty “math problem” through a strategic lens, asking practical questions about what works, what doesn’t, and where to invest in math redesign. In pursuit of these answers, we conducted over 200 research interviews and site visits with community college leaders, administrators, topic experts, faculty, and students, distilling their collective teachings into an actionable guide for accelerating developmental student success.

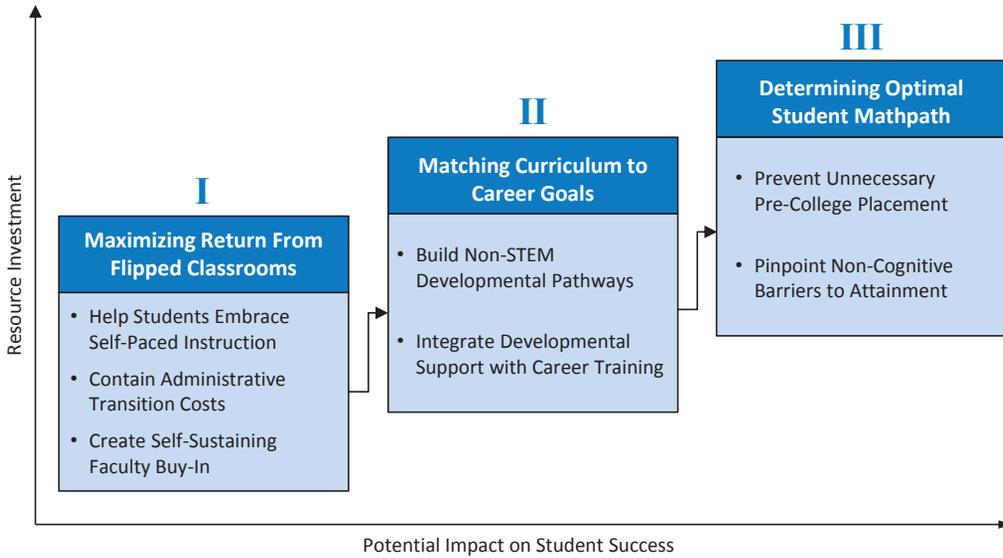
### Three Critical Areas in Need of Redesign

Our research surfaced three actionable areas in need of math redesign: content delivery, curriculum, and placement practice. Ineffective classroom pedagogy, mismatched curriculum, and imprecise placement practice are the primary culprits of student attrition.



### A Practical Approach to Accelerating Student Success

Each section of this study tackles one of the three developmental math challenge areas, addressing open questions from progressive college leaders on delivery, curriculum, and placement redesign—How do we maximize return from flipped classrooms? How do we better match curriculum to students' career goals? How do we determine an optimal student mathpath?



# Top Lessons From the Study (cont.)

## Maximizing Return From Flipped Classrooms

### Lecture-Drill Pedagogically Ineffective

Mind-boggling attrition data and student evaluations can no longer be ignored—lecture-drill instruction is pedagogically ineffective for developmental math students. “Sage on the stage” delivery is passive, participation is optional, and lecture leaves no room for individualized problem solving. Recognizing these drawbacks, progressive community colleges are experimenting with alternative instructional models and have evolved a winning strategy: the modified math emporium.

### A Winning Model Emerges—Modified Math Emporium Highest-Return Delivery Strategy

The modified emporium model “flips the classroom” by transforming rows of note-taking desks into an interactive computer lab. There is no generic lecture; students spend class time working through individualized exercises on computer software, focusing on their unique areas of difficulty. Of the many instructional models analyzed in our research, the modified emporium led to the greatest scalable gains in student course completion and learning.

### Software Doesn’t Stand Alone—Role of Instructor Elevated, Not Marginalized

Critical to the modified emporium’s success is the new, more impactful role of the course instructor. Freed of administrative burdens and podium speaking time, modified emporium instructors can become academic success coaches, helping individual students work through uniquely challenging problems during class time or spotting (and then teaching) absent college-ready behaviors required for attainment.

### How to Get the Most Out of Your Flipped Math Classroom

While some modified emporiums experience double-digit gains in gatekeeper course completion and significant cost savings, others fail to move the dial—success is in the implementation details. The resources in this section support members in maximizing the return of their flipped math courses. Featured strategies, lessons learned, and implementation tools are designed to help students embrace self-paced instruction, contain administrative transition costs, and generate faculty buy-in.



#### Help Students Embrace Self-Paced Instruction



- Math Tutoring Community Partnerships
- Embedded Individualized Coaching Sessions
- Faculty-View Dashboard
- Module-Clustered Seating
- Student Pacing Calendars
- Mandatory Course Contract
- All-Inclusive Grading Scheme
- Tuition-Saving Acceleration Incentives

#### Contain Administrative Transition Costs



- Optimal Cross-Silo Implementation Timeline
- Software Vendor Evaluation Rubric
- Shell Courses
- Interim Grade Placeholders
- Peak Hour Staffed Open Lab

#### Create Self-Sustaining Faculty Buy-In



- Leadership-Led Redesign Launch Workshop
- Campus Media Partnership
- Low-Cost Academic Integrity Safeguards
- Delineated Support Staff Job Descriptions
- 5-Minute Course Kickoff Scripts
- Behind-the-Scenes Software Demonstration
- Instant-Access Multimedia Training

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### **Good News—Heightened Vendor Competition Raising Bar for Online Learning Platforms**

Flipped math classrooms are an investment with a bright long-term future. Heightened competition among digital learning platforms is providing better functionality for the same or lower cost. Online courses are increasingly individualized to learner goals, embed game-based learning, and provide actionable student intelligence to faculty and administrators. Not only will institutions that effectively complement these new learning platforms see gains in developmental student success—they'll be advantaged in the competition for future students, grants, and preferred employer partnerships.

## Top Lessons From the Study (cont.)

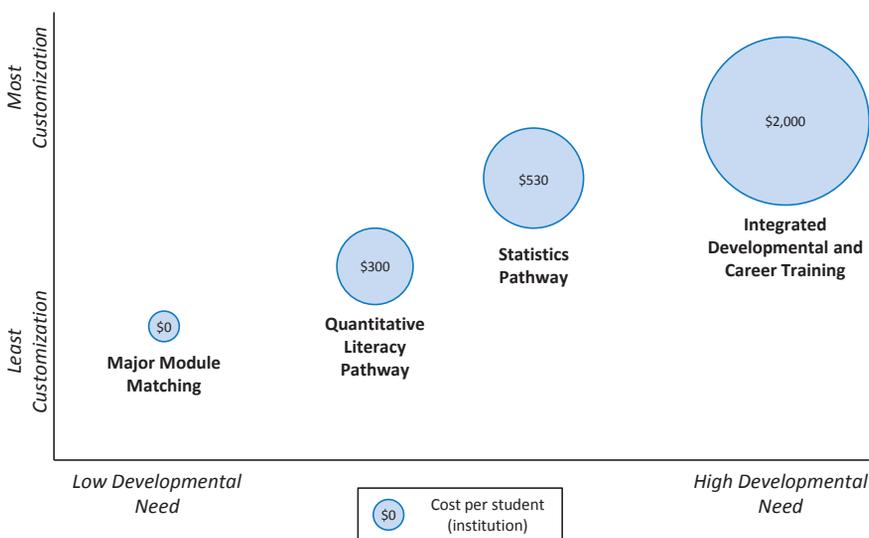
### Matching Curriculum to Career Goals

#### Algebra a Costly Roadblock to Attainment, Better Alternatives Available

Developmental math sequences typically reteach high school algebra; yet for most students, this curriculum is void of practical application. While the role of algebra in curriculum tangles itself in philosophy as well as economics, college leaders increasingly view this lofty algebra bar as an unnecessary roadblock to developmental student success. Progressive faculty argue there are better alternatives available, math curriculum that maintains rigor but is connected to students' career goals.

#### Balancing Cost and Customization—Save Aggressive Tailoring for Highest-Need Students

The greatest obstacle to matching students' curriculum to career goals is the potentially high cost of customization. To combat this obstacle, we recommend varying levels of curriculum customization according to students' developmental needs, focusing the most extensive tailoring on students with the greatest math needs and the lowest odds of traditional completion. Strategies explored in this section include major module matching, statistics pathways, and I-BEST.



#### Major Module Matching a Low-Cost Strategy for Removing Unnecessary Content Barriers

Institutions with modular delivery models can tailor developmental curriculum to students' academic and career goals by requiring students to complete only those topics required for success in their intended program of study. Colleges that have implemented major module matching have seen a significant reduction in developmental sequence length and a subsequent increase in completion rates.

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### **Statistics Pathways Dramatically Elevate Non-STEM Student Success**

The number of jobs requiring statistics knowledge is growing rapidly, yet most colleges don't offer developmental curriculum that prepares students to be successful in college statistics. Progressive institutions are implementing statistics pathways that fulfill developmental requirements and college-level math requirements, removing content without practical application and equipping students with a high-demand math skill set. These pathways have led to double-digit gains in college-level math completion.

### **Integrated Developmental and Career Education Highest-Return Model for High-Need Students**

While statistics pathways and major module matching elevate completion for students entering with medium-to-low developmental need, students who place into the lowest level of developmental math require often require more significant content tailoring to reach attainment. Our research found the best model for these students is a program called I-BEST, which weaves contextualized developmental support into a vocational credential ladder. This initiative explores the critical success factors of high-performing I-BEST programs.

## Top Lessons From the Study (cont.)

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### Determining Optimal Student Mathpath

#### **Current Placement Practice Imprecise, Leading to Overmathing**

At most colleges, a hidden high-stakes exam testing high school concepts determines whether a student will start in developmental or college courses. Data suggests that about one in four developmental students are overmathed under this system—developmental students who would have earned a B or higher had they been placed into college math. This overmathing not only wastes students' time and money, but also significantly diminishes their chances of degree completion.

#### **Four Strategies for Preventing Unnecessary Pre-College Placement**

Modular placement exams, co-requisite mainstreaming models, math refresher courses, and using high school GPA as an alternative placement indicator can all prevent costly overmathing; however, these strategies are most impactful with different student populations. While modular placement exams and the use of high school GPA as an alternative placement indicator are effective strategies for students at all skill levels, data shows that co-requisite mainstreaming and math refresher courses should be reserved for upper-level developmental students and students who demonstrate high levels of motivation.

#### **High School GPA More Predictive of Success Than Placement Exam Score**

Colleges using high school GPA as an alternative placement mechanism are finding many students who would have been placed into developmental coursework using exam scores are now being placed directly into college coursework, where they perform on par with class peers. Practitioners attribute the superior predictive power of GPA to its assessment of both academic aptitude and soft skills—traits like motivation, self-discipline, and ability to succeed in a classroom environment.

#### **What the Future Holds—Pinpointing (and Then Mitigating) Non-Cognitive Barriers**

There is a growing cross-disciplinary consensus that traits like productive persistence, grit, curiosity, optimism, and self-control play a tremendous role in developmental student success. Progressive colleges are investing in “character diagnostics” to identify these non-academic success factors upon entry, enabling institutions to more precisely path students to high-impact interventions.

### 360-Degree Assessments Key to Determining Optimal Student Mathpath

A unifying theme throughout this initiative is personalization. Forum research found that even among high-impact interventions, different student types respond best to unique interventions. Based on over 200 research conversations with innovative colleges across the country, the rubric below summarizes which profiled strategies deliver the greatest return for unique student groups.

	Developmental Math Placement 	Academic Concentration 	Motivation Level 	
Highest-Return Strategy for Student Type	<b>Modified Emporium</b>	Medium-High	Declared	Medium-High
	<b>Statistics Pathway</b>	Medium-High	Non-STEM	Medium-High
	<b>Developmental I-BEST</b>	Low-Medium	Applied	Low-High
	<b>MOOC Math Refresher</b>	Medium-High	All	High
	<b>Co-Requisite Mainstreaming</b>	High	All	Medium-High

Source: Advisory Board interviews and analysis.

# Understanding Your Current Practice

The following questions are designed to guide members in evaluating their current activities. Members may use them to determine if the full range of best practices is being used on their campuses and to evaluate whether absences represent an opportunity for investment or action.

## Maximizing Return From Flipped Classrooms

Yes No

### *Help Students Embrace Self-Paced Instruction*

- |  |                          |                          |
|--|--------------------------|--------------------------|
| 1. Is your developmental math sequence offered through a modified emporium model of computer-based learning?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Can students complete modularized math lessons at their own pace?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Are your math emporiums sufficiently staffed to support a maximum 1:18 instructor-to-student ratio?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Is your math emporium staffed to match student attendance levels during the day?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. In addition to faculty instructors, do you employ tutors to address students' academic and administrative needs?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Do you employ a lab supervisor to manage staffing and scheduling, train tutors, and provide technical support in the math emporium?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. Do you hire students from four-year partner institutions, upper-level college math courses, or the student employee pool to work as tutors in the math emporium?                                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Can instructors easily access academic and demographic information about enrolled students to coach them on acceleration through developmental coursework?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. Are students encouraged to sit near peers working through the same set of modules to foster class cohesion and facilitate small group interactions between students and instructors?                  | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. Are faculty required to engage with developmental students through individualized check-in sessions?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 11. Do faculty reserve room at the front of the classroom for individualized coaching sessions where students can discuss curricular progress and address problematic math topics with their instructor? | <input type="checkbox"/> | <input type="checkbox"/> |
| 12. Do faculty use individualized pacing calendars to help students set goals for modular completion and track student progress through the semester?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 13. Do instructors factor homework assignments, attendance, and class participation into students' final grades to incentivize course engagement?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 14. Does your college's instructional model offer students financial incentives to accelerate through the developmental sequence and move into college-level coursework?                                 | <input type="checkbox"/> | <input type="checkbox"/> |

### *Contain Administrative Transition Costs*

- |  |                          |                          |
|--|--------------------------|--------------------------|
| 15. Does your college have a phased redesign implementation timeline that includes important checkpoints with staff from academic affairs, student affairs, enrollment management, and information technology? | <input type="checkbox"/> | <input type="checkbox"/> |
| 16. Is your math emporium stocked with unique markers (e.g., colored cups) to indicate when students have questions or take exams during class?  | <input type="checkbox"/> | <input type="checkbox"/> |

- 17. Does your math emporium software interface with the student information system?
- 18. Are staff members from across campus included in the software selection process for the emporium and equipped with a vendor evaluation rubric to standardize feedback?
- 19. Does the registrar track student progress through developmental math modules using semester-long "shell courses" to simplify administrative processes?
- 20. Can students who need to complete less than a full semester of math modules enroll in tuition-saving short-term shell courses?

*Create Self-Sustaining Faculty Buy-In*

- 21. Does the president demonstrate active support for developmental math redesign by hosting a redesign launch workshop that convenes constituents from across campus?
- 22. Are faculty convinced that a modified math emporium can be implemented while safeguarding academic integrity?
- 23. Has the redesign team engaged math faculty in the software selection process for the modified math emporium?
- 24. Do first-time math emporium instructors have access to on-demand training materials?
- 25. Do administrators share improved results data from other institutional redesigns with faculty to encourage buy-in?
- 26. Has your college collaborated with on-campus media publications (e.g., student magazine, newspaper, or radio show) to generate staff and faculty buy-in for math redesign?

*If you answered "No" to any of questions 1 through 26, please turn to Section 1: Maximizing Return From Flipped Classrooms on page 37.*

**Matching Curriculum to Career Goals**

**Yes No**

*Build Non-STEM Developmental Pathways*

- 27. Does your college offer developmental courses tailored to students with different levels of developmental need, those pursuing STEM and non-STEM fields, and those interested in career training?
- 28. Are developmental requirements confined to competencies necessary for success in students' intended field of study?
- 29. Can students pursuing non-STEM concentrations opt to enroll in developmental statistics courses instead of the traditional algebra sequence?
- 30. Have administrators considered adopting pre-packaged statistics and quantitative literacy curricula from the Carnegie Foundation for the Advancement of Teaching or the Charles A. Dana Center at the University of Texas-Austin?
- 31. Do administrators easily generate student enrollment in new developmental course offerings?
- 32. Do four-year institutions accept statistics pathway credit for students from your community college?
- 33. Do your math instructors leverage their professional connections at four-year institutions to build an articulation agreement network for new math course offerings?

## Understanding Your Current Practice (cont.)

### *Integrate Developmental Support with Career Training*

- |   |                          |                          |
|---|--------------------------|--------------------------|
| 34. Has your college adopted an I-BEST model to integrate developmental support with vocational training for low-level developmental students?                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 35. Have student completion rates at your college at least doubled since implementing an I-BEST program?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 36. Do you have a designated staff member responsible for pairing instructors for team-teaching in I-BEST classrooms?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 37. Do your developmental instructors have sufficient technical expertise to create contextualized math, English, and writing exercises for I-BEST support classes? | <input type="checkbox"/> | <input type="checkbox"/> |

*If you answered "No" to any of questions 27 through 37, please turn to Section 2: Matching Curriculum to Career Goals on page 75.*

### **Determining Optimal Student Mathpath**

**Yes No**

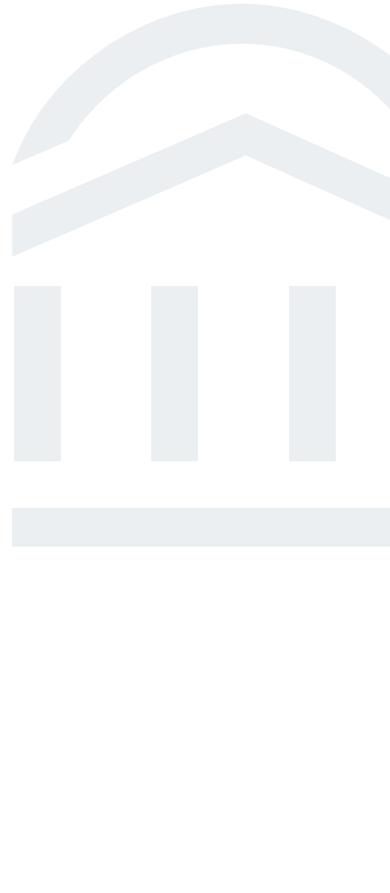
#### *Prevent Unnecessary Pre-College Placement*

- |   |                          |                          |
|---|--------------------------|--------------------------|
| 38. Are your developmental requirements determined by diagnostic assessments that pinpoint specific math topic deficiencies?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 39. Can upper-level developmental students at your college enroll directly in college-level coursework with the condition they also enroll in a companion success course? | <input type="checkbox"/> | <input type="checkbox"/> |
| 40. Does your college offer pre-enrollment refresher courses that review developmental math coursework before placement testing?  | <input type="checkbox"/> | <input type="checkbox"/> |
| 41. Does your college offer refresher courses as Massive Open Online Courses (MOOCs)?   | <input type="checkbox"/> | <input type="checkbox"/> |
| 42. Does your college consider high school GPA when placing students into courses?  | <input type="checkbox"/> | <input type="checkbox"/> |

#### *Pinpoint Non-Cognitive Barriers to Attainment*

- |  |                          |                          |
|--|--------------------------|--------------------------|
| 43. Does your college assess student motivation, persistence, self-control, or grit when placing students into courses?            | <input type="checkbox"/> | <input type="checkbox"/> |
| 44. Are soft skills taught and incentivized in developmental math classrooms at your college?                                      | <input type="checkbox"/> | <input type="checkbox"/> |
| 45. Does your advising staff assess students' academic and non-academic strengths and goals to determine optimal student mathpath? | <input type="checkbox"/> | <input type="checkbox"/> |

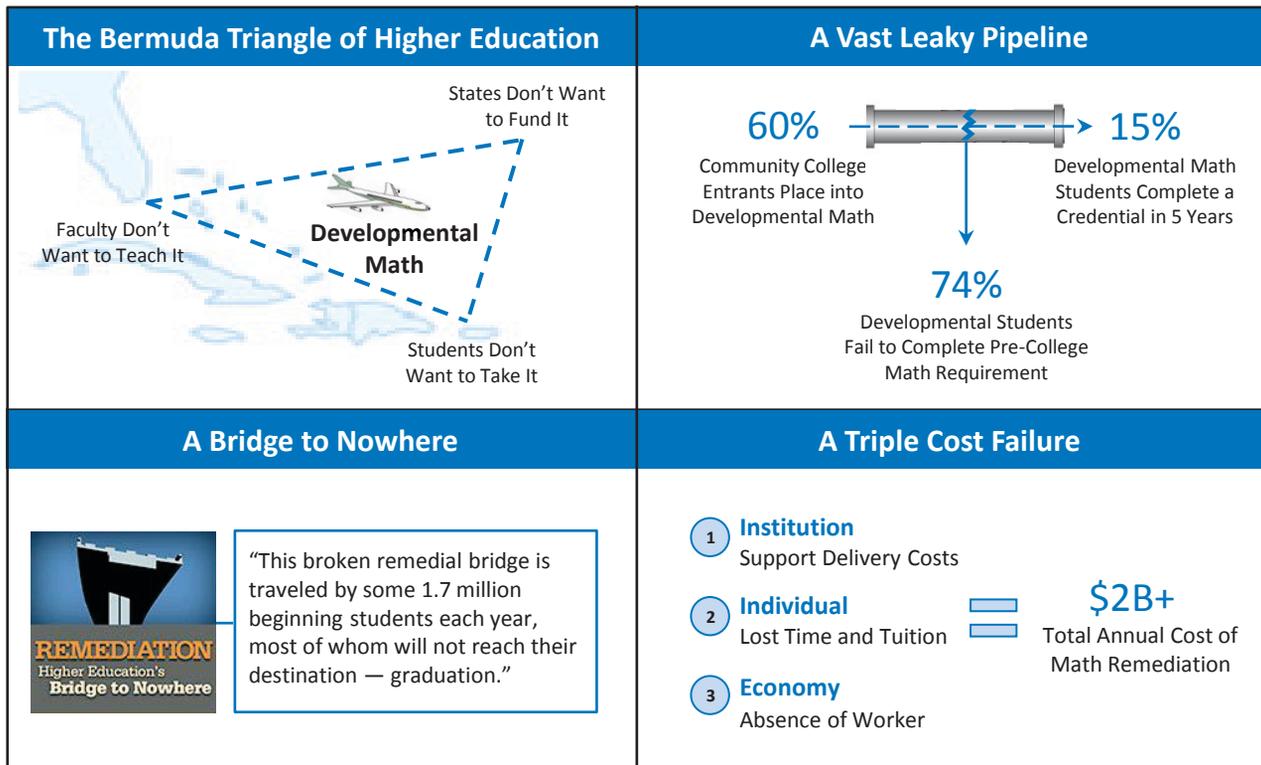
*If you answered "No" to any of questions 38 through 45, please turn to Section 3: Determining Optimal Student Mathpath on page 93.*



## How This Research Will Further Your Redesign Efforts

Once a low-profile college offering, developmental math has been forced into the public spotlight by the completion agenda, earning names such as the “Bridge to Nowhere” and the “Bermuda Triangle of Higher Education.” College leaders agree these gloomy labels ring true, with over half of community college entrants testing into developmental coursework and only a small fraction of these students ever progressing to college-level math, let alone earning a college credential. One estimate pegs the total annual cost of math remediation at over \$2 billion dollars a year.

## Pick Your Developmental Math Metaphor



Source: Complete College America, “Remediation: Higher Education’s Bridge to Nowhere,” April 2012, <http://www.completecollege.org/docs/CCA-Remediation-final.pdf>; Advisory Board interviews and analysis.

Historically, three factors have discouraged community college leaders from investing in developmental math redesign: belief that college prep belongs in high schools, limited funds, and staff resistance to change.

## Out of Our Hands?

*Leaders Question Whether Community Colleges Are Right Place for Critical Redesign*

### Too Late



“There shouldn’t be developmental math! We get kids fresh out of high school who have spent the past 13 years in public school and they can’t do basic arithmetic. Let’s start by fixing K-12.”

*Bob Shea, CFO  
Community College of  
Rhode Island*

### Strapped for Funds



“Are community colleges really the best place to reinvent our country’s math education? We are talking about our nation’s economic health. This important task should fall to those with deeper pockets.”

*Mary Spangler, Chancellor  
Houston Community  
College System*

### Change-Averse Culture



“High failure rates of students taking math isn’t new. The data has been there for two decades—shame on us for not doing anything sooner. Higher education resists transformation until the need is impossible to ignore.”

*Larry Keen, President  
Fayetteville Technical  
Community College*

Source: Advisory Board interviews and analysis.

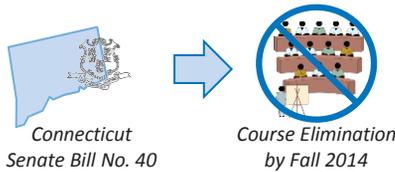
Fortunately, these historical obstacles are either eroding or being overcome by sheer force of will. There is a new sense among community college leaders that even if developmental math attrition is a larger societal problem, and even with constrained resources, community colleges are indeed the right place to drive change.

College leaders agree that in almost all cases, institution-driven change is far preferable to top-down mandates. Yet in recent years, frustrated by the slow pace of progress, states have begun to mandate how colleges should redesign developmental math. Even when these directives are well designed and intentioned, they often produce unintended consequences in the process of being adapted to local cultures.

## Change Ourselves, Before Change is Thrust Upon Us

### *College-Led Reform Far Preferable to Top-Down Mandates*

**The End of Open Access**  
*Connecticut Proposes Elimination of Frontloaded Developmental Education*



**Culturally Incompatible Directives**  
*Virginia Statewide Redesign Timeline Out of Sync with Institution's Administrative Realities*

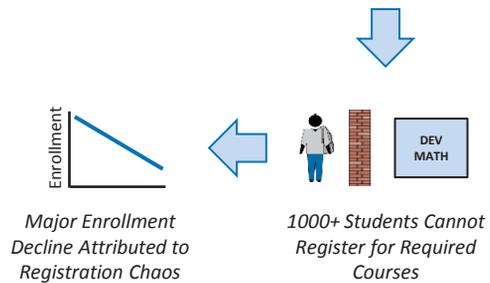


**Coming to a State Near You?**

**33 Alliance States and Counting**

**COMPLETE COLLEGE AMERICA**

- Advocating end of frontloaded developmental education in favor of co-requisite support



Source: Paul Fain, "How to End Remediation," Inside Higher Ed, April 4, 2012, <http://www.insidehighered.com/news/2012/04/04/connecticut-legislature-mulls-elimination-remedial-courses>; Advisory Board interviews and analysis.

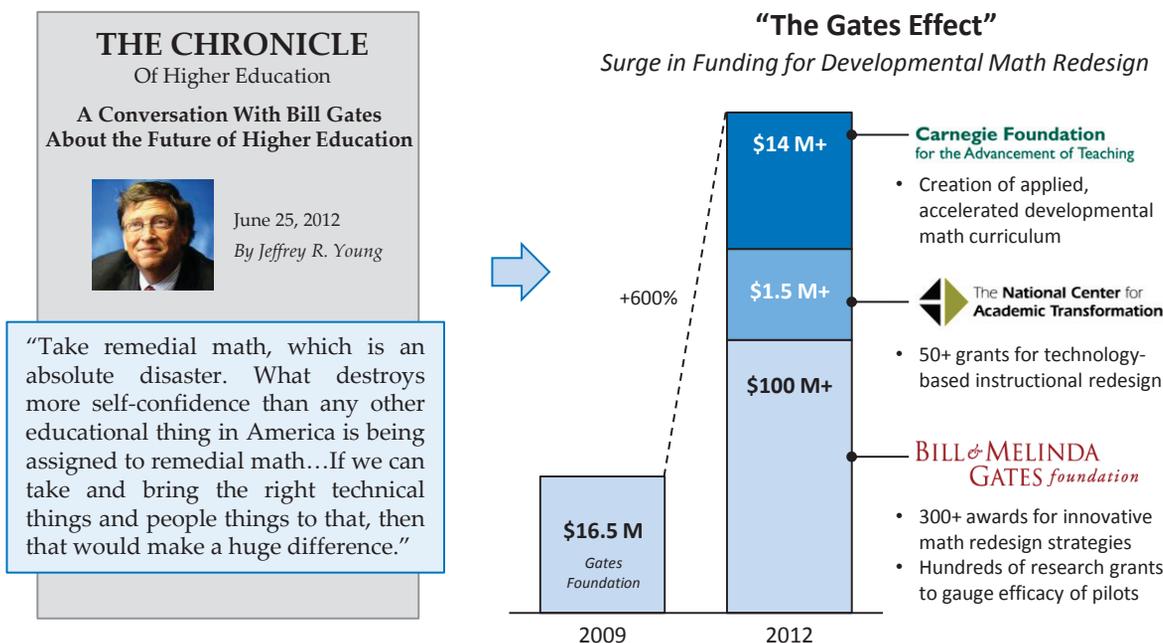
In 2012, the Connecticut Senate proposed a bill that would eliminate traditional front-loaded developmental education by fall 2014, despite research suggesting that this practice is damaging to math students with significant developmental need. This controversial policy move is championed by the organization Complete College America, an advocacy group that has gathered an alliance of 33 states and counting.

A second challenge with top-down state mandates is their potential incompatibility with local administrative processes. The Virginia Community College System recently embarked on a statewide math redesign modeled after an effective redesign at Northern Virginia Community College. Community College Forum interviews with other colleges in the state found that the shortened timeline of this top-down approach led to widespread administrative confusion and even an enrollment decline on one campus.

Although heightened public interest can attract unproductive interference in community college operations, the elevation of the developmental math problem has also generated much-needed funding and momentum. Since 2009, there has been a 600 percent increase in foundation dollars allotted to colleges for developmental math redesign, largely thanks to the contributions of the Bill and Melinda Gates Foundation.

## Not All Bad News

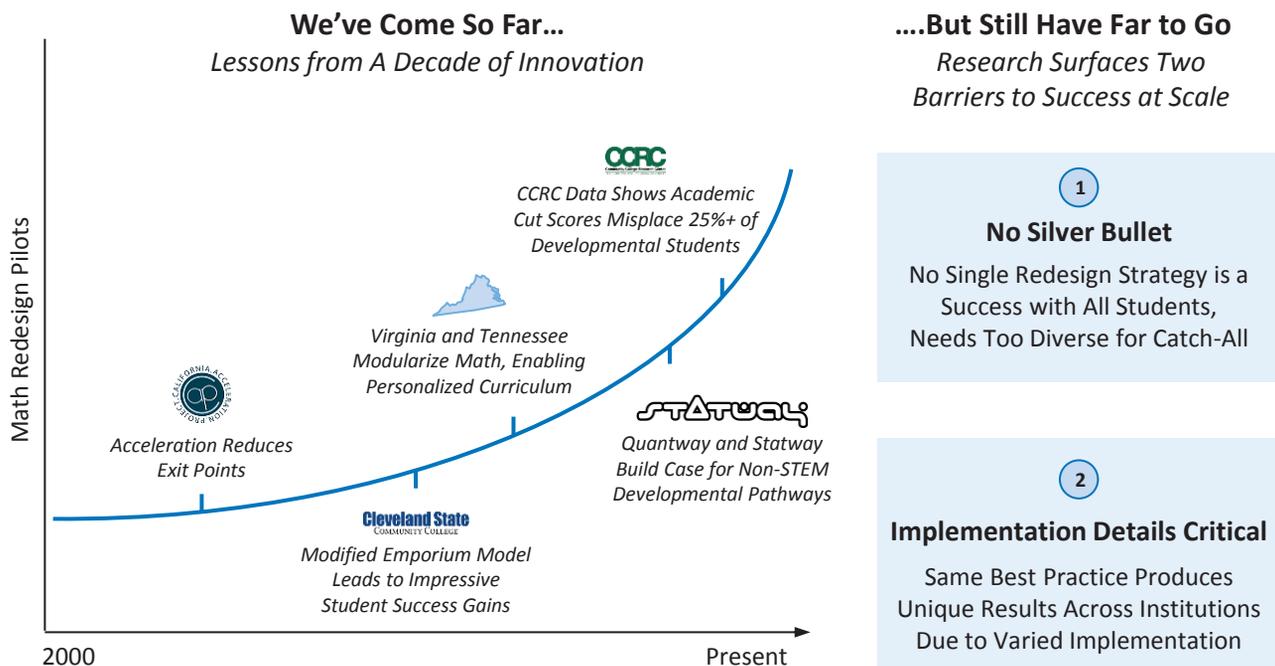
### Elevation of Math Problem Generates New Money and Momentum



Source: Bill & Melinda Gates Foundation, “Foundation Giving \$110 Million to Transform Remedial Education, April 20, 2010, <http://www.gatesfoundation.org/press-releases/Pages/new-ideas-for-remedial-education-in-community-college-100420.aspx>; Bill & Melinda Gates Foundation, “Community Colleges and States Selected to Boost College Graduation Rates by Improving Remedial Courses and Strategies,” June 22, 2009, <http://www.gatesfoundation.org/press-releases/Pages/raising-graduation-rates-community-colleges-090622.aspx>; Advisory Board interviews and analysis.

The influx of grants devoted to developmental math reform has fueled countless pilots at colleges across the country. This decade of experimentation has dramatically advanced our understanding of what works and what doesn't in math education, but still our nation's developmental math problem remains unsolved. Our research has uncovered two major barriers to success at scale: the absence of a silver bullet solution and the deep importance of effective implementation.

## Benefiting from a Decade of Experimentation



Source: Clive Belfield and Peter Crosta, "Predicting Success in College: The Importance of Placement Tests and High School Transcripts," Community College Research Center, Feb. 2012, <http://ccrc.tc.columbia.edu/Publication.asp?UID=1030>; Carnegie Foundation for the Advancement of Teaching, "Developmental Math," accessed Jan. 9, 2013, <http://www.carnegiefoundation.org/developmental-math>; Advisory Board interviews and analysis.

Despite the advances of the past decade, our research surfaced no silver bullet strategy to developmental math attrition and doesn't see one coming. Students discontinue their educations for a variety of reasons too diverse for a catch-all solution. Developmental math innovators suggest that resolving math attrition requires personalized interventions, connecting students with the right amount and type of developmental support to equip them for success.

The second major barrier to success at scale is the importance of getting implementation right. Community colleges with similar student bodies have experienced vastly different outcomes when executing the same best practice due to differences in idea execution.

Members asked the Community College Forum to break down institutional, regional, and foundational silos in search of a practical roadmap for reengineering developmental math; a guide for college leadership on what works, what doesn't, and where to invest in developmental math redesign. In pursuit of these answers, we worked with college leaders, topic experts, faculty, students, and administrators to uncover the best (and worst) practices in math redesign as well as the key ingredients for implementation success.

## Your Charge to EAB

### *Breaking Down Institutional and Regional Silos In Search of Right Answer*

#### A Strategic Approach to Reengineering Developmental Math



#### *Most Overheard Questions from Community College Leadership*

- Which Redesign Strategies Are Worth the Investment?
- What Are the Key Ingredients for Implementation Success?
- How Can We Use Developmental Math to Optimally Position Students for Credential Attainment?

#### Our Methodology

*200+ Research Interviews and Site Visits*

##### College Leadership

*Consult executives on current state of practice and pinpoint improvement areas*

##### Faculty

*Assess benefits and challenges of local redesign efforts and lessons learned*

##### Students

*Diagnose problems with current experience and solicit feedback on redesign efforts*

##### Foundations

*Leverage third-party resources, analyze future trends and developments*

##### Administrators

*Understand logistical barriers to redesign, proven solutions, and lessons learned*

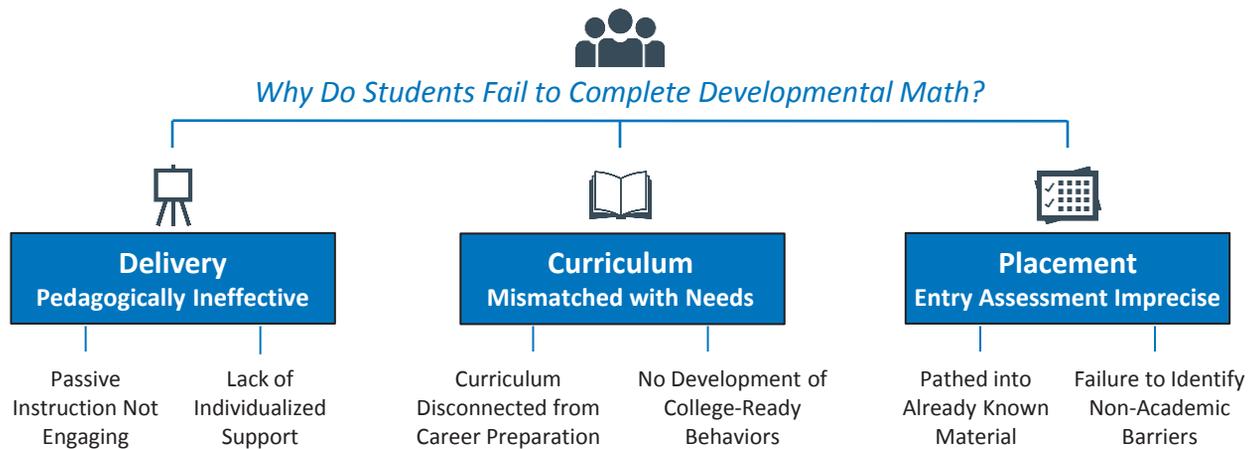
##### Vendors

*Study product capabilities and consider best-fit packages for different institution types*

Source: Advisory Board interviews and analysis.

Our research surfaced three actionable areas in need of redesign: content delivery, curriculum, and placement practice. Each section of this study explores one of these critical developmental math challenge areas.

## Three Critical Areas in Need of Redesign



### Open Questions from Leading Community College Presidents

*"Which active learning platform is most effective? How do we optimally operationalize and scale flipped classrooms?"*

*"Should all developmental students be required to complete high-level algebra, or are alternative curricular models worth the investment?"*

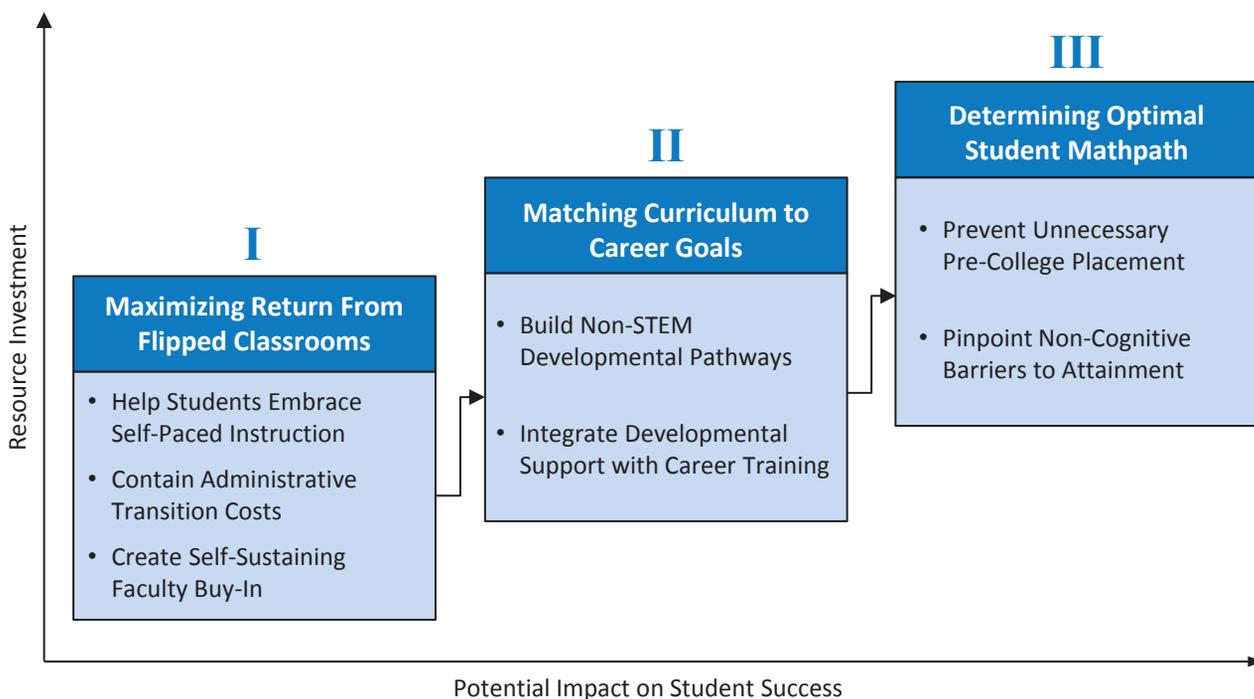
*"What are innovative colleges doing to more accurately place students, connecting them with the right resources to support college success?"*

Source: Advisory Board interviews and analysis.

Each section of this study tackles one of the three developmental math challenge areas, addressing open questions from progressive college leaders on delivery, curriculum, and placement redesign: How do we maximize return from flipped classrooms? How do we better match curriculum to students' career goals? How do we determine an optimal student mathpath? Together, these recommended practices form a blueprint for accelerating developmental student success through high-return personalized pathways.

## Reengineering Developmental Math

*Accelerating Student Success Through High-Return Personalized Pathways*

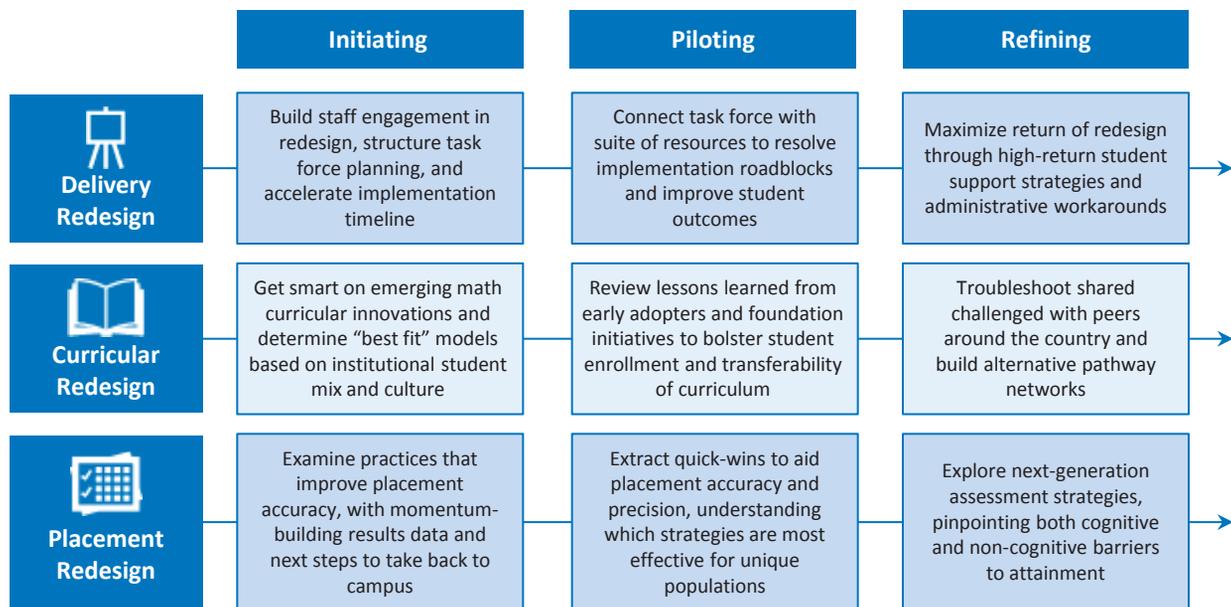


Source: Advisory Board interviews and analysis.

The aim of this initiative is to guide campuses at different stages of the redesign process, whether initiating a change, piloting a new strategy, or refining long-time programs. The chart below lays out our recommendation for how institutions at different stages of redesign can most effectively use this publication and follow-up resources.

## How We Hope This Research Will Further Your Efforts

### *Institutions at Different Stages of Developmental Math Redesign*



Source: Advisory Board interviews and analysis.



## Section 1

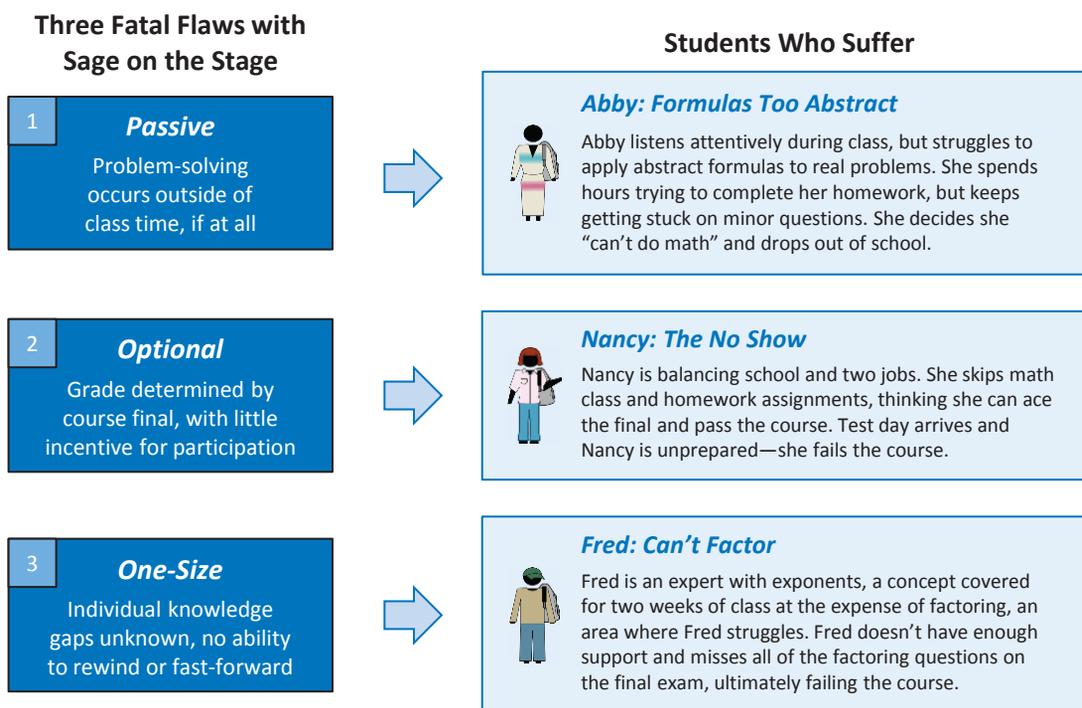
# Maximizing Return From Flipped Classrooms

- Help Students Embrace Self-Paced Instruction
- Contain Administrative Transition Costs
- Create Self-Sustaining Faculty Buy-In

Our research found that most developmental math courses are taught through podium-style lectures, what is often referred to as “sage on the stage” learning. Conversations with these sages and the students they teach surfaced widespread agreement that lecture-drill is a poor fit for developmental students. We pinpointed three fatal flaws with sage on the stage: delivery is passive, participation is optional, and lecture leaves no room for individualized problem solving.

## Traditional Delivery Pedagogically Ineffective

### Lecture-Drill Especially Poor Fit for Developmental Math Students



Source: Advisory Board interviews and analysis.

Above is a collection of students who suffer at the hands of the sage on the stage model. First is Abby, who finds formulas too abstract without the opportunity for hands-on, practical learning during class. For her, math is simply a collection of formulas on a whiteboard and there is no connection to her life goals. The second student profiled is Nancy the no-show, who is balancing competing demands and needs strong incentives to keep her on task. Math faculty explained that students like Nancy don’t do optional work unless they see a clear link to their goals. Finally there is Fred, a math whiz who just can’t factor. His instructor doesn’t spend enough time on the concept, he never masters factoring, and he fails the course. Although Abby, Nancy, and Fred are fictional students, their profiles are a synthesis of real stories from interviews with practitioners across the country. These are students who are underserved by the sage on the stage method of developmental math delivery.

The failures of the sage on the stage model have fueled momentum on campus for instructional transformation. Students, faculty members, department chairs, and senior executives have all expressed a new appetite for change in the way students are taught developmental math.

## No Standing Ovations

### *Need for Math Delivery Transformation Recognized Across Campus*

#### **Student**

*“My last math teacher kept getting confused while writing formulas on the board, talking to herself and checking her notes. We all thought she didn’t know what she was doing, so students just stopped going.”*

#### **Chancellor**

*“We aren’t going to meaningfully impact student success unless we do away with the professor standing up there at the chalkboard droning on about systems of equations. Our students don’t learn that way. Frankly, no one does.”*

#### **Department Chair**

*“A truly gifted math lecturer is one in a million. My math faculty are adjuncts who chose their profession for the love of math, not the love of oratory.”*

#### **Faculty Member**

*“My students need a lot of personal support and the lecture hall isn’t the best place to provide that, or so their grades would show.”*

Source: Advisory Board interviews and analysis.

The good news is that there are abundant alternatives to sage on the stage learning, several of which are profiled below. Our research found that while many alternatives exist, most are cost, culture, or resource prohibitive.

## Abundant Alternatives to Sage on the Stage But Most Strategies Culture or Resource Prohibitive

### Jigsaw



*Student groups complete separate but related assignments and teach concepts to remainder of class*

**Requires advanced instructional techniques to lead class in facilitated group work**

### SCALE-UP



*Students complete assignments with classmates in specially designed group workspaces*

**Requires active student group work with minimal oversight and \$100,000 renovation per room**

### Case Method



*Real-world assignments fuel discussions of possible solutions with instructor and classmates*

**Requires skilled instructor and professional development hours to lead class discussion**

### Clickers



*Electronic voting system records student responses to questions embedded in lecture*

**\$20,000 technology investment per classroom yields 1-to-2 point increase on final exams**

### Fully Online Model



*All in-class meetings replaced by virtual classrooms and automated online assessments*

**Technology investment produces no completion gains due to lack of instructor guidance**

Source: Science Education Research Center, "Jigsaws: On the Cutting Edge," Carleton College, May 29, 2012, <http://serc.carleton.edu/sp/library/jigsaws/index.html>; Robert Beichner, "The SCALE-UP Project," accessed Jan. 9, 2013, [http://www7.nationalacademies.org/bose/Beichner\\_CommissionedPaper.pdf](http://www7.nationalacademies.org/bose/Beichner_CommissionedPaper.pdf); Brian Harper, "I've Never Seen or Heard It This Way! Increasing Student Engagement through the Use of Technology-Enhanced Feedback," *Teaching Educational Psychology*, Jan. 2009; Advisory Board interviews and analysis.

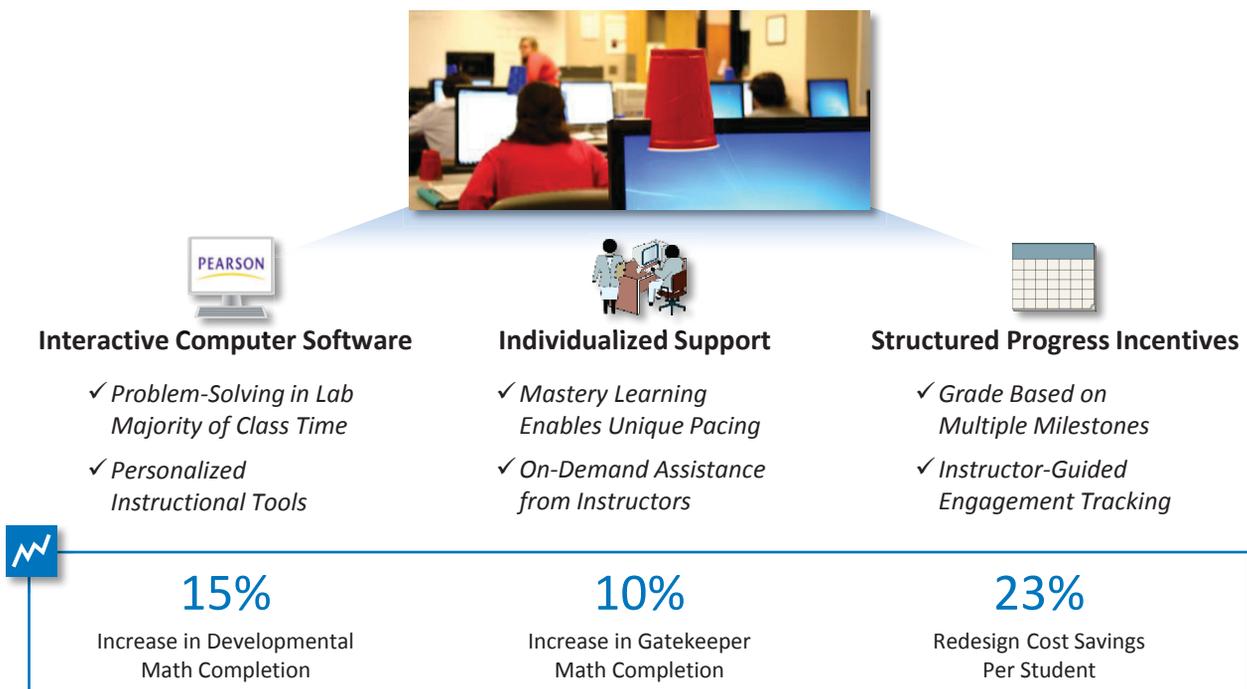
While active learning strategies like Jigsaw, SCALE-UP, and the Case Method have the potential to boost student engagement, research found these strategies are difficult to enforce in the classroom, and leave much room for faculty error. These strategies are generally regarded as advanced teaching techniques that require experienced faculty and hours of professional development to implement correctly, often a luxury that math adjuncts aren't afforded.

Technological innovations like electronic clickers have been used in many classrooms to aggregate student responses and spark discussion. Despite their popularity, clickers only produce a marginal bump in student success, a disappointment considering the \$20,000 average investment required for implementation. The fully online model also falls short of expectations. Research from the Community College Research Center (CCRC) at Columbia University has found that most fully online community college students have worse completion rates than those in face-to-face lectures. Although online courses allow students to pace themselves, their performance suffers without hands-on support from instructors.

Of the various instructional models we studied, the modified emporium led to the greatest, scalable gains in student course completion and learning. At first glance, the term “emporium” may sound more like a marketplace than a classroom. This thinking isn’t too far off; similar to a marketplace, math emporiums facilitate interactive relationships between students and faculty, provide individualized attention for students in need, and offer structured incentives for participation.

## A Winning Model Emerges

### *Modified Emporium Improves Student Outcomes and Scales*



Source: The National Center for Academic Transformation, “Changing the Equation: Redesigning Developmental Math, Developmental Math Comparative Costs,” accessed Jan. 17, 2013, <http://www.thencat.org/Mathematics/CTE/SchoolData/Costs.html>; Advisory Board interviews and analysis.

In the modified emporium, traditional classrooms are transformed into interactive labs. Students use computer software to complete problem-solving lessons for the majority of class time. Exercises are personalized to meet individual students’ needs and involve a host of multimedia instructional tools.

The emporium model also facilitates individualized support sessions between instructors and students. Rather than a generic lecture for all, students progress through content at their own pace, focusing on their own developmental needs and moving swiftly through content that comes naturally. When students find concepts particularly challenging, faculty are there to provide additional assistance. Modified emporiums rely on faculty acting as student mentors—grades are based on multiple milestone quizzes embedded in the software, so instructors can remind students of their progress and encourage acceleration.

Results data shows that modified math emporiums work. Across the 15 institutions profiled, colleges saw an average 15% increase in developmental math completion rates, a 10% increase in gatekeeper math completion, and a 23% cost savings per student compared to traditional lecture-drill models. The cost reduction comes from an increase in faculty teaching load made possible by the added support of technology and tutors in the classroom.

With such impressive results data coming from campuses that have implemented modified math emporiums, it's surprising that the model hasn't spread like wildfire. As it happens, the modified emporium is haunted by its early reputation as an approach ill-suited for developmental students. The emporium model originated at Virginia Tech in 2000 as a massive computer lab where students worked through math coursework at their own pace (pictured below), a classroom seemingly void of support mechanisms so critical for developmental student success.

## **“But We Aren't Virginia Tech”**

### *Computer Warehouse Fodder of Staff Nightmares*



IMAGE CREDIT: WASHINGTON POST – JARED SOARES

“What are those red cups for?”

“How do faculty maintain order?”

“What if the computers stop working?”



Source: Advisory Board interviews and analysis.

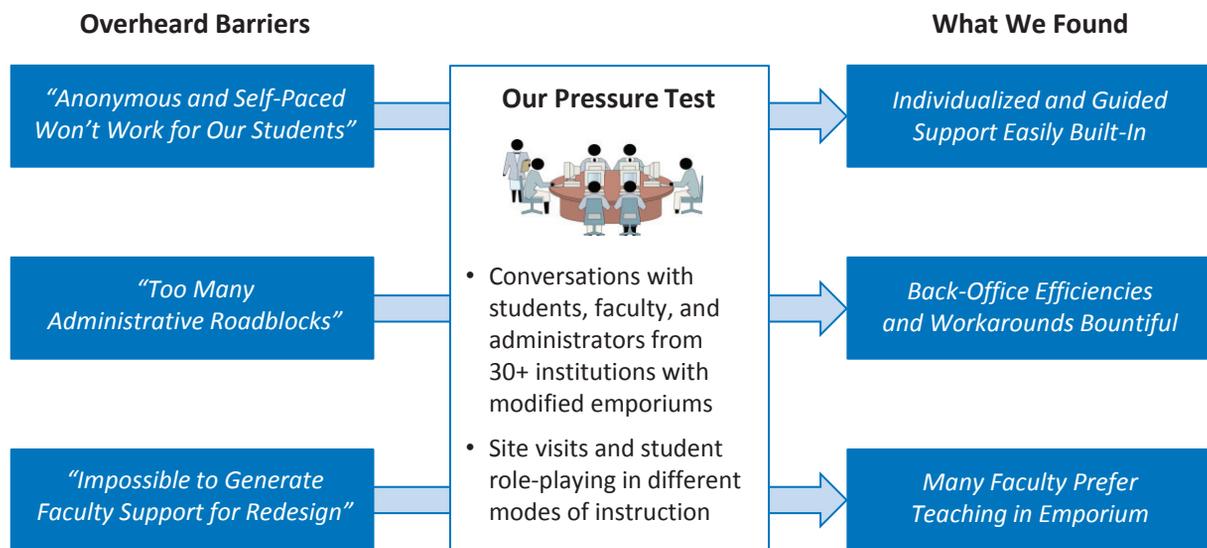
Community colleges have since adapted the emporium model to fit the needs of their unique student bodies by shrinking class sizes, embedding support mechanisms, and elevating the role of the instructor. The model still bears resemblance to its origin, but has now evolved sufficiently to earn a new name, hence the term “the modified math emporium.”

The modified emporium classroom, like its namesake, uses red Solo cups to signal when a student has a question. Students place the cups on top of their computer monitors while waiting for assistance from an instructor or tutor. This communication method can initially be unsettling for many faculty; red cups are often associated with weekend debauchery, not studying. However, plastic cups are an essential—and economical—way for students to request assistance without interrupting their work. Many institutions also use blue cups to signal when students are taking a quiz or assessment. Faculty at many colleges eventually saw the benefit of using Solo cups to facilitate communication after seeing how efficiently the modified emporium ran.

Unfortunately, there is no shortage of misconceptions about emporium-style learning. Our interviews surfaced three commonly cited barriers to adopting the modified emporium approach: anonymous and self-paced curriculum won't work for community college students, there are too many administrative roadblocks to implementation, and an inability to get faculty to support redesign.

## Setting the Record Straight

### *No Shortage of Misconceptions About Emporium-Style Learning*



Source: Advisory Board interviews and analysis.

After conducting over 100 interviews with instructors, administrators, and students from different modified emporiums, we found that the most oft-cited barriers to implementation were avoidable, or just untrue. Individualized and guided support can be built into an emporium model, back-office efficiencies and workarounds are bountiful, and many faculty actually prefer teaching in the emporium.

Our research also found that there are right ways (and wrong ways) to flip the classroom. Success is not automatic, and the outcomes data across modified emporiums varies. This is a model where implementation is critical for maximizing return on investment. The strategies featured in this section support leaders in implementing and improving the effectiveness of redesigned math courses.

## Maximizing Return From Flipped Classrooms

### *What You Need to Know to Get the Most Out of Your Modified Emporium*

#### Help Students Embrace Self-Paced Instruction



- Math Tutoring Community Partnerships
- Embedded Individualized Coaching Sessions
- Faculty-View Dashboard
- Module-Clustered Seating
- Student Pacing Calendars
- Mandatory Course Contract
- All-Inclusive Grading Scheme
- Tuition-Saving Acceleration Incentives

#### Contain Administrative Transition Costs



- Optimal Cross-Silo Implementation Timeline
- Software Vendor Evaluation Rubric
- Shell Courses
- Interim Grade Placeholders
- Peak Hour Staffed Open Lab

#### Create Self-Sustaining Faculty Buy-In



- Leadership-Led Redesign Launch Workshop
- Campus Media Partnership
- Low-Cost Academic Integrity Safeguards
- Delineated Support Staff Job Descriptions
- 5-Minute Course Kickoff Scripts
- Behind-the-Scenes Software Demonstration
- Instant-Access Multimedia Training

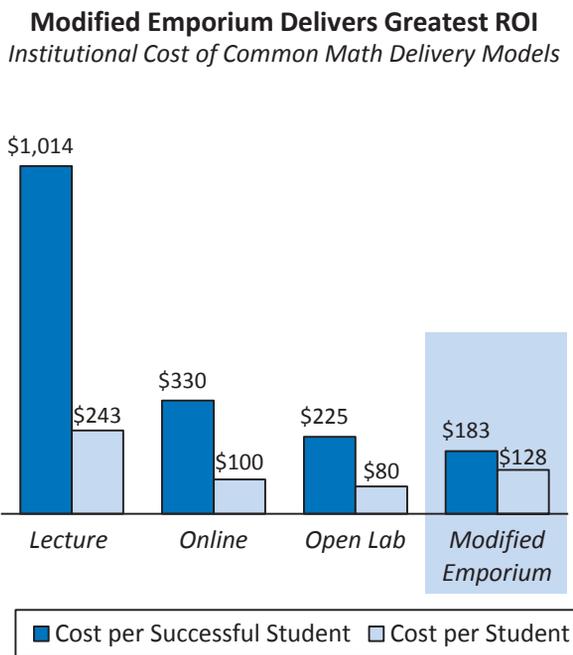
Source: Advisory Board interviews and analysis.

For the modified math emporium, implementation is critical for maximizing return on investment. Even institutions with years of experience with modified emporiums are still searching for ways to further bolster student success. Numerous best practices, data, lessons learned, and artifacts from the models examined in this study are profiled in this section and available through our online implementation toolkit.

Helping students embrace self-paced instruction requires a lab with built-in personalized support. Students should feel attached to the classroom, their peers, and most importantly, their instructor. Cost calculations of different delivery models found that while models with limited personalized instructor support, like open labs and online courses, may appear cost-effective at first, they yield lower returns on investment than highly personalized modified math emporiums. The model has a lower cost per successful student than online, open lab, and lecture classes.

## Personalized Student Support Worth the Investment

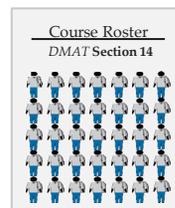
*“Anonymous” Classrooms Cheap Only at First Glance*



### Size Matters

*Resource Essentials to Help Students Embrace Self-Paced Instruction*

#### 35-Capped Course Assignments



- Enables Student Progress Tracking
- Creates Community in the Classroom

#### Max 1:18 Instructor-to-Student Ratio



- Builds Opportunity for 1:1 Student Coaching
- Generates Capacity for On-Demand Instructor Assistance

Source: The National Center for Academic Transformation, “Changing the Equation: Redesigning Developmental Math, Developmental Math Comparative Costs,” accessed Jan. 9, 2013, <http://www.thencat.org/Mathematics/CTE/SchoolData/Costs.html>; Advisory Board interviews and analysis.

Although our research found slight differences in the size and setup of the modified emporium classrooms, all successful models share two key features. First, all courses have 35 students or fewer to allow instructors to keep track of student progress and create a sense of community in the classroom. Secondly, all courses maintain a maximum 1 to 18 instructor-to-student ratio.

The numbers proposed aren't magic—some institutions have smaller classes, some larger. Decisions about lab size and instructor-to-student ratios come down to institutional culture and resources. However, colleges with the most successful math labs found that size matters for helping students embrace self-paced instruction. Small class sizes allow staff to execute on the strategies detailed in the pages that follow.

Responsibilities within the math emporium are divided among faculty instructors, tutors, and lab supervisors. Lab supervisors coordinate all of the sections held in the lab, taking over the majority of administrative and technological responsibilities. Instructors and tutors work together to field student questions and maintain order in the lab. Most math emporiums staff one instructor and one tutor in a class of about 30 students. For many faculty, tutors are the most exciting aspect of the modified math emporium, sharing many (less desirable) instructional responsibilities in the lab and reducing faculty workload.

## Staffing Your Emporium

### *The Who's Who of Student Support Professionals*

#### Faculty Instructor



Tracks grades, answers questions, and delivers embedded mini-lectures

**Paid \$20,000-\$85,000 per year**

#### Tutor



Fields student questions and assists with lab administration

**Paid \$0-12.00 per hour**

#### Lab Supervisor



Manages staffing and scheduling, trains tutors, and provides technical support

**Paid \$30,000-\$52,000 per year**

#### Win-Win Tutor Partnerships

##### *Aspiring High School Teachers*



University of Dayton students from School of Education volunteer in math lab for service requirement

##### *Former Star Pupils*



Upper-level math students serve as role models and connect with current developmental students as peers

##### *Work-Study Students*



Student tutors are campus employees, a program proven to increase work-study student retention

Source: Advisory Board interviews and analysis.

Emporium tutors come from different educational and professional backgrounds; however, our research surfaced three particularly high-performing tutor partnerships. Sinclair Community College hires student volunteers from the School of Education at the University of Dayton to tutor in the lab as part of their service requirement. Sinclair does not pay the tutors any salary or stipend, but the student volunteers benefit from the direct service opportunity. As aspiring teachers, the University of Dayton students learn the importance of math education in the K-12 system. Student reactions reflect their renewed commitment: "I'm going to be a high school teacher eventually, and watching these kids study eighth grade math in college was shocking; it motivated me to be a better high school teacher."

Northern Virginia Community College also employs student tutors in their math emporiums. These tutors are advanced math students, many of whom completed their developmental coursework through the same emporium model. These tutors serve as role models, peers, and success stories for developmental students. Employing current advanced math students also generates opportunities for work-study. El Paso Community College is dedicated to recruiting student employees for its modified emporium. The program provides much-needed campus employment for student tutors, a strategy that has been shown to boost the tutors' retention.

The modified math emporium essentially turns class time into de facto office hours. Every class session is an opportunity for students to receive answers to their most pressing questions through one-on-one student-to-instructor coaching. When compared to the amount of individualized instruction students receive in traditional lecture-drill classrooms, it is easy to see why students learn more in the emporium. Instructors have time to meet with students individually, a higher quality interaction that facilitates greater learning and stronger student-instructor relationships.

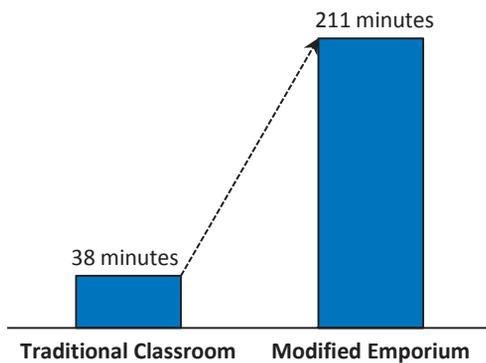
## As If Every Student Went to Office Hours

### Staffing Structure Enables High-Impact 1:1 Coaching During Class Time

#### More Time for 1:1 Interactions

*550% Capacity Increase with Modified Emporium*

**Per Student Individualized Instruction**  
*One Semester, 3-Credit Course, 25 students*



#### And More Impactful Interactions

*Best-Practice: Dashboard-Driven Coaching*

**Student: David Godow**

- Modules Needed
- Intended Concentration
- Previous Academic History
- Financial Aid Status
- Demographic Information

Faculty-View Student Profiles Guide Conversation

#### Faculty Dashboard Enables Customized Coaching

Metric	Sample Instructor Dialogue
Intended Concentration	"To meet entry requirements for the physical therapist program, you need to complete modules 4, 6, and 7. Let's design a study plan."
Financial Aid Status	"It's best to finish module 3 by the end of the semester so you can receive financial aid for the course. What are you struggling with?"

Source: Advisory Board interviews and analysis.

Our calculations show that instructors spend far less one-on-one time with students in traditional lecture classrooms than modified emporiums. Assuming a class size of 25 students, the average student receives 38 minutes of individualized instructor attention each semester in a lecture classroom. Under the same assumptions, the average student receives 211 minutes each semester in a modified emporium. This is a 550% capacity increase for one-on-one instructional interactions.

The most important advantage math emporiums have over lecture classrooms is not the quantity of time, but the quality of student-faculty interactions. Virtually every software package on the market can be set up to enable instructors to see the modules students need to complete, students' intended concentration, their academic history, and even their financial aid status. This information enables faculty to create student-level dashboards that guide coaching sessions. These dashboard-driven student coaching sessions are a true best practice; instructors help students navigate personal roadblocks to completion that would not have been noticed or addressed in the absence of this personalized support structure.

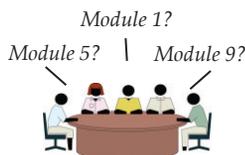
Innovators use clustered seating assignments and designated faculty meeting spaces to ensure students feel a connection to the class and to their instructor. In a self-paced classroom open to students with different levels of need, it is important for faculty to create a sense of community in the classroom. Although opening math labs to students at different developmental levels increases students' enrollment options, administrators are careful to ensure there are mechanisms in place to create a strong sense of community in the classroom.

## Creating Communities in the Classroom

### *Clustered Seating and Faculty Meeting Space Organically Facilitate Learning*

#### Clustered Seating Fosters Group Learning

*Free-Form Seating Creates Havoc for Instructors*



- ⊘ Instructor switches between questions
- ⊘ Students working on different topics struggle to joint problem-solve

*Proximity to Peers Helps Instructors, Students*



- ✓ Instructor gives mini-lectures on challenging topics
- ✓ Students can ask each other for help

#### Designated Meeting Spaces Allow Student-Faculty Coaching Sessions



- One-on-one weekly meetings during class time
- Designated, separate area avoids disrupting other students in the lab
- Instructor reviews each student's pacing calendar to discuss modular progress
- Facilitates personal connection between student and instructor

Source: Advisory Board interviews and analysis.

A mixed computer lab has the potential to create havoc for instructors, tutors, and students. Students sitting next to each other working on completely different topics are likely to have trouble helping one another when problems arise. For instructors, switching between seemingly unrelated questions can be disorienting, and doesn't provide a bigger picture of students' shared problems in a particular topic. As a result, progressive faculty seat students in close proximity to peers working on a similar set of modules. Students can ask their neighbors for help and instructors have a sense of shared trouble areas; if multiple students are struggling with the same problem, the instructor can pull the group aside to deliver a mini-lecture that clarifies the concept.

Data shows that developmental students excel in self-paced work when they have an adequate support network on campus; successful math emporiums have faculty who establish themselves as instructors, coaches, and mentors for their students. Instructors at Northern Virginia Community College designate a meeting space in the front of the computer lab for weekly one-on-one meetings with students during class. These meetings are opportunities for instructors to discuss each student's progress through the curriculum and address problems as they arise. Instructors use a combination of faculty dashboards and student pacing calendars to guide students toward timely completion of their developmental requirements.

Community College Forum interviews with math faculty found that most developmental students require continuous encouragement from instructors to stay motivated during the semester. In self-paced courses, instructors rely on pacing calendars to keep students on track for success. Pacing calendars outline deadlines for completing milestones in the modular curriculum. Students use the calendar to pace themselves and discuss progress setbacks with their instructor.

## Holding Students Accountable for Progression

### *Student Pacing Calendars Encourage Timely Completion*

#### Math Lab Progress Calendar

*Sets Deadlines for Module and Quiz Completion*

Deadline	Module/Quiz	Date Completed
Sept. 25 <sup>th</sup>	1A	<i>Sept. 24</i>
Oct. 2 <sup>nd</sup>	1B	<i>Oct. 2</i>
Oct. 11 <sup>th</sup>	1C	<i>Oct. 13</i>
Oct. 16 <sup>th</sup>	2A	<i>Oct. 17</i>
Oct. 23 <sup>rd</sup>	2B	<i>Oct. 22</i>
Oct. 30 <sup>th</sup>	2C	<i>Oct. 30</i>



Provides constant reminder of deadlines for students



Tailored to individual student academic goals



Reviewed each week, revised as needed



Avoids rush to finish at the end of the semester

Deadlines are suggestions, not requirements;  
Faculty encourage students who fall behind to catch up, but do not penalize for slow progress

Source: Advisory Board interviews and analysis.

At the beginning of the course, students sit with instructors to discuss the number of modules required for their developmental sequence and their academic goals for the semester. Instructors set deadlines for completing chapter quizzes and modular exams tailored to each student's developmental needs and academic goals. Each week, math lab students meet with their instructor to review their progress and ensure they stay on track to complete their modules on time. This strategy ensures students maintain steady progress and do not rush to finish all of their required material at the end of the semester.

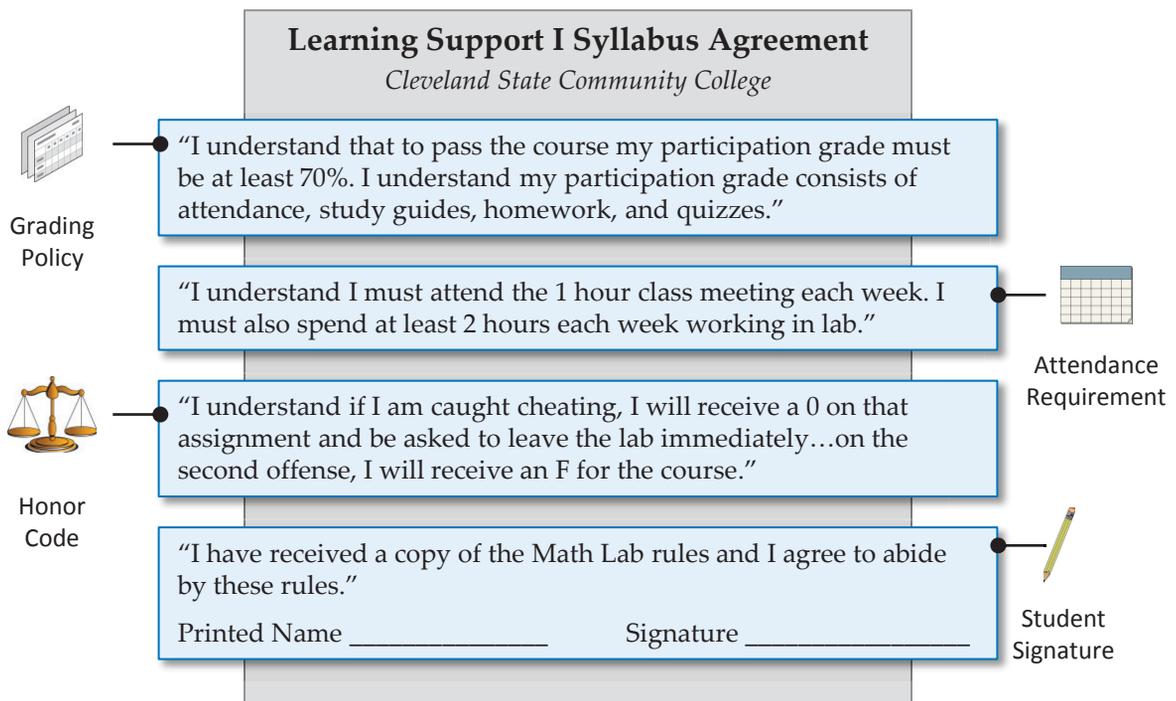


You may access the Student Pacing Calendar by referring to the **Implementation Toolkit Resource Center** at [eab.com](http://eab.com).

Most instructors with experience in the modified math emporium understand it takes time for students to adjust to new modes of learning. Students may be unsure how to behave in a new course format, which could delay their completion goals. Cleveland State Community College ensures that developmental math students read the course syllabus to learn the class policies and strategies for success. The syllabus outlines the grading policy, attendance requirements, and honor code. Students must sign the agreement before beginning work on their modules.

## Course Contracts Generate Student Commitment

*Formal Agreements Encourage College-Ready Behaviors*



Source: Advisory Board interviews and analysis.



You may access the Course Contract by referring to the **Implementation Toolkit Resource Center** at [eab.com](http://eab.com).

Active engagement through homework and class participation prepares students to perform well on final exams. Successful math emporiums use all-inclusive grade schemes that require students participate throughout the semester. Our interviews with community college math faculty coupled with data from the University of Alabama support the idea that all-inclusive grade schemes improve student outcomes.

## Everything Counts

### All-Inclusive Grade Scheme Requires Student Participation Throughout

#### Math Lab Grading Sheet

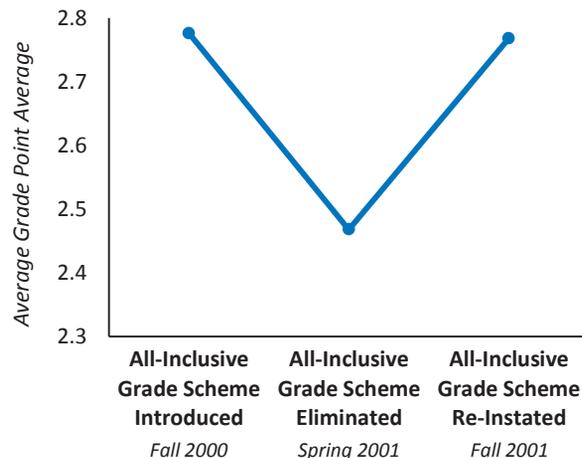
Weighted Grades Given for Assignments

Assignment	Points
Homework	82/100
Modular Exams	89/100
Class Attendance	15/16
Independent Lab Time	30/32
Class Discussion	9/10
Video Lectures	7/10
<i>Total</i>	<i>86.5%</i>

Score translates to Pass/Fail grade

#### Grades Dip Without Point Incentive

Average Intermediate Algebra Grades at University of Alabama



Source: The National Center for Academic Transformation, "Impact on Students: The University of Alabama," accessed March 21, 2013, [http://www.thencat.org/PCR/R2/UA/UA\\_FR1.htm](http://www.thencat.org/PCR/R2/UA/UA_FR1.htm); Advisory Board interviews and analysis.

While community college faculty agree that "students don't do optional," many developmental math classes only require students to complete a course final. Innovative colleges recognize the academic benefit of completing homework assignments and participating in class discussions, and make these activities part of the course grade. Students are motivated to complete the work, familiarize themselves with the material throughout the semester, and ultimately perform well on their final assessment.

The University of Alabama instituted a developmental math lab in fall 2000. The first semester of the lab included an all-inclusive grade scheme: attendance was mandatory and counted as part of the course grade. On average, students in the Intermediate Algebra course maintained a 2.8 GPA. When the all-inclusive grade scheme was eliminated the following semester, grades declined. Course performance sunk by 11%. When administrators realized the effect of class requirements on student performance, the all-inclusive grade scheme was reinstated. Average performance rose once again.

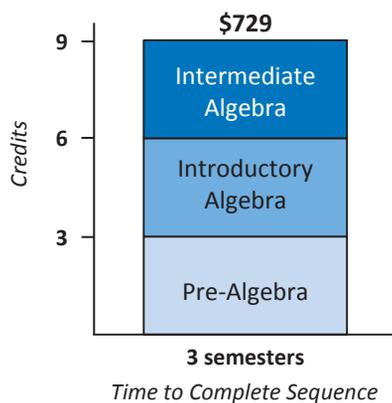
Administrators can also help students embrace self-paced instruction by charging for time in seat as opposed to credits enrolled. Unlike a traditional semester model, math emporiums can be structured to charge students for the number of semesters enrolled, providing students an opportunity to save hundreds of dollars by accelerating their developmental completion in the emporium.

## Financial Incentives for Acceleration

*El Paso Community College Encourages Speedy Completion with Tuition Savings*

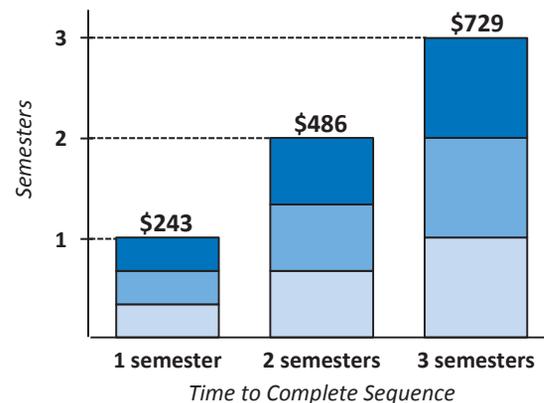
### Traditional Charge-Per-Credit Model

*Developmental Completion Costs Students Over \$700*



### Emporium Charge-Per-Semester Model

*Accelerated Completion Costs Less Than \$250*



### Show Me The Money

“Money is a great motivator. Students know they can save hundreds of dollars by moving quickly through the curriculum, so they try harder to move on to the next module. It’s great to finally have some leverage—even if the kids don’t like math, they like saving money.”

*Math Lab Tutor*

Source: Advisory Board interviews and analysis.

El Paso Community College is one of many institutions that see higher rates of student success from acceleration with the modified math emporium. Students are encouraged to master material quickly in the hopes of completing additional coursework before the end of the semester. The more developmental credits students complete in one semester, the less time and money they must spend for these courses in the semesters that follow. Our interviews with lab tutors revealed that students respond very positively to these incentives. One tutor shared that he encourages students to stay committed and come to the lab as much as possible by reminding them of the exact dollars saved from acceleration.

In addition to maximizing the pedagogical effectiveness of the lab, members wondered how to logistically operationalize the model—how can colleges contain administrative transition costs? Our research surfaced many lessons learned from early adopters of the model. This page features three of most important lessons for first-time implementation: develop a cross-departmental implementation roadmap, allow time for a pilot phase before full-scale launch, and remember to place red and blue Solo cups in the lab with each student.

## Contain Administrative Transition Costs

### *Lessons (Hard) Learned from Early Adopters*

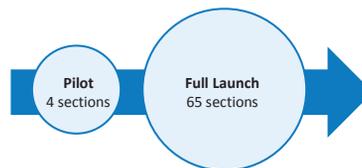
#### Develop Cross-Departmental Implementation Roadmap

Math Redesign Roadmap	
✓ Advising	✓ Testing
✓ Financial Aid	✓ Scheduling
✓ Facilities	✓ HR
✓ Math Department	✓ IT
✓ Tutoring Center	✓ Procurement

“We could have saved thousands of dollars and hundreds of hours of staff time by coordinating with student services in the planning phase of our redesign—software selection, scheduling, and course descriptions all have major ramifications for administrators.”

*Math Department Chair*

#### Allow Pilot Phase Before Moving to Full-Scale Launch



“NCAT suggests an all-or-nothing approach to redesign, so we launched headfirst without a pilot. There was no time to work out the logistical kinks, and our students and staff paid a heavy price. We could have learned those lessons on a much smaller, less costly scale with a phased implementation.”

*Redesign Coordinator*

#### Don't Forget the Red and Blue Solo Cups



“I have a question” “I’m taking a quiz”

“The first week of our redesign launch we forgot to place Solo cups in the lab, so students had to keep their hands up when they had a question or needed a test password. This slowed student productivity and launched our redesign on the wrong foot. Fortunately, it was a quick fix.”

*VP, Academic Affairs*

Source: Advisory Board interviews and analysis.

First, develop a cross-silo implementation roadmap. Flipping the classroom cannot be confined to the math department. Student services and facilities must be involved in both decision making and execution for the model to succeed. If representatives from each department are not included in planning, math faculty members may make seemingly harmless decisions that can lead to administrative chaos.

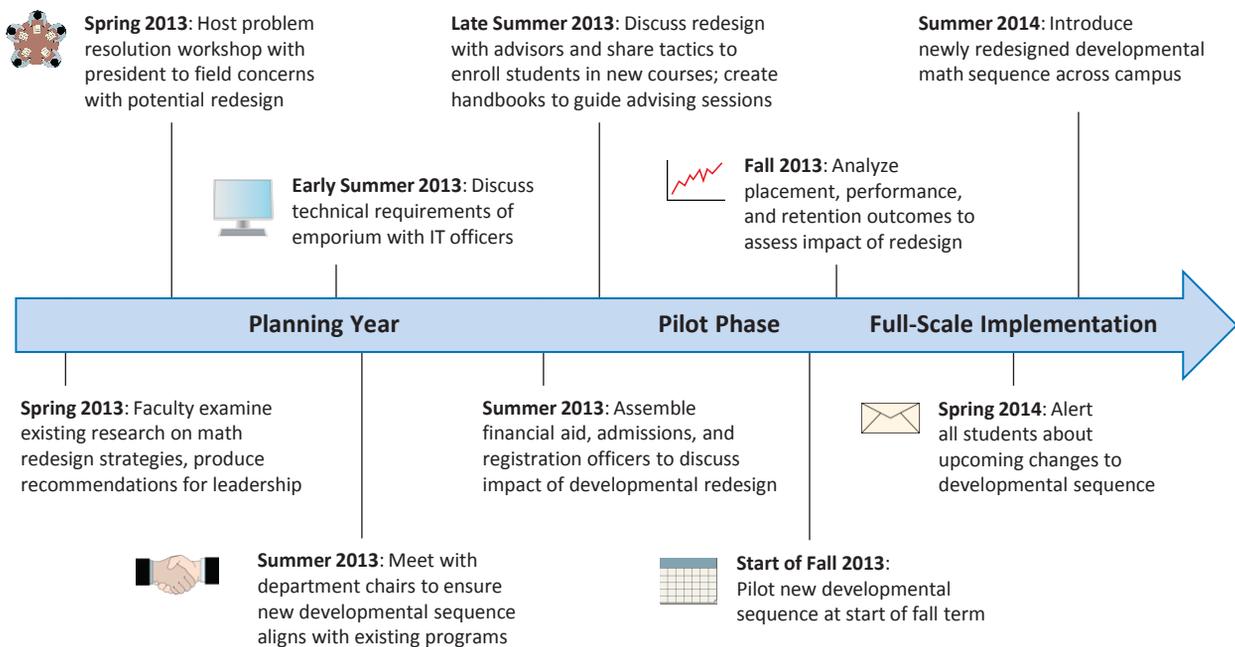
Second, allow for a gradual pilot phase before moving to full-scale implementation. Many institutions accumulate unnecessary costs while sorting out large-scale logistical concerns and learning to make the model work for their campuses.

The third major lesson learned seems trivial but is surprisingly important: do not forget to stock the lab with a signaling device, such as red and blue Solo cups. Red cups signal that a student has a question; blue cups signal a student is taking a quiz or exam. We interviewed members from one institution that forgot to place cups on student desks the first week of their redesign, and it was a major drain on productivity. Without the cups, students must to raise their hands to solicit help, preventing them from working through modules. The absence of blue cups also made it difficult for faculty to tell which students were allowed to have their notebooks out and which were in the middle of a quiz or exam. This anecdote is a cautionary tale—empirium success truly does lie in the details, even the smallest ones.

Based on best practices and lessons learned by early adopters, the Community College Forum created an optimal cross-silo implementation timeline for phased implementation of the modified math emporium. Practitioners recommend to start redesign planning discussions at least one year before full implementation. This allows sufficient time for research, cross-departmental consultations, and a one-semester pilot phase.

## Optimal Cross-Silo Implementation Timeline

*Phased Implementation Allows Ample Planning Time with Student Services*



Source: Advisory Board interviews and analysis.



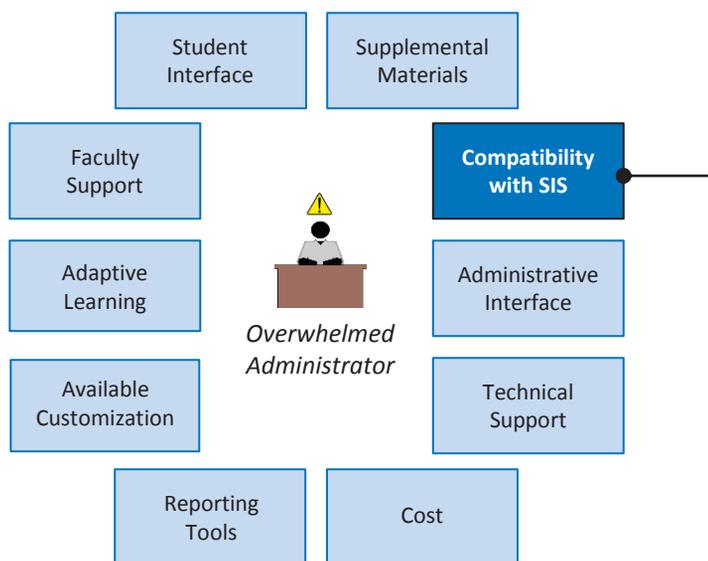
You may access the Optimal Cross-Silo Implementation Timeline by referring to the **Implementation Toolkit Resource Center** at [eab.com](http://eab.com).

Software selection is one of the biggest administrative decisions to be made when transitioning to the modified math emporium. In choosing among the many software package options, college leaders must consider several factors, including interface design, supplemental materials, customization features, and technical support. Our research found that the most important feature of any emporium software package is its compatibility with the student information system (SIS). Automatic syncing between emporium software and the SIS saves hundreds of hours of administrative work.

## What Matters Most In Software Selection

### *Interfacing Software and SIS Vital to Lab Administration*

#### Many Factors to Consider in Software Selection...



#### ...But (Overlooked) SIS Compatibility is Key

*Interfacing Software Saves Over 800 Hours of Administrative Work*



- ✓ Enrolled students automatically uploaded to faculty grade book
- ✓ Enrolled students automatically registered in emporium software
- ✓ Enrolled students' grades and progress automatically uploaded to transcript



800

Average administrative hours saved each semester with interfacing software

Source: Advisory Board interviews and analysis.

There are numerous benefits of utilizing a math emporium software package that interfaces with the college SIS. First, enrolled students are automatically uploaded to a digital faculty grade book. Instructors rely on the grade book to track each student's progress through the curriculum and identify roadblocks that arise. Software compatibility also allows for students enrolled in the course to be automatically registered for the emporium software and progress to be automatically uploaded to their official transcript. In the absence of software interfacing, administrators face over 800 hours of their time completing these tasks manually.

Virtually every institution we interviewed uses a third-party vendor software package rather than attempting a home-grown solution.

Software evaluation rubrics list software package features and assign a standardized number of points to each feature, weighted by importance. To guide strategic software selection, each task force member should complete a software vendor evaluation rubric. The Community College Forum considers SIS compatibility the most important and often overlooked feature of any software package. Its importance relative to other software features is reflected in the sample rubric below.

## Software Evaluation Rubric Supports Vendor Selection

### *Weighted Point System Mitigates Unproductive Internal Debate*

Developmental Math Software Evaluation (Illustrative)

Software Feature	Points	CENGAGE	Pearson	ALEKS
Interfaces with SIS	40	40	40	0
Faculty-friendly interface	20	20	19	15
Student-friendly interface	20	17	20	10
Automated diagnostic exams	10	0	0	10
Non-linear modular progression	10	0	0	10
<b>Total</b>	<b>100</b>	<b>77</b>	<b>79</b>	<b>45</b>

Top software features

Weighted points reflect institutional priorities

Aggregated faculty rubrics decide emporium software

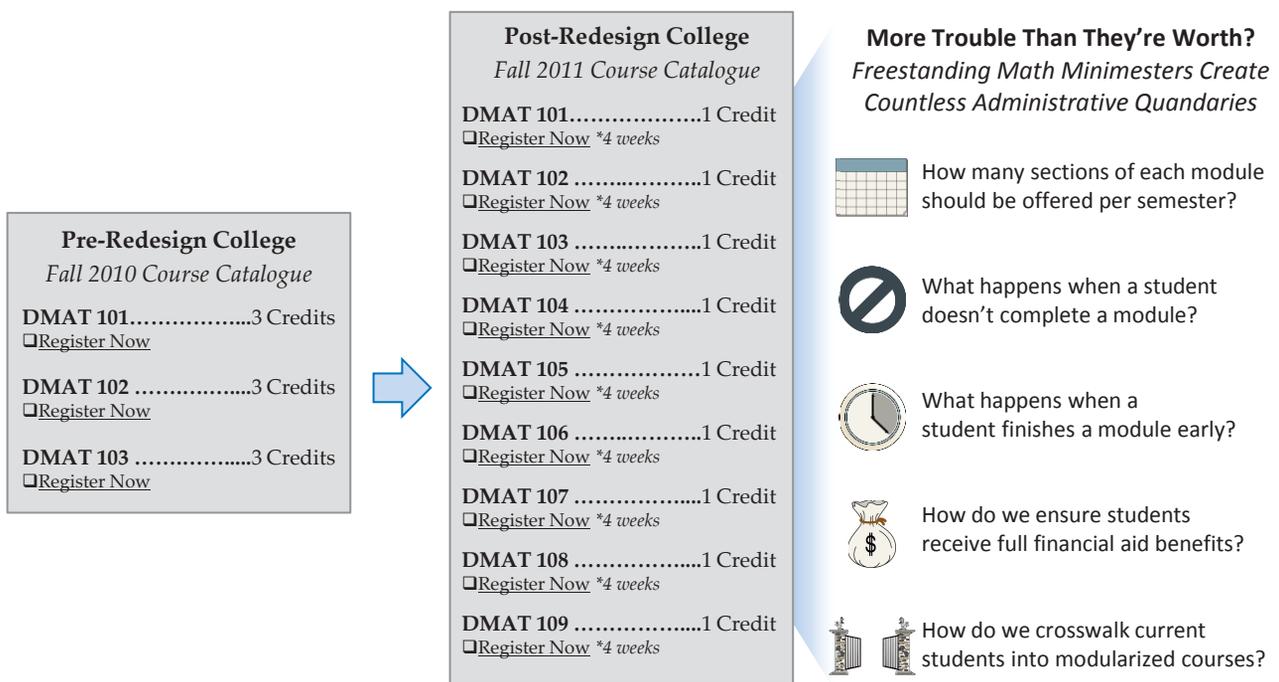
Source: Advisory Board interviews and analysis.

We recommend that each member of the developmental math redesign task force complete a software evaluation form with his or her own evaluation of each package. To mitigate unproductive debate, aggregated results from the individual evaluations should determine the final software selection.

College leaders implementing a modified emporium must also consider the impact of transitioning from a semester-long curriculum to a modularized model. Math modules are discrete curriculum topics (e.g., factoring, systems of equations, etc.) that are critical to any flipped classroom; students pace their own progression through each module and focus on their own areas of difficulty. However, the idea of eliminating traditional semesters in favor of freestanding, one-credit modules may cause members of the registrar’s office to run for the hills.

## Seeking New Registrar

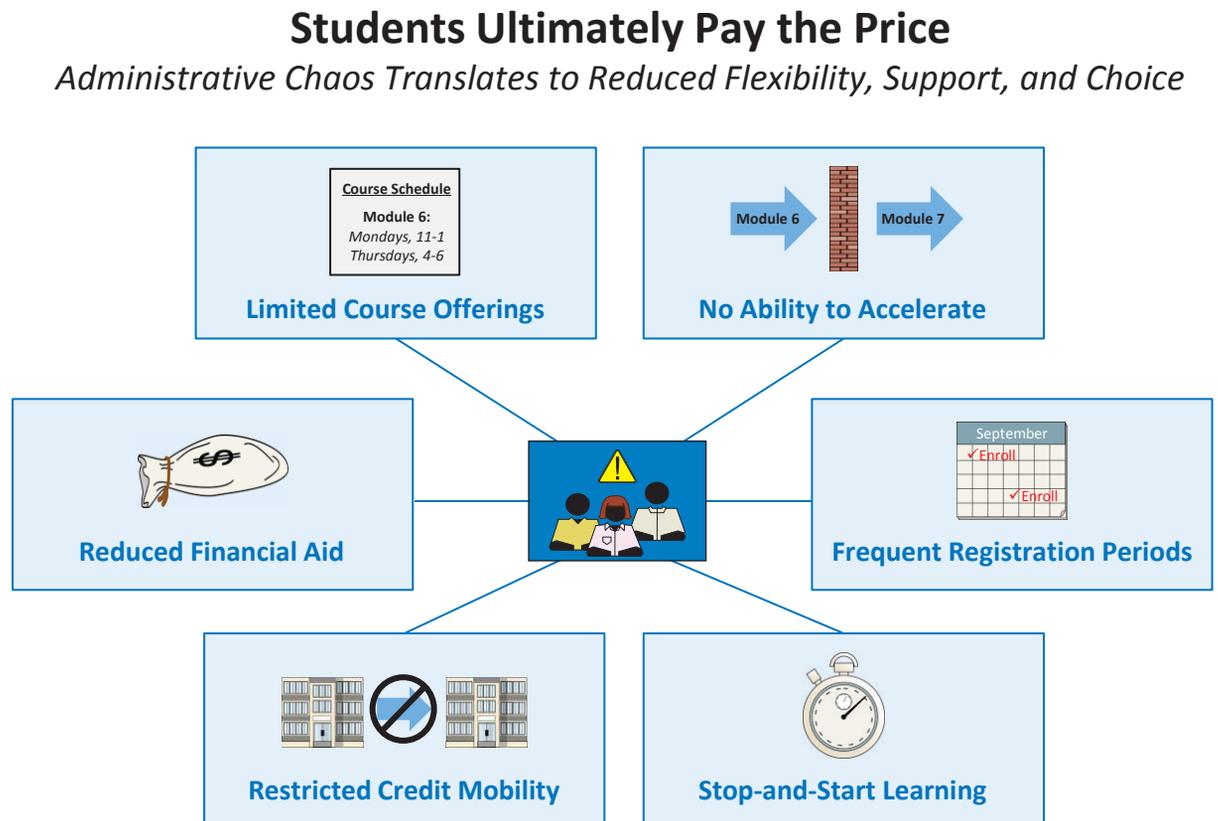
### *Freestanding Modularization Creates Course Scheduling, Registration Fiasco*



Source: Advisory Board interviews and analysis.

Depending on the number of math modules created for a single developmental math course, the college registrar may suddenly be faced with up to 12 one-credit freestanding mini-semester. This can create countless administrative quandaries: How many sections of each module should be offered per semester? What happens when a student doesn’t complete a module? How do we crosswalk current students into modularized courses? All questions without easy answers.

Abandoning traditional semesters in favor of freestanding mini-semesters often leads to administrative chaos for students. Mini-semesters reduce students' enrollment flexibility, acceleration options, and access to support.



Source: Advisory Board interviews and analysis.

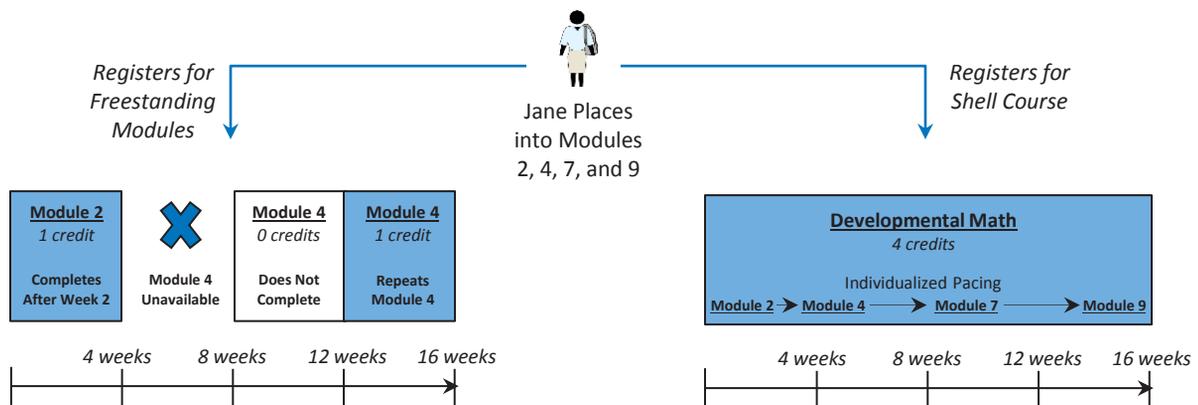
The most immediate effects of freestanding mini-semesters stem from their similarities to traditional semesters. The college can only offer a limited number of modules each mini-semester. Students who master the material before the end of the allotted four weeks cannot accelerate to the next course, which leads to stop-and-start learning. Every four weeks requires another registration period for the next mini-semester, additional work for both students and administrators.

Explaining freestanding modules to external bodies is also problematic. Federal financial aid programs, like Pell grants, often require students to enroll in full course loads to maintain eligibility. Students enrolled in freestanding mini-semesters for their math modules risk losing financial aid because they are only enrolled in a one-credit course as opposed to a normal three-credit course. Four-year university partners are similarly unwilling to accept freestanding mini-semesters as an alternative to traditional semesters; students attempting to transfer developmental credit from mini-semesters often find their petitions denied.

Fortunately, early adopters offer an administrative solution to freestanding modules called shell courses. Shell courses “hide” modules in traditional semesters, allowing students to self-pace while keeping administrative processes the same for the registrar’s office. The example below shows how shell courses solve for common problems with freestanding modules, using a fictionalized student named Jane.

## Solution: Shell Courses “Hide” Modules

### Rolling Modules into Traditional Semesters Prevents System Meltdown



**Creating Method from Madness**

“We drove the registrar (and really the entire student services division) crazy the first year of our modular redesign. Shell courses avoid the logistical nightmare of enrolling students in a million minimesters.”

*Math Department Chair*

Source: Advisory Board interviews and analysis.

Jane’s placement exam indicates she must complete Modules 2, 4, 7, and 9 before enrolling in college-level math. The left side of the diagram above shows her progression through freestanding modules. First, Jane enrolls in Module 2 for the first four weeks of the semester. She masters the material quickly, and completes the module in just two weeks. Although Jane is ready to move onto Module 4 right away, it is not offered until the second half of the semester. Jane must wait until Module 4 is offered, and cannot work on math for six weeks. When she is finally able to enroll in Module 4, she finds it difficult, and cannot complete it in the allotted four weeks for the course; she must re-enroll in Module 4. At the end of a 16-week semester, Jane completes only two modules, and spends the next semester completing the remaining developmental modules.

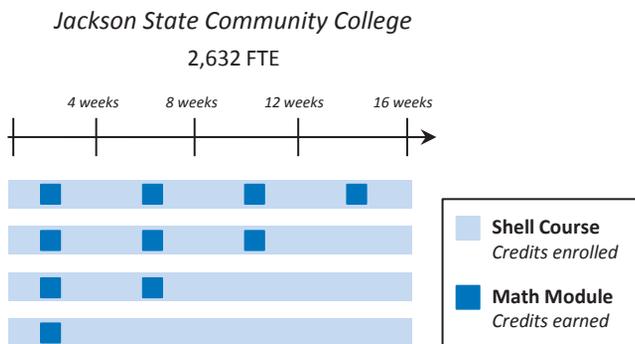
In the shell course model, Jane registers once for a course called “Developmental Math.” All of the students enrolled in this course work on math modules they need to complete their individual developmental requirements. Jane starts with Module 2 and completes the lessons after two weeks. She moves right to Module 4, Module 7, and Module 9, without any breaks in her learning. From the registrar’s perspective, Jane enrolled and completed a one-semester course, fulfilling her developmental requirement. In interviews with enrollment managers, we found that shell courses are simple to use and contain administrative chaos.

Shell courses can be structured differently according to institutional type, size, and goals. Standardized 16-week shell courses work well for colleges interested in reducing administrative work for enrollment managers. Colleges aiming to reduce students' tuition burden typically adopt shell courses of different lengths, with students paying only for the number of credits earned during the semester. The two shell course models are shown below.

## Unique Designs, Similar Results

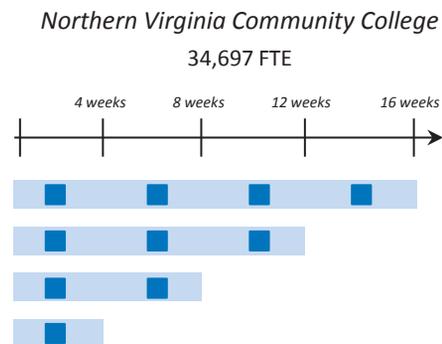
### Shell Courses Structured Differently Across Institution Types and Sizes

#### Standard Placeholders Maximize Scheduling Ease



**Minimizes Scheduling Time**  
Enrollment managers place all developmental math students in same shell course

#### Differentiated Placeholders Cut Tuition Costs



**Reduces Tuition**  
Students only pay for seat time necessary to complete required modules in sequence

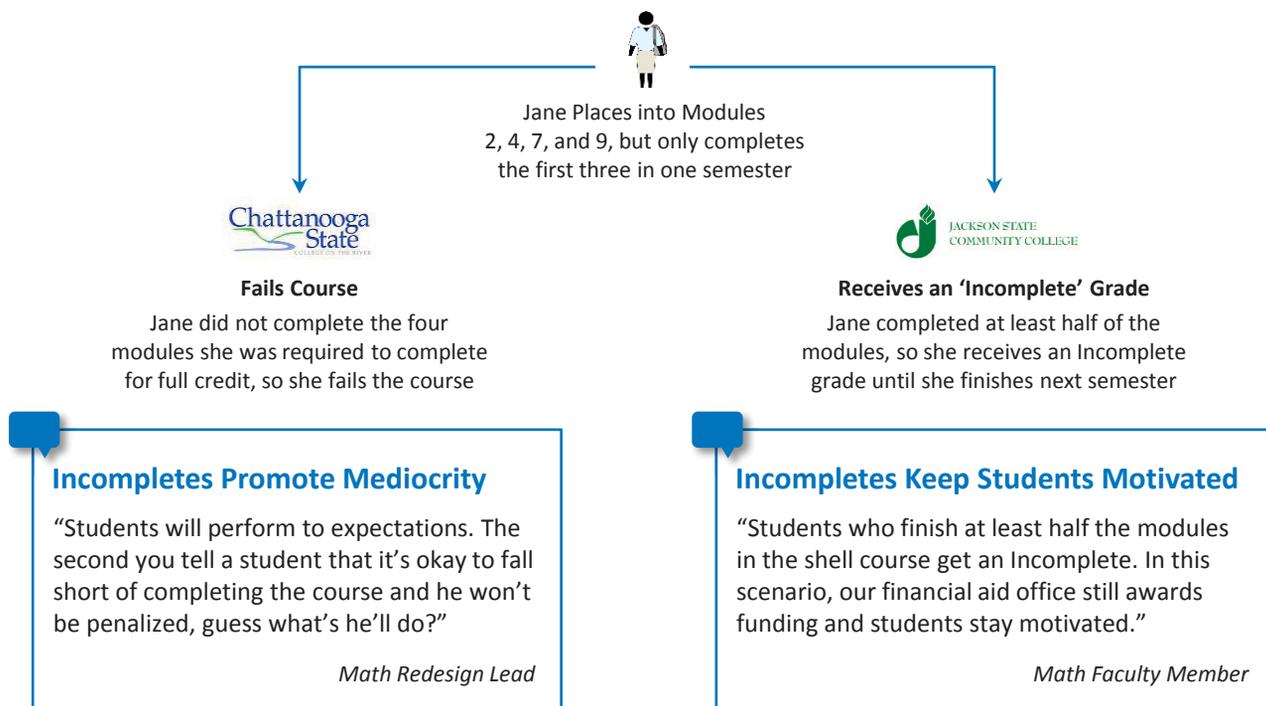
Source: Advisory Board interviews and analysis.

Jackson State Community College uses 16-week shell courses for all developmental math students, regardless of the number of modules needed to complete the sequence. The college created three shell courses for their developmental math students—Developmental Math I, II, and III. Students are required to complete at least four modules in each course. If students have fewer than four modules remaining in their developmental sequence, they must complete these modules by the end of the semester. The model benefits enrollment managers by minimizing the amount of time spent registering students according to their placement and progress. All developmental math students start in Developmental Math I and earn credit for each shell course once they have completed four credits.

Northern Virginia Community College employs a different shell course model. By default, all students are enrolled in a 16-week, four-credit shell course and expected to complete at least four modules by the end of the semester. Students who need fewer than four modules to complete the developmental sequence can register for three-, two-, and one-credit shell courses. Students pay only for the number of credits needed to complete their developmental math requirement, a great incentive for acceleration.

Regardless of shell course structure, students across colleges are typically expected to complete a minimum number of modules by the end of the semester to receive credit for the course. However, college leaders are divided on grading policies when a student does not complete all of the modules required for the semester. Below, our fictional student Jane highlights the two opposing positions in this debate.

## 'Incompletes' Promote Mediocrity or Encourage Progress? Colleges Split on Merits of Incomplete Grades for Slow Modular Completers



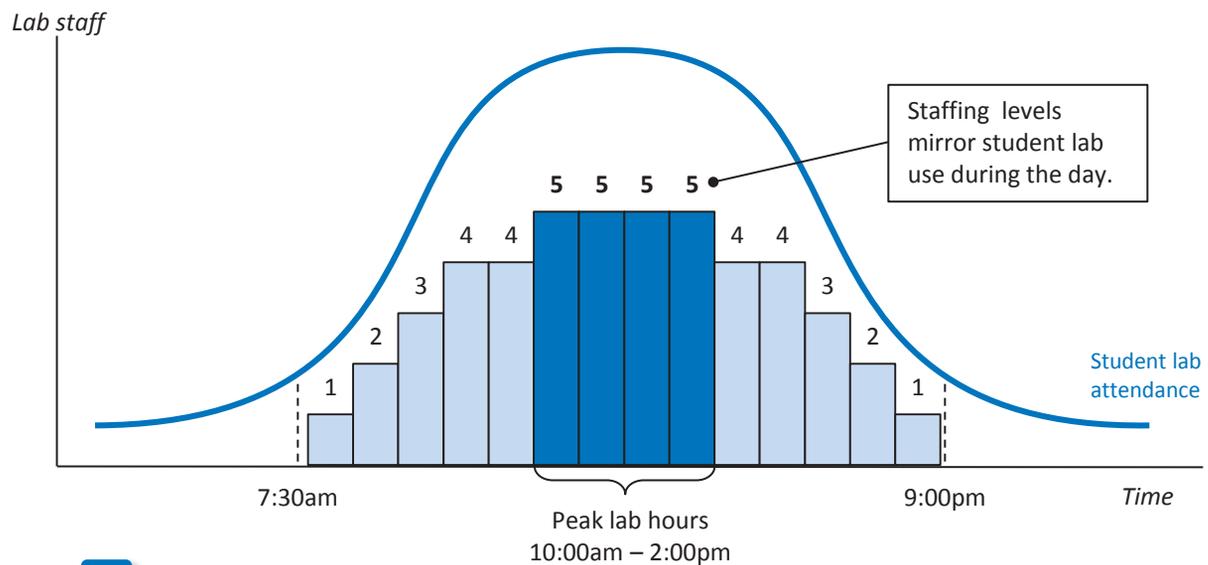
Source: Advisory Board interviews and analysis.

As a student at Chattanooga State Community College, Jane would fail her developmental math shell course if she completed only Modules 2, 4, and 7 by the end of the semester; she placed into Module 9 but did not complete it in time. Advocates of this strict pass-fail policy encourage students to perform to course expectations. The consequence of falling short of expectations is course failure. The prospect of failure motivates students to complete their required modules by the end of the semester.

Like many community colleges, Jackson State Community College requires students to complete four modules to pass a shell course. But as a student at Jackson State, Jane would receive an “Incomplete” grade for getting through three of her four required modules. Students who complete at least half of the required modules for a shell course receive an Incomplete. Students who complete fewer than half of the required modules fail the shell course. Advocates for this flexible grading policy argue “partial credit” encourages students to continue with the module sequence despite challenges encountered.

Some institutions give students the choice of when to work on their developmental math modules; instead of attending class at a certain time and day, instructors require students to work in the lab a certain number of hours each week. Matching lab staffing levels to student attendance patterns reduces unnecessary spending on instructional compensation during off-peak times in the lab. Lab supervisors use data from their math software platform to analyze peak hours of student lab attendance and staff the lab accordingly.

## Optimizing Staffing Levels to Match Student Demand



### On-Call Math Assistance

"It's great to come to the lab and know there are always tutors here who can answer my questions. I've never had to fight other kids for tutors' time or wait very long for help."

*Community College Student*

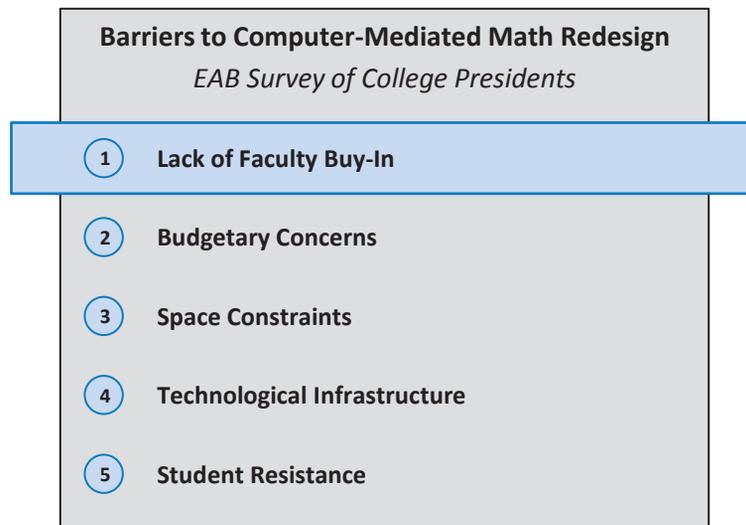
Source: Advisory Board interviews and analysis.

Administrators at Cleveland State Community College found that most students attend lab between 10:00am and 2:00pm on weekdays. Although the computer lab is open from 7:30am to 9:00pm, only a few students chose to work through their developmental math modules in the early mornings or late evenings. The lab is staffed to meet levels of student attendance: fewer staff report to the lab in the early morning and late evening. This maintains a low student-to-instructor ratio and minimizes unnecessary staffing expenses.

Community College Forum interviews reveal that despite the administrative challenges inherent in any classroom transition, college leaders are far more concerned about faculty transition difficulties to the modified emporium approach. A survey of presidents at member colleges found that leaders consider “lack of faculty buy-in” the single greatest barrier to math redesign. They explained that without a faculty champion to lead the charge, flipping the classroom would not be feasible on their campus.

## In Need of Self-Sustaining Faculty Buy-In

*Lack of Staff Engagement Most Oft-Cited Implementation Barrier*



Source: Advisory Board interviews and analysis.

Our research uncovered a welcome finding: campus support is attainable without a strong faculty champion. However, it's up to the college leadership to gain campus momentum for redesign.

## Campus Momentum Attainable and In Leadership's Hands

### *Presidential Support Needed to Secure Staff Engagement, Redesign Success*

#### Faculty Champion Not a Prerequisite...

"There was not a single faculty member on campus that was enthusiastic about moving to a modified emporium. No kicking and screaming, but it was close. Our redesign was driven by our president and now—don't tell him—but we can't imagine teaching in any other format."

*Modified Emporium Instructor*

#### ...But Presidential Support Is

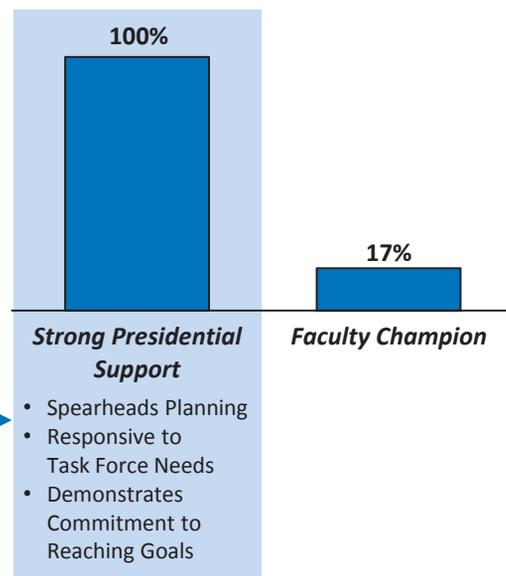
"Redesign can't be just a math department initiative—success hinges on too many moving parts across campus. Our president stepped in with his full support, building campus momentum and removing roadblocks. His voice at the table was a lot more valuable than course release hours, though those are nice too."

*Math Department Chair*

#### Leadership Backing Key Ingredient

*Successful Delivery Redesigns*

n=19



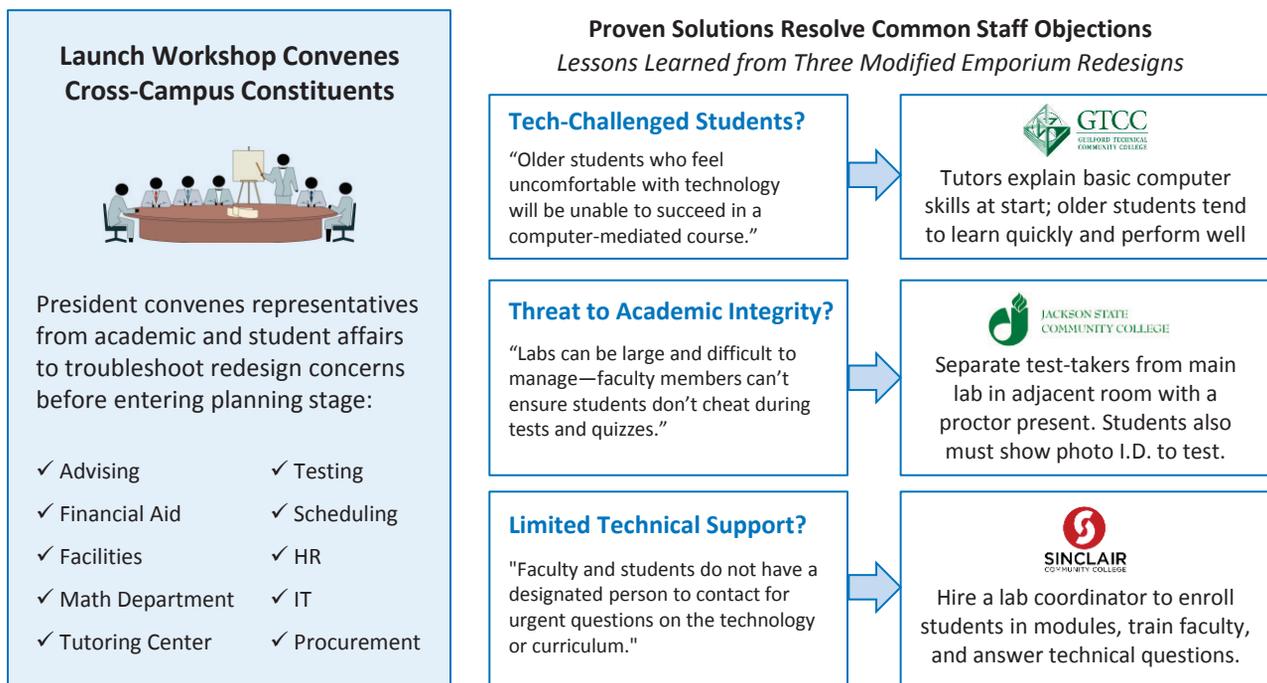
Source: Advisory Board interviews and analysis.

Our research of 19 successful modified emporiums found that only 17% of these colleges had a faculty champion who was driving the initiative and generating momentum within the faculty ranks. However, in all of the successful modified emporiums, the redesign had strong presidential support. The president spearheaded planning, was responsive to task force needs, and demonstrated a strong commitment to reaching goals. This support drove campus-wide engagement, and ultimately led to a successful redesign.

Campus momentum starts with a redesign launch workshop. This is the single most important event for a college president to lead, a visible early demonstration of their commitment to math redesign. The workshop convenes campus constituents from academic affairs and student services to troubleshoot concerns and establish a timeline for implementation. Below are several of the most common staff objections leaders face during redesign planning as well as proven solutions to move past these concerns.

## Addressing Campus Concerns from Day One

### Leading Redesign Launch Workshop Most Important Presidential Act



Source: Advisory Board interviews and analysis.

Our research surfaced an overwhelming number of stories of skeptical faculty who eventually became advocates of computer-mediated math redesign. In each instance, leaders showed strong support for the redesign, shared peer success stories, and organized representatives from across campus to develop sound plans for implementation.

The credibility of the modified emporium model relies on the ability of colleges to maintain academic integrity safeguards. Faculty skeptics often discredit the self-paced model as an opportunity for students to cheat on class assignments and final assessments; however, we uncovered several low-cost academic integrity safeguards that solicit faculty buy-in for developmental math emporiums.

## Low-Cost Academic Integrity Safeguards



### Dedicated Testing Room

Typically situated adjacent to math lab and separated by glass wall. Reduces distractions for test-takers



### Restricted Testing Materials

Scrap paper and answer sheets collected after exams to restrict information sharing



### ID Card Credentialing

Students keep ID card next to computer to deter students from impersonating others during exams



### Exam Proctor

Tutor assigned to oversee exam room, address technological issues, and answer questions



### 1:18 Faculty to Student Ratio

Minimizes distractions in lab and exam room; enables tutors to work closely with struggling students



### Syllabus Agreements

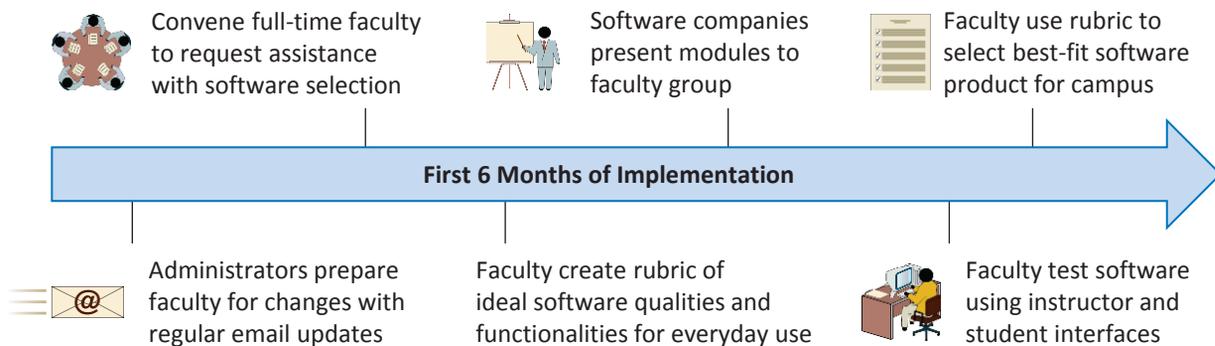
Outlines penalties for cheating to emphasize severity of infraction

Source: Advisory Board interviews and analysis.

Implementing the emporium model requires faculty input starting in the initial planning stage. Since developmental math faculty use the emporium software platform every day, they are often included in the software selection process. Faculty meet to discuss their needs in a software platform, see behind-the-scenes demonstrations, and ultimately take part in the final selection. The diagram below outlines how faculty involvement in software selection is integrated in the first six months of emporium implementation.

## Behind-the-Scenes Software Demonstration

### Engaging Math Faculty in Critical Decision for Math Emporium



#### Exclusion Breeds Faculty Resentment

"Faculty heard stories of the emporium model and software being rammed down faculty members' throats at other institutions. That's where the initial pushback came from...horror stories and a lack of choice."

*Kathleen Cleary  
Sinclair Community College*

Source: Advisory Board interviews and analysis.

On instructor we interviewed drew the comparison between teaching in a math emporium for the first time and learning to swim. First-time swimmers learn by jumping in the water and making adjustments until they figure out how to swim. Similarly, instructors learn to teach in an emporium simply by teaching, recognizing where they need assistance, and seeking out help when necessary. Administrators can help faculty best by making support resources widely available. The training materials profiled below support faculty in their first years teaching in an emporium setting. All of the resources can be made fully available online.

## Instant-Access Multimedia Training

### Supporting Emporium Instructors with Quick-Win Resources



#### Emporium 101 Manual

Outlines goals of math emporium and provides best practices to teach math content alongside instructional software.

#### 24/7 Training Materials

“We have a lot of new faculty, and we can’t do full-scale training every semester. We learned that we needed materials on hand to get new people up to speed.”

*Jane Serbousek*  
Northern Virginia Community  
College



#### Instructional Videos

Demonstrates strategies to overcome common administrative and instructional challenges in emporium classroom.



#### Sample Lecture Scripts

Exemplifies five-minute lectures for start of lab sessions. Topics include study skills and test-taking tips.



#### Online Professional Developmental Courses

Structured opportunity to learn essential elements of leading emporium classroom.

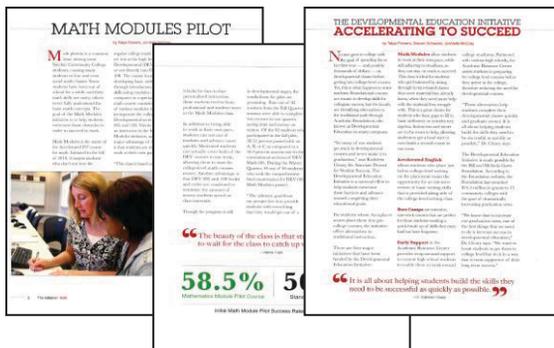
Source: Advisory Board interviews and analysis.

Faculty often worry that students will reject the modified math emporium in favor of the traditional lecture-drill model. To assuage these fears, administrators at Sinclair Community College charged a student journalism class with featuring the emporium pilot course for their next assignment. Students produced a high-quality magazine that included the history of the math redesign, early outcomes data, and student feedback from short interviews—nearly all overwhelmingly positive. Seeing this honest student feedback helped faculty understand the value of the emporium model and eventually become champions for its use at their institution.

## Publicizing Success at Sinclair Community College

### *Student Magazine Highlights Emporium Benefits, Urges Campus Acceptance*

#### Journalism Class Investigates Emporium *Sinclair Community College*



#### Publication Offers Honest Perspective *Profiles Students and Faculty*

- Outlines major initiatives funded by the Developmental Education Initiative
- Includes faculty features to emphasize approval from all constituents
- Distributed to staff, faculty, and students
- Student perspective fosters a culture of interest on campus

### Introducing the Peer-Reviewed Emporium

“This is the most candid feedback we get—students are willing to share things with their peers they would never share with faculty.”

*Kathleen Cleary  
Sinclair Community College*

Source: Advisory Board interviews and analysis.

Virtually every faculty member we interviewed told the same story: they were skeptical of the modified emporium at first, but saw the model's merits after seeing students enjoy the course and, most importantly, seeing impressive gains in developmental math completion rates. The data has convinced faculty members from across the country that the modified emporium will also work for their students.

## No Going Back

### Once Skeptical Staff Sing Praises of Modified Emporium Thanks to Results Data

#### Developmental Math Completion Rates

Tidewater Community College	
Traditional	Redesigned
50%	67%

#### Saved Time and Tuition

“When faculty saw results, they understood why the emporium was a good idea. Staff consider failure to be students who spend time and money and get nothing out of it. This was a success.”

*Curt Aasen, Director of Institutional Research and Effectiveness*

South Texas College	
Traditional	Redesigned
52%	65%

#### Building Internal Momentum

“At first, whomever was willing to chair the redesign effort was the chair. There weren't hands being raised until there was proof that the model actually works—now competition is stiff.”

*Jose Cruz, Vice President for Information Services and Planning Division*

Cleveland State Community College	
Traditional	Redesigned
54%	70%

#### Pedagogically Sound

“Most of us panicked. We thought that without lectures, nobody was going to learn...but after setting up the lab the way we wanted and seeing students in the lab, we knew it worked.”

*Karen Wyrick, Associate Professor and Math Department Chair*

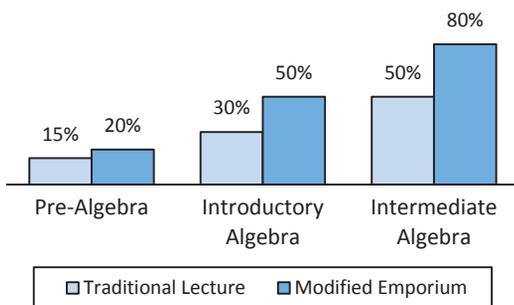
Source: Advisory Board interviews and analysis.

Results data from the modified math emporium becomes more informative when broken down by student placement level. Disaggregated completion rates indicate that students with different levels of math aptitude derive different levels of benefit from the model. Overall, students with medium-to-high developmental math aptitude benefit the most from the modified math emporium.

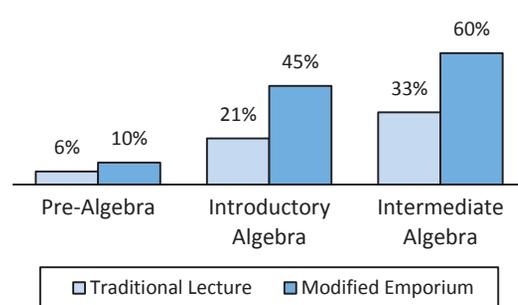
## Students With Greatest Developmental Need Still a Challenge

*Highest Return for Students with Medium-to-High Aptitude*

**Developmental Math Completion Rates**  
By Student Placement Level, Low to High



**College-Level Math Completion Rates**  
By Student Placement Level, Low to High



### Low Math Placement, Limited Success Gains

“Our redesign has been very effective for students testing into introductory and intermediate algebra. But for students with significant developmental need—the ones who need to get through all the modules—our current approach isn’t enough. These students need even more personalized support.”

*Math Department Chair*

Source: Advisory Board interviews and analysis.

Students with the highest developmental need, those placing into pre-algebra math, still perform better in a modified math emporium than in a lecture-drill classroom. But with only 20% of these students completing a developmental math sequence and 10% completing a college-level math course, students with the highest developmental need still struggle. The next section of this study explores strategies to improve success rates among this group.

We are optimistic that, in the coming years, continual improvements to the modified math emporium will produce better outcomes for all students, especially those entering with the highest developmental need. Competition among software vendors and online platforms is spurring innovations in digital learning, providing better functionality for the same or lower cost to consumers.

## The Best is Yet to Come

### Heightened Competition Raising the Bar for Learning Platforms

#### The Platform Wars



#### The Power of a Platform

"It's hard to predict who will win the platform wars, but it's easy to predict that someone will. The costs of building an online platform are negligible...The rewards of building the winning platform are vast, as Instagram found when it was bought by Facebook for \$1 billion."

*Kevin Carey, New America Foundation*

#### Next-Gen Features



##### Adaptive Learning

- Program generates questions, activities, and assessments proven to accelerate achievement of "like learners"



##### Predictive Analytics

- User data enables analysis and enforcement of effective learning habits, earlier detection and correction of struggling students



##### Game-Based Learning

- Players learn by completing puzzles and challenges, progressing through a compelling narrative



##### Contextualized Content

- Students can enroll in applied, program-specific courses relevant to career and academic concentration

Source: Kevin Carey, "Revenge of the Underpaid Professors," The Chronicle of Higher Education, May 20, 2012, <http://chronicle.com/article/Revenge-of-the-Underpaid/131919/>; Advisory Board interviews and analysis.

Software vendors like Pearson, Cengage, and ALEKS are now facing competition from open-source providers like the Khan Academy, EdX, and Coursera. This competition will lead to innovations in digital learning platforms as providers distinguish themselves to capture greater market share. Our research indicates that community colleges will benefit from improved features like adaptive learning, predictive analytics, gamified learning modules, and contextualized content. These features are already starting to take shape.

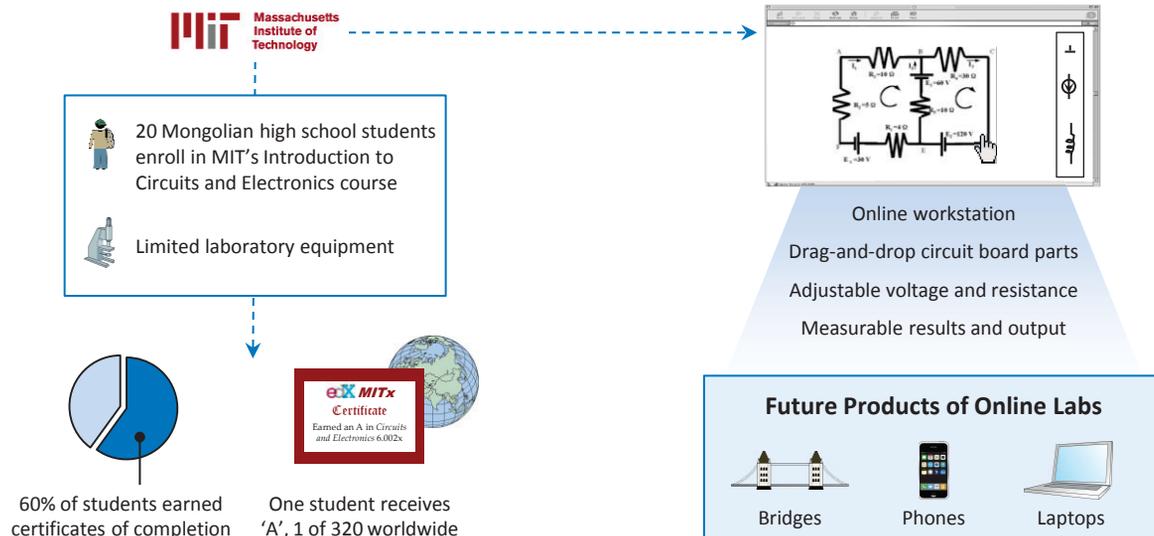
The positive effects of these next-generation features are already being realized. More than 6,000 miles from where the gamified course was first developed, a group of high school students in Ulan Bator, Mongolia, enrolled in the MIT-EdX “Introduction to Circuits and Electronics” MOOC. Of the 20 high school students enrolled in this college-level course, 60% earned a certificate of completion and one student even went on to earn an “A,” one of only 320 people worldwide, suggesting the interactive components of the course eroded language and learning barriers.

## Building Virtual Circuits in Ulan Bator

### *Interactive Problem-Solving Erodes Language and Learning Barriers*

**6,000+ Miles From Cambridge, MA and Showing Impressive Results**

**Interactive Lab Inspires Gamification Across Disciplines**



Source: Marc Parry, “5 Ways That edX Could Change Education,” *The Chronicle of Higher Education*, Oct. 1, 2012, <http://chronicle.com/article/5-Ways-That-edX-Could-Change/134672>; Technology Improv, “MITx Course Review Part 1: Introduction to the open education system,” accessed Dec. 12, 2012, <http://www.technologyimprov.com/posts/mitx-review-part-1-introduction-to-the-open-courseware-system>; Advisory Board interviews and analysis.

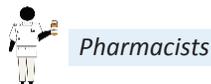
Using an online interactive lab, students could drag and drop circuit board parts, adjust voltage and resistance, and test the output of their circuitry. The MIT-EdX circuits course is only the beginning of the gamification movement. Some platforms already offer embedded puzzles and narratives that develop as students progress through software, and vendors are starting to develop more interactive classes where students can engage in building bridges, phones, and even laptops.

Vendor competition is also leading to advancements in curriculum contextualization. As community colleges support a growing number of vocational students, demand for discipline-specific math content has grown. Thanks to technological advances, in the near future students across disciplines may be able to fulfill their developmental math requirement by learning content relevant to their future careers. While aspiring welders calculate angles and melting points, aspiring pharmacists may be asked to solve an equation to fill a prescription.

## Competing on Contextualization

*Vendors Opening Doors to Blended Delivery and Curricular Innovations*

### Interactive Developmental Math Software for Aspiring:



Pharmacists



Historians



Welders



Designers

**Math for Pharmacists: Module 2**

1. To fill a prescription, you must to take a 1.5L bottle of a 20% solution and mix it with sterile water to make as much 12% solution as possible.

How much sterile water will you use ?

A. 525mL  
 B. 800mL  
**C. 2500mL**  
 D. 4250mL

$(.20)/(1500ml) = (.12)/(X)$   
 $300ml = .12X$

Source: Advisory Board interviews and analysis.

Contextualized curriculum helps students like Abby, our earlier hypothetical student who thinks formulas are too abstract, apply math to everyday problems and her future career goals. As more colleges seek contextualized math content for their students, more providers will compete to create next-generation software packages with expanded libraries of discipline-specific math. This will only enhance the value derived from investments in flipped classrooms.



## Section 2

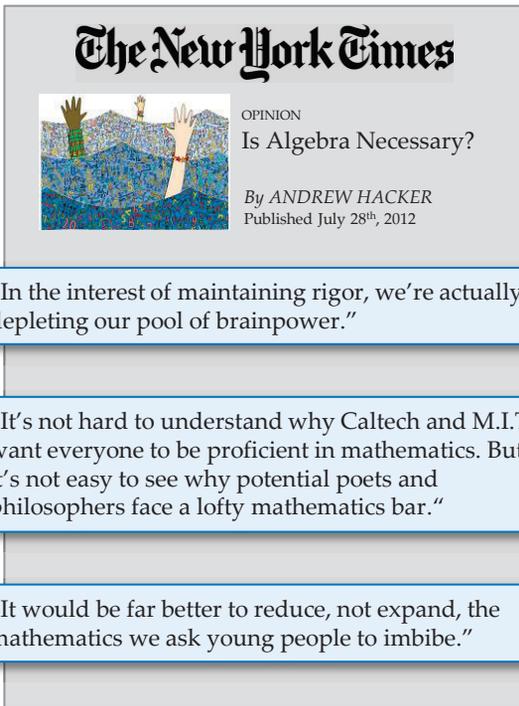
# Matching Curriculum to Career Goals

- Build Non-STEM Developmental Pathways
- Integrate Developmental Support with Career Training

The role of algebra in higher education is tangled in philosophy, not just economics. In June 2012, an op-ed printed in the *New York Times* argued that the American economy is unnecessarily deprived of college graduates because algebra serves as a barrier to degree attainment for millions of students. More than just challenging, algebra was branded a curriculum with limited application outside the classroom. The controversial op-ed sparked a national debate on the role and relevance of algebra in education, with hundreds of commenters rushing to defend the merit of teaching algebra in college.

## A Matter of Philosophy, Not Just Economics

### Op-Ed on High-Cost of Algebra Sparks Debate on Math Rigor and Relevance



**The New York Times**

OPINION  
Is Algebra Necessary?  
By ANDREW HACKER  
Published July 28<sup>th</sup>, 2012

“In the interest of maintaining rigor, we’re actually depleting our pool of brainpower.”

“It’s not hard to understand why Caltech and M.I.T. want everyone to be proficient in mathematics. But it’s not easy to see why potential poets and philosophers face a lofty mathematics bar.”

“It would be far better to reduce, not expand, the mathematics we ask young people to imbibe.”

### Commenters Argue Algebra Is a Must-Keep Pillar of Higher Education

ALL	EAB PICKS	NYT PICKS
<p><b>Brain Exercise</b></p> <p>“Mathematics is not simply difficult for difficulty’s sake. It develops and uses your reasoning in its purest form.”</p>		
<p><b>Everyday Utility</b></p> <p>“I may not use quadratic equations every day, but I could never figure out how to make something 30 percent larger in a drawing or recipe without algebra.”</p>		
<p><b>Global Imperative</b></p> <p>“Children in Japan, China, and Finland are much more proficient in mathematics than American children. Part of the problem is rampant laziness among Americans.”</p>		

Source: Andrew Hacker, “Is Algebra Necessary?” *New York Times*, July 28, 2012, <http://www.nytimes.com/2012/07/29/opinion/sunday/is-algebra-necessary.html?pagewanted=all>; Advisory Board interviews and analysis.

Many faculty, students, and staff are adamant that universal algebra requirements do more to hurt students than help. Our interviews yielded many stories of students whose career aspirations were derailed by failing algebra-based developmental math courses. These are students with no intention of pursuing careers in math, science, or technology, whose goals were shattered by career-irrelevant algebra requirements.

## But Algebra Skills Too High-Cost

### *Research Makes Compelling Case for Reduction of Lofty Math Requirement*

#### Cup of Coffee, Hold the Career Plan

“Last semester I had an education student who, despite every obstacle life threw at her, completed all she needed for graduation with flying colors except algebra. And now she hands me my morning coffee at the Starbucks across the street instead of teaching kids how to read.”

*Math Faculty Member*

#### Dreams (and Funds) Deferred

“I don’t understand how graphing linear equations has anything to do with becoming a physical therapist. I’m paying for three semesters of developmental math—money my family needs—and I don’t see how these formulas apply. It sure is a costly routine to be just for the sake of tradition.”

*Community College Student*

#### Better Alternatives Available

“Newly-developed statistics and quantitative literacy alternatives don’t ‘dumb down’ curriculum—students are actually applying math to life. It’s critical thinking, not memorization in one ear and out the next. And, most importantly, they are not dropping out.”

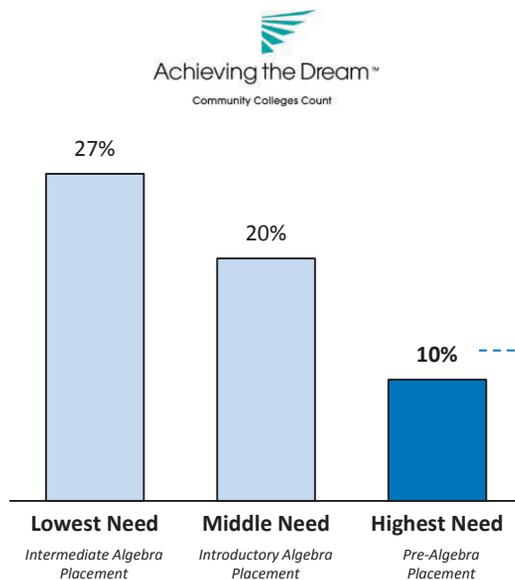
*Carnegie Foundation*

Source: Advisory Board interviews and analysis.

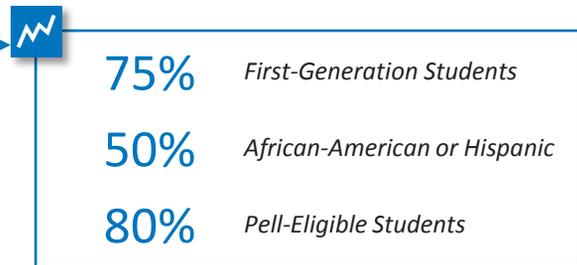
National data from Achieving the Dream reveals that students who test into the lowest level of developmental math have only a one in ten odds of attainment. Further, a disproportionate number of these developmental students are from underrepresented student groups such as first-generation college-goers, minority students, and Pell Grant recipients—students at the core of the community college open access mission.

## Students with Greatest Need Suffer Most from Lofty Algebra Bar

**Highest Need, Lowest Completion Rates...**  
*Pre-Algebra Students 1 in 10 Odds of Attainment*



**...And Traditionally Underrepresented**  
*National Demographics of Pre-Algebra Students*



### Underserved Access Core of Mission

“If we don’t help students at the very bottom of the ‘pyramid,’ we risk losing so many young people who already face a lot of hardship. It’s part of our mission; we should all care.”

*Developmental Math Faculty Member*

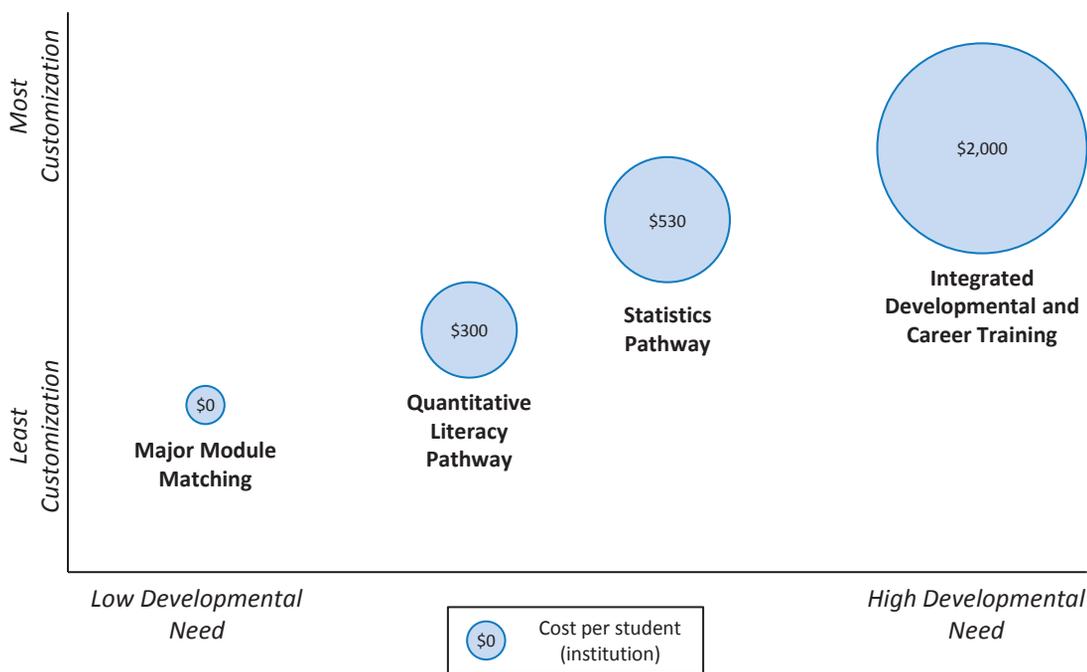
Source: Thomas Bailey, Dong Wook Jeong, and Sung-Woo Cho, “Referral, Enrollment, and Completion in Developmental Education Sequences in Community Colleges,” Community College Research Center, Nov. 2009, <http://ccrc.tc.columbia.edu/Publication.asp?uid=659>; Advisory Board interviews and analysis.

Charged with a mission to provide high-quality education to traditionally underrepresented groups, many community college leaders feel a responsibility to ensure that students with developmental needs can succeed at their institutions. Our research identified tailored math pathways as crucial to elevating degree attainment for developmental students of all levels, but particularly those with the greatest developmental needs.

Some college administrators resist matching students' curriculum to individual career goals because of the potentially high cost of customization. To combat this obstacle, we recommend varying levels of curriculum customization according to students' developmental needs, focusing the most extensive tailoring on students with the greatest math needs and the lowest odds of traditional completion.

## Balancing Cost and Customization

### *Tailoring Most Critical for High-Need Students*



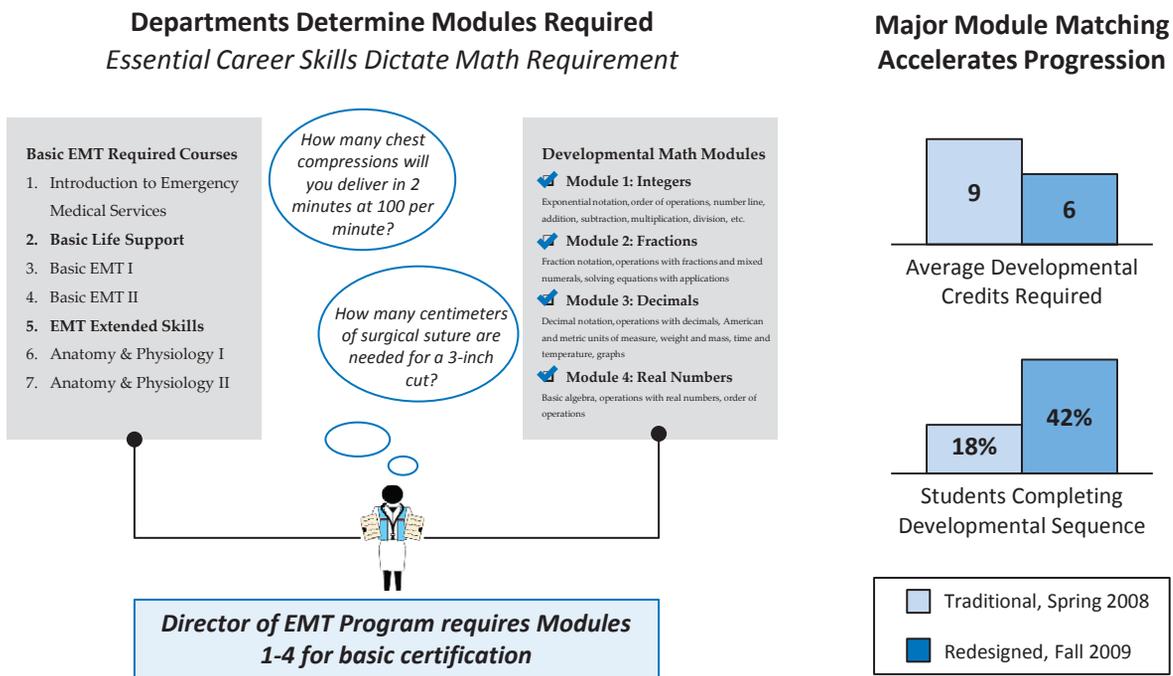
Source: John Wachen, Davis Jenkins, Clive Belfield, and Michelle Van Noy, "Contextualized College Transition Strategies for Adult Basic Skills Students: Learning from Washington State's I-BEST Program Model," December 2012, <http://ccrc.tc.columbia.edu/Publication.asp?UID=1159>; Advisory Board interviews and analysis.

There are several low-cost ways to match curriculum to career goals. This section begins with an exploration of strategies best-suited for non-STEM students, such as major module matching and statistics and quantitative literacy pathways. Our research found that for students with the greatest developmental needs, greater contextualization is the key to boosting completion rates. The increasingly popular I-BEST model is a high-return strategy for supporting students with significant developmental need that integrates developmental support with for-credit vocational training.

Institutions with the modified emporium model in place can tailor the developmental curriculum to students' academic and career goals through major module matching. At Jackson State Community College, department chairs review descriptions of each developmental math module offered at the institution and determine which are necessary for success in each program of study. Students are only required to complete modules required for their major, shortening the developmental sequence and ultimately improving completion rates.

## Removing Unnecessary Content Reduces Barriers to Completion

### JSCC Matches Modules to Degree Programs



Source: Advisory Board interviews and analysis.

Department chairs at colleges with major module matching expressed that the process made them feel part of the overall math redesign. Once invested in the redesign process and witness to its success, these faculty members become champions for the initiative across campus.

According to the Bureau of Labor Statistics, the number of jobs requiring statistics knowledge is likely to grow by at least 14% over the next ten years. Yet despite these market demands, most colleges only offer college algebra preparation as the sole enrollment option for developmental math students. In these courses, less than 10% of the curriculum overlaps with concepts covered in college statistics. As a result, students pursuing non-STEM majors don't receive the developmental support needed for future college and career success.

## Algebra Remediation Poor Prep for STAT101 Yet Statistics Skills Increasingly in Demand

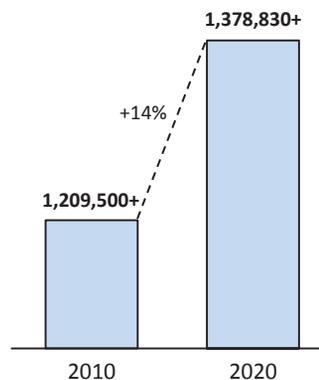
### Little Overlap Between Statistics and Algebra

TABLE OF CONTENTS <i>Pre-Algebra and Introductory Algebra</i>	
<p><u>Ch. 1: Basic Concepts</u></p> <ul style="list-style-type: none"> <li>• Numerical Expressions</li> <li>• Prime and Composite Numbers</li> <li>• Integers: Addition and Subtraction</li> <li>• Integers: Multiplication and Division</li> </ul> <p><u>Ch. 2: Real Numbers</u></p> <ul style="list-style-type: none"> <li>• Rational Numbers</li> <li>• <b>Real Numbers, Algebraic Expressions</b></li> <li>• <b>Exponents</b></li> </ul> <p><u>Ch. 3: Equations and Problem Solving</u></p> <ul style="list-style-type: none"> <li>• Solving First-Degree Equations</li> <li>• Equations and Problem Solving</li> <li>• Equations Involving Parentheses</li> </ul> <p><u>Ch. 4: Formulas and Problem Solving</u></p> <ul style="list-style-type: none"> <li>• Formulas: Geometric and Others</li> <li>• Problem Solving</li> <li>• <b>Ratio, Proportion, and Percent</b></li> </ul>	<p><u>Ch. 5: Coordinate Geometry</u></p> <ul style="list-style-type: none"> <li>• <b>Cartesian Coordinate System</b></li> <li>• <b>Graphing Linear Equations</b></li> <li>• <b>Slope of a Line</b></li> <li>• <b>Writing Equations of Lines</b></li> <li>• Systems of Two Linear Equations</li> <li>• Eliminate-by-Addition Method</li> <li>• Graphing Linear Inequalities</li> </ul> <p><u>Ch. 6: Exponents and Polynomials</u></p> <ul style="list-style-type: none"> <li>• Adding and Subtracting Polynomials</li> <li>• Multiplying Polynomials</li> <li>• Dividing by Monomials</li> <li>• Dividing by Binomials</li> <li>• Negative Integers as Exponents</li> <li>• Factoring by Distributive Property</li> </ul> <p><u>Ch. 7: Factoring and Problem Solving</u></p> <ul style="list-style-type: none"> <li>• Factoring, Distributive Property</li> <li>• Factoring, Difference of Two Squares</li> <li>• Factoring Trinomials</li> <li>• Factoring and Solving Equations</li> <li>• Problem Solving</li> </ul>

Only 9% of topics in traditional developmental algebra textbook needed for college Statistics

### Statistics Skills Wanted

*Number of U.S. Jobs Requiring Statistics Knowledge Likely to Grow 14% by 2020*



Source: Bureau of Labor Statistics, "Occupational Outlook Handbook: Statisticians," accessed Jan. 9, 2013, <http://www.bls.gov/ooh/math/statisticians.htm#tab-7>; Advisory Board interviews and analysis.

In 2009, Los Medanos College launched a statistics pathway giving students at any developmental level the opportunity to complete a developmental statistics course and a college-level statistics course in one year. The accelerated pathway was developed by carefully reviewing the topics necessary for success in college statistics and eliminating unnecessary algebra concepts hindering student engagement. Shortening and contextualizing the developmental curriculum kept non-STEM students motivated to complete their math requirement and led to massive completion gains.

## Launching a Statistics Pathway

### *Los Medanos College Path2Stats*

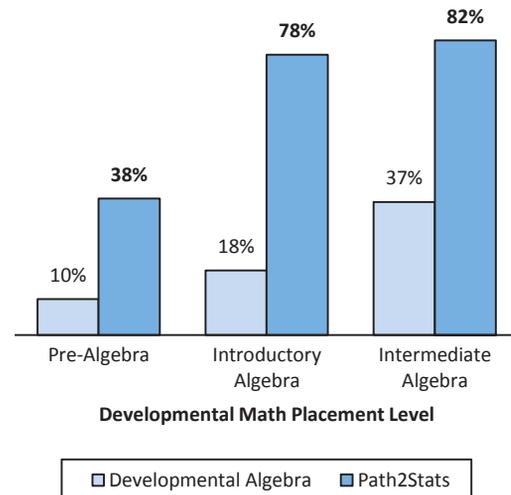
#### A New Path To College Math

*Developmental Course Aligned with College-Level Statistics Provides Algebra Alternative*



- Six-unit developmental course prepares students for college-level Statistics in one semester
- First cohort of students started Fall 2009; all degree-seeking students in non-STEM disciplines
- Strong emphasis on real-world applications, educational transfer plans, and individual career planning sessions

#### Path2Stats Students More Than Double Completion Rates of Developmental Algebra Students in College-Level Math



Source: Advisory Board interviews and analysis.

Students in the Path2Stats program completed college math by more than twice the rate of their peers at every level of developmental placement. The outcomes data provides evidence that curricular tailoring is effective for students at any level of developmental need.

Part of the credit for the impressive gains in student success at Los Medanos is due to a curriculum that emphasizes math's applicability to real-world situations. Faculty may reinforce these lessons by connecting classroom lessons to students' career goals, working with students to build transfer plans to local four-year institutions, and arranging trips to the college career office.

Community colleges seeking alternatives to developmental algebra can limit implementation costs by adopting prepackaged curricula. Over the past five years, the Carnegie Foundation for the Advancement of Teaching and the Charles A. Dana Center at the University of Texas-Austin have developed three developmental curriculum packages used by community colleges across the country. Quantway and Statway were developed jointly by the two organizations, and the New Mathways project was developed the Dana Center independently.

## Not Starting from Scratch

### *Foundations Develop Pre-Packaged Statistics and Quantitative Literacy Programs*

	 QUANTWAY	 STATWAY	New Mathways
<b>Pathway Length</b>	One semester	Two semesters	One to two semesters, depending on placement
<b>Initial Placement</b>	Introductory Algebra	Introductory Algebra	Open to students at any developmental level
<b>Content</b>	Practical mathematical literacy	College statistics with just-in-time developmental math	Quantitative literacy, statistics, or pre-algebra and Student Success Course
<b>Program Outcome</b>	Completion of developmental sequence	Completion of college statistics course	Completion of college math course
<b>Faculty Training</b>	Conference attendance, monthly phone calls, and online courses for faculty; institutional cost of \$45,000 over two years	Conference attendance, monthly phone calls, and online courses for faculty; institutional cost of \$45,000 over two years	27-page implementation guide for new faculty, early resources available online, updates ongoing

Source: Carnegie Foundation for the Advancement of Teaching, "Developmental Math," accessed Jan. 9, 2013, <http://www.carnegiefoundation.org/developmental-math>; Advisory Board interviews and analysis.

The crucial difference between Quantway, Statway, and the New Mathways curriculum packages are the ease of scalability. In interviews with faculty, administrators, and representatives from each of the foundations, we found that the materials developed by the Carnegie Foundation require advanced teaching strategies and intensive professional development hours. In contrast, the Dana Center's New Mathways project is considered easier to bring to life in the classroom and can be modified according to regional curricular requirements. Curricular materials for quantitative literacy, statistics, and algebra courses in The New Mathways project are available on the Dana Center's website.



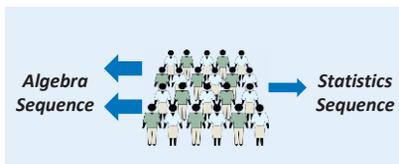
You may access the New Mathways Implementation Guide by referring to the **Implementation Toolkit Resource Center** at [eab.com](http://eab.com).

Developmental statistics courses can encounter initial resistance from both students and four-year transfer partners. Administrators with experience launching statistics pathways advise institutions to prepare for two potential challenges in the first year of implementation: low student enrollment and university transfer partners unwilling to accept statistics credits.

## Learning From First Adopters

### Overcoming Two Potential Challenges to Non-STEM Developmental Pathways

#### Generating Student Enrollment



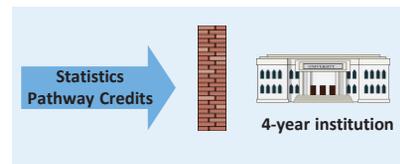
**Students Unaware of Statistics Pathway, Few Enroll**

#### Where is Everybody?

“I was surprised that more students didn’t enroll in our new statistics pathway, given the number who failed algebra and didn’t even need it for their major.”

*Math Department Chair*

#### Ensuring Transferability



**Four-Year Institutions Reject Statistics Pathways for Transfer Credit**

#### Unpredictable Articulation

“University decisions about articulation agreements get made so randomly. There is no reason why statistics should be considered any differently than algebra.”

*Math Department Chair*

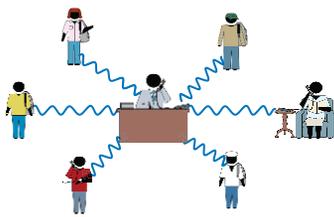
Source: Advisory Board interviews and analysis.

Colleges can easily generate student enrollment in new statistics pathways with an advanced recruitment plan. To avoid costly last-minute recruitment efforts, we recommend adopting an approach from Los Medanos College: list new statistics offerings alongside traditional offerings in the course catalog, advertise new statistics courses in traditional developmental courses, and start statistics courses two weeks later in the semester to give students a chance to switch into the course. These recruitment methods require little administrative time and effectively generate enrollment in new courses.

## Spreading the Word

### Strategic Recruitment Planning Worth the Investment for New Math Offerings

#### VIP Phone Banking at Mystery College Well-Intentioned, But Low-Return



- Math department chair phones 500 students to discuss course options for enrollment
- One-to-one phoning expends hours of valuable administrative time
- Students receive information on statistics course once at unexpected time, with no supplemental materials to consider choice carefully

#### Three-Prong Enrollment Strategy from Los Medanos Populates Path2Stats

##### Top of Page, Top of Mind

**MATHEMATICS**  
Math 004: Basic Math  
Math 012: Pre-Algebra  
Math 025: Elementary Algebra  
Math 030: Intermediate Algebra  
Math 034: Intro to Statistics

List developmental statistics among math courses in catalogue so students consider courses equally



##### Statistics PSAs for Algebra Students



Math Department Chair visits algebra courses at start of semester to inform students of statistics path



##### Delayed Start for New Offering



Start statistics two weeks later than other classes so faculty have time to advertise and recruit students

Source: Advisory Board interviews and analysis.

Los Medanos College suggests a three-prong approach to recruiting students to new statistics courses. First, elevate the placement of the new offering in the course catalog alongside other math courses; students rarely see pilot courses placed into the “experimental” section of the catalog. Second, assign staff to visit developmental algebra courses at the start of the semester and inform non-STEM students that developmental statistics courses are available. Statistics are better aligned to non-STEM degree requirements and should appeal to these students. Third, delay the start of the statistics pathway by two weeks to enable students to move from developmental algebra to developmental statistics without missing the first few days of class.

Convincing four-year transfer partners to accept developmental statistics credits is a more difficult challenge. While the extent to which colleges can affect articulation agreements varies across institutions and states, Montgomery College's two-step approach to building transfer pathways is a replicable best practice.

## Building Bridges to Articulation

*Montgomery College Promotes Transferability With Professional Networking*

1

### Professional Colleagues Form Initial Articulation Network

<p><b>Williams</b></p>  <p><b>Justin P. Siegel</b> Associate Math Professor</p>	<p><b>EASTERN CONNECTICUT STATE UNIVERSITY</b></p>  <p><b>Ricardo Nieves</b> Math Department Chairperson</p>
<p><b>BABSON</b></p>  <p><b>Allison P. Nickel</b> Math Department Chairperson</p>	<p><b>UNIVERSITY OF BRIDGEPORT</b></p>  <p><b>Isabel M. Pardo</b> Vice President of Academic Affairs</p>

### Leveraging Relationships For Credit

“Colleagues at nearby institutions are good to start with when searching for articulation for a new course. They trust you and are open to accepting the credits.”

*John Hamman, Math Department Chair  
Montgomery College*

2

### Program Director Leverages Three Pieces of Evidence to Build Transfer Network



#### Making the Case

##### Evidence of Partners

- List of early transfer partners, generated through math faculty connections

##### Evidence of Rigor

- College-level student learning outcomes demonstrating algebra-equivalent critical thinking and development

##### Evidence of Outcomes

- Program results data showcasing student success and performance on national exams

Source: Advisory Board interviews and analysis.

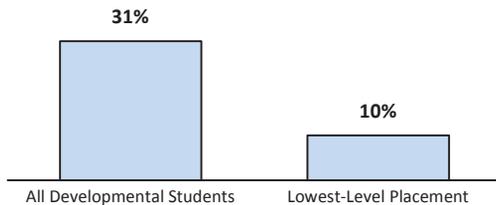
Montgomery College successfully navigated the articulation process by capitalizing on their math faculty's professional network. As a starting point, college math faculty with relationships at nearby partner institutions leveraged those connections to form an initial group of transfer partners. From there, the college marshaled three key pieces of evidence to attract additional transfer institutions. The first piece of evidence is a list of early transfer partners, which builds the legitimacy of the program. The second piece is evidence of curricular rigor and the third is evidence of positive student outcomes. With these three pieces of evidence, Montgomery College was able to make the case to potential partners and build its transfer network.

Statistics pathways and major module matching are most effective for students who place into the two highest levels of developmental math. However, students testing into the lowest levels of developmental math, while aided by these innovations, continue to face bleak graduation odds. These outcomes for student with more significant development need have prompted both policy makers and college leaders to ask whether these students are a lost cause. Should resources be reallocated to students with greater attainment odds?

## Math for Poets Not a Panacea

### *Students with Highest Math Need At Risk of Abandonment*

**Lowest-Level Students a Lost Cause?**  
*Achieving the Dream Graduation Rates, 2010*



“It might be time to close the door on students who enter with significant remedial needs. Their chances of success are slim and the costs of supporting them are sky-high.”

*Community College President*

### States Impose Limits on Developmental Offerings



**Texas:** Governor Rick Perry issues executive order to improve ineffective programs; six institutions eliminate developmental courses



**Connecticut:** Senate bill calls for end of developmental courses; final version allows maximum one semester of remediation

### But Closing Doors Antithetical to Mission

#### *Most Needy Students Left to Fend for Themselves?*



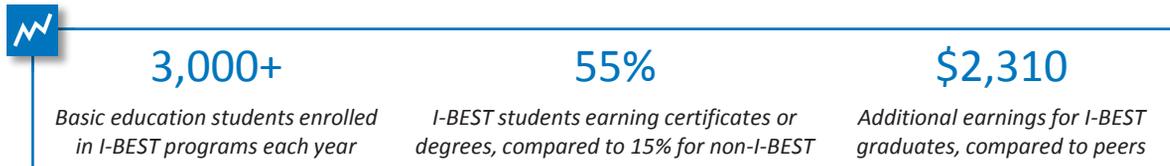
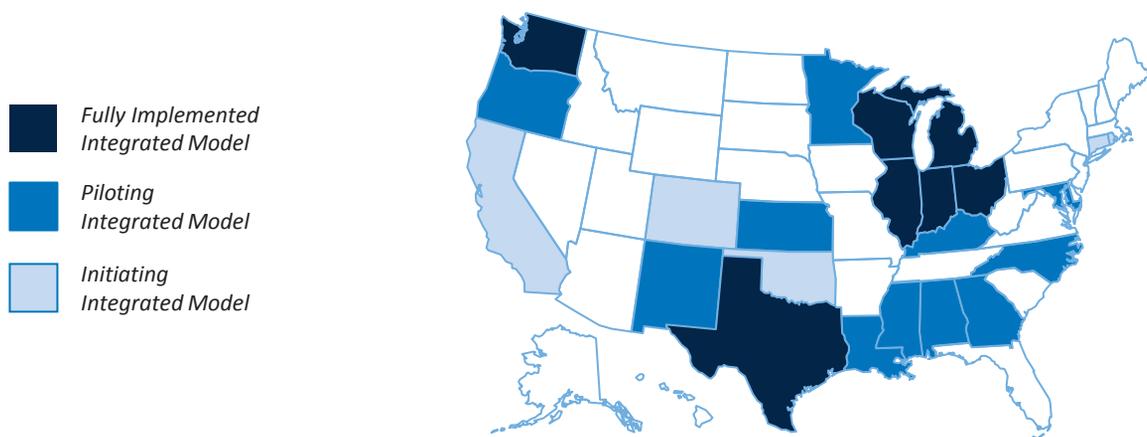
Source: Complete College America, “Time is the Enemy,” Sept. 27, 2011, [http://www.completecollege.org/resources\\_and\\_reports/time\\_is\\_the\\_enemy](http://www.completecollege.org/resources_and_reports/time_is_the_enemy); Nikki Edgecombe, “Accelerating the Academic Achievement of Students Referred to Developmental Education,” Feb. 2011, <http://ccrc.tc.columbia.edu/Publication.asp?UID=867>; “Report of the Texas Higher Education Coordinating Board on Higher Education Cost Efficiencies to the Governor,” Nov. 2012, <http://www.highereducationpolicyinstitute.org/index.cfm?objectid=A9286AF9-CEBB-91F2-32B29679F495AF60>; State of Connecticut, “An Act Concerning College Readiness and Completion,” July 2012, <http://cga.ct.gov/2012/ACT/PA/2012PA-00040-R00SB-00040-PA.htm>; Advisory Board interviews and analysis.

Despite growing calls to drastically reduce developmental support, most college leaders believe closing doors to students with the greatest developmental need is antithetical to their mission. Rather than turn away scores of adult, international, first-generation, and minority students, our members are eager for strategies to boost success rates for these populations.

Our research found that students who place into the lowest level of developmental math benefit greatly from a program called I-BEST, which integrates contextualized developmental and basic skills support with vocational training. The I-BEST model has produced impressive student success gains since its 2006 launch in Washington State, causing institutions across the country to consider the integrated approach for their campuses.

## Integrating Developmental Support with Career Training

### *Success of Washington I-BEST for ABE Propels Model Across State Borders*



Source: Washington State Board for Community and Technical Colleges, "2012 I-BEST Review," June 2012, [http://www.sbctc.ctc.edu/college/education/resh\\_rpt\\_12\\_1\\_ibest\\_review\\_000.pdf](http://www.sbctc.ctc.edu/college/education/resh_rpt_12_1_ibest_review_000.pdf); "Washington's Community and Technical Colleges Integrated Basic Education and Skills Training (I-BEST)," Nov. 2012, [http://www.sbctc.ctc.edu/college/abepds/WEB\\_IBESTone-pager\\_11.5.12.pdf](http://www.sbctc.ctc.edu/college/abepds/WEB_IBESTone-pager_11.5.12.pdf); Davis Jenkins, Matthew Zeidenberg, and Gregory Kienzi, "Building Bridges to Postsecondary Training for Low-Skill Adults," Community College Research Center, May 2009, <http://ccrc.tc.columbia.edu/Publication.asp?uid=695>; Advisory Board interviews and analysis.

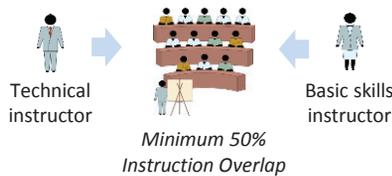
I-BEST was developed in Washington State to provide basic skills students with contextualized academic training and technical instruction. Since its inception, the model has been adapted for various student competency levels, including developmental education. Results data from I-BEST programs illustrate that students with severe developmental needs have strong chances of degree attainment with the right support. In Washington State, 55% of I-BEST students earn degrees or credentials, a major improvement on the average achievement levels for basic skills students. Post-graduate outcomes are similarly impressive, with I-BEST students earning over \$2,000 more in annual earnings than their peers in traditional developmental programs.

Although the I-BEST program has been adapted to account for local regulations, student needs, and budgets, the core features of the original model remain mostly intact across the country. Most programs require developmental skills and technical instructors to co-teach for-credit credential courses with a minimum of 50% instructor overlap. I-BEST credential sequences feed students into high-demand, high-pay industries in their local regions, such as manufacturing and health care.

## I-BEST in Brief

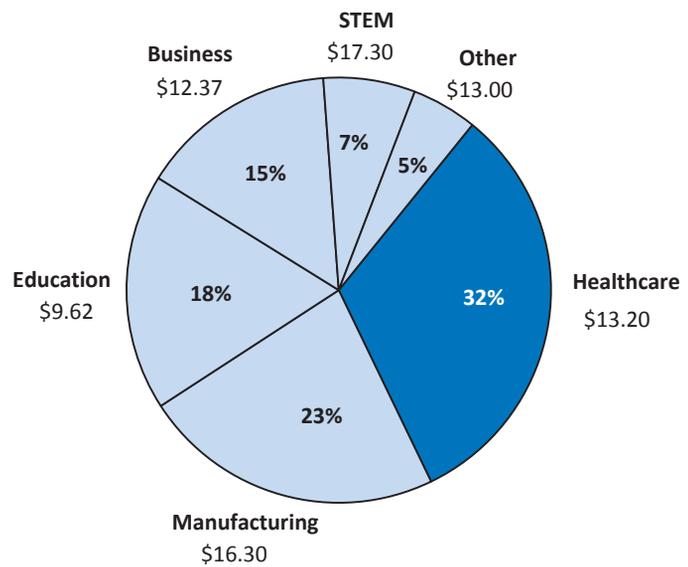
### Core Features of Washington-Born Integrated Model

#### Basic Skills and Technical Instructors Co-Teach Credential Sequence



- Launched in 2006, I-BEST offered at all 34 Washington community colleges and expanding nationally
- Washington State program enrolls diverse student mix, including 41% students of color, 21% ESL status, and 47% parents
- For-credit programs in high-demand, high-pay local industries
- Designed for basic skills and high developmental need students, given heightened cost of delivery

#### Fields Target High Demand Industries Median Hourly Wages for I-BEST Completers



Source: Washington State Board for Community and Technical Colleges, "Washington's Community and Technical Colleges Integrated Basic Education and Skills Training (I-BEST)," Nov. 2012, [http://www.sbctc.ctc.edu/college/abepds/WEB\\_IBESTone-pager\\_11.5.12.pdf](http://www.sbctc.ctc.edu/college/abepds/WEB_IBESTone-pager_11.5.12.pdf); John Wachen, Davis Jenkins, and Michelle Van Noy, "How I-BEST Works: Findings from a Field Study of Washington State's Integrated Basic Education and Skills Program," Sept. 2010, <http://ccrc.tc.columbia.edu/Publication.asp?UID=806>; Advisory Board interviews and analysis.

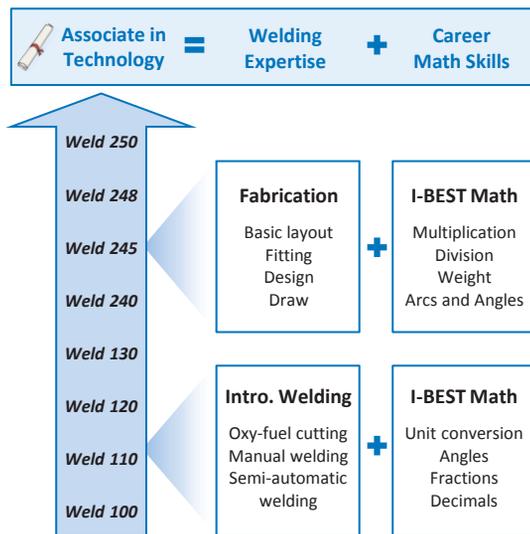
Given the heightened cost of delivery, I-BEST programs are typically reserved for students with more significant developmental needs. Contextualized lessons and high-touch instructor interventions optimally equip these students for degree attainment.

Like the modified math emporium, I-BEST program outcomes vary with how the model is implemented. While some colleges share stories of I-BEST programs with minimal gains in completion rates, others boast tremendous completion gains in which I-BEST students outperform college-ready peers. The welding I-BEST program at Grays Harbor College is a best-in-class example of curricular integration that has yielded truly impressive returns in student success.

## I-BEST in Practice

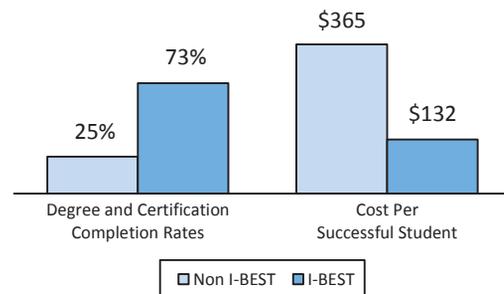
### Grays Harbor Welding Program Best-in-Class Example of Integration

#### Developmental Math Integrated with Welding Instruction

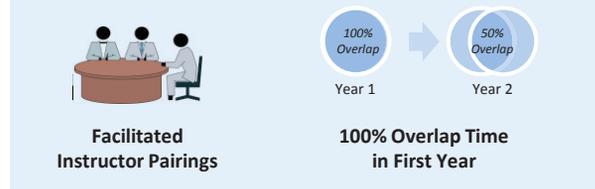


#### Integration Triples Attainment Odds

Truly Impressive Returns for Students with Greatest Need



#### Strategic Instructor Partnerships Key to Success



Source: John Wachen, Davis Jenkins, Clive Belfield & Michelle Van Noy, "Contextualized College Transition Strategies for Adult Basic Skills Students: Learning from Washington State's I-BEST Program Model," Dec. 2012, <http://ccrc.tc.columbia.edu/Publication.asp?UID=1159>; Advisory Board interviews and analysis.

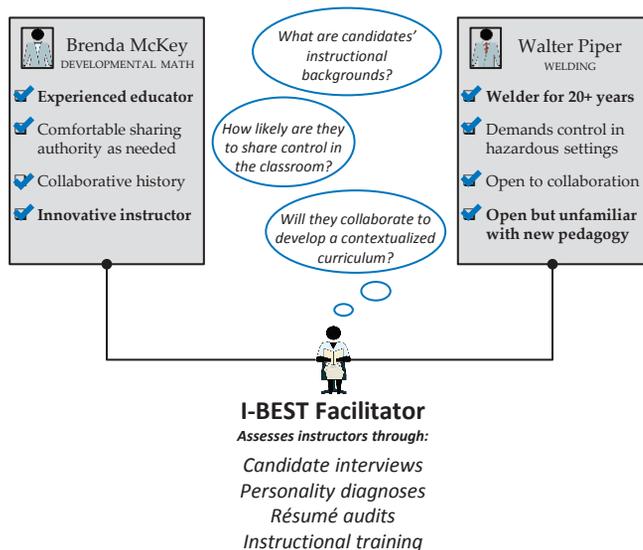
Faculty at Grays Harbor attribute the I-BEST program's success to high-performing instructor partnerships. The effective pairings are facilitated by an I-BEST facilitator tasked with pairing instructors based on classroom style and supporting pairs during the first few years of their partnership. The I-BEST facilitator encourages new pairs to consider 100% overlap time in their first year to ensure instructors can develop contextualized curriculum and teach effectively together.

I-BEST instructor pairings disintegrate for many reasons, including a struggle over control in the classroom, mismatched personality styles, and an inability to contextualize course content. To prevent these damaging outcomes, Grays Harbor College employs an I-BEST Facilitator to interview instructors, assess their potential for joint teaching, and decide which instructors will flourish as a pair. One hundred percent instructional overlap time in the first year gives the developmental instructor familiarity with the technical content.

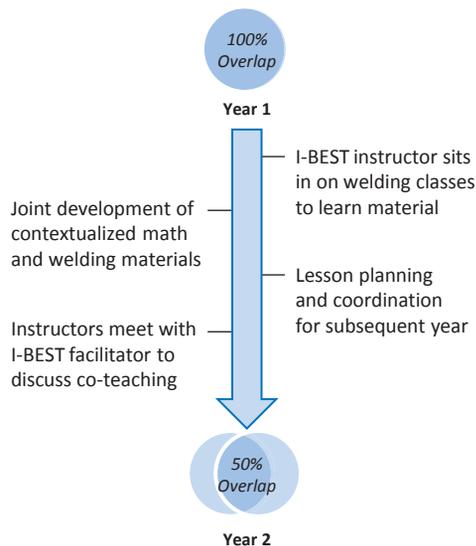
## Facilitating High-Performing Instructor Partnerships

### *Grays Harbor College Attributes Program ROI to Strategic Pairings*

#### I-BEST Facilitator Matches Instructors by Personal and Professional Style



#### 100% Instructor Overlap in First Year Builds Critical Content Familiarity



Source: Advisory Board interviews and analysis.

I-BEST faculty members joke that instructional pairs are like a marriage—two people from different “worlds” within the college come together and must learn to cooperate on tasks they’ve previously done independently. Following this analogy, the I-BEST Facilitator acts as both a “matchmaker” and “marriage counselor” to the faculty pair. After creating the initial pairings, the I-BEST facilitator continues to meet with paired faculty members to address issues that arise during their partnership. The facilitator encourages faculty members to be in the classroom together 100% of the time in their first year of joint teaching to gain respective content familiarity. Grays Harbor faculty believe this overlap is key to designing curriculum that brings both mathematic and technical concepts to life.





### Section 3

# Determining Optimal Student Mathpath

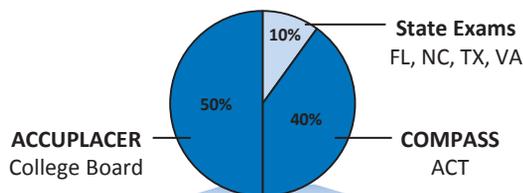
- Prevent Unnecessary Pre-College Placement
- Pinpoint Non-Cognitive Barriers to Attainment

At most institutions, a high-stakes exam testing high school concepts determines whether a student will start in developmental or college courses and have vastly different chances of degree attainment. The College Board's Accuplacer and the ACT's Compass exams are the most widely used placement exams across institutions; these exams rely on a single numerical score to place students into courses. A handful of states have developed more sophisticated placement exams for entering college students, but they represent a very small segment of available assessments.

## Current Entry Assessments Flawed

### *Unnecessary Pre-College Placement Common and Costly*

#### Cut-Score Tests Dominate Placement Landscape



- 2-3 hours to complete
- Evaluates math, reading, and writing levels using high school competencies
- Single numerical score governs placement

#### Hidden High-Stakes

“Students don’t treat placement tests like final exams. They think, ‘I have to take this rinky-dink test on pre-historic content, and I need to be at work in 15 minutes.’ They don’t take it seriously.”

*Developmental Math Faculty Member*

#### Winning on Ease, Not Accuracy

*Cut Score as Sole Indicator Leads to Overmathing*

**Overmathing:** Placement of students who would have earned a B or higher in college math into a developmental course

#### Frequency of Overmathing with Common Assessments



**630,000**

*Students Overmathed Every Year*

**\$600**

*Tuition Wasted On Remediation, Per Student*

Well Placed Overmathed

Source: Clive Belfield and Peter Crosta, “Predicting Success in College: The Importance of Placement Tests and High School Transcripts,” Community College Research Center, Feb. 2012, <http://ccrc.tc.columbia.edu/Publication.asp?UID=1030>; American Association of Community Colleges, “Fast Facts,” accessed Jan. 23, 2013, <http://www.aacc.nche.edu/AboutCC/Pages/fastfacts.aspx>; Advisory Board interviews and analysis.

Data from the Community College Research Center suggests that about one in four developmental students are overmathed—developmental students who would have earned a B or higher had they been placed into college math. This overmathing not only wastes students’ time and money, but also significantly diminishes their chances of degree completion.

Forum research uncovered four best practices to prevent unnecessary pre-college placement: modular placement exams, co-requisite mainstreaming models, math refresher courses, and high school GPA as an alternative placement indicator. Across the next pages we'll cover innovative incarnations of these strategies, shedding light on which strategies are most effective for unique student types.

## Preventing Unnecessary Pre-College Placement

### *Four Proven Strategies to Reduce Costly Overmating*

#### Modular Placement Exams



*Avoid redundant content instruction, limiting remediation to specific deficiencies*

#### Math Refresher Courses



*Structure test prep by sending students to one-week algebra review prior to exam day*

#### Co-Requisite Mainstreaming



*Path upper-level developmental students to college-level math with mandatory supplemental instruction*

#### High School GPA as Alternative Placement Indicator



*Place students based on prior academic performance, not one-time exam score*

Source: Advisory Board interviews and analysis.

Institutions considering redesigning their placement procedures should consider the types of students best served by each practice. While modular placement exams and the use of high school GPA as an alternative placement indicator work well for students at all skill levels, our research shows that co-requisite mainstreaming and math refresher courses should be reserved for upper-level developmental students and students who demonstrate high levels of motivation.

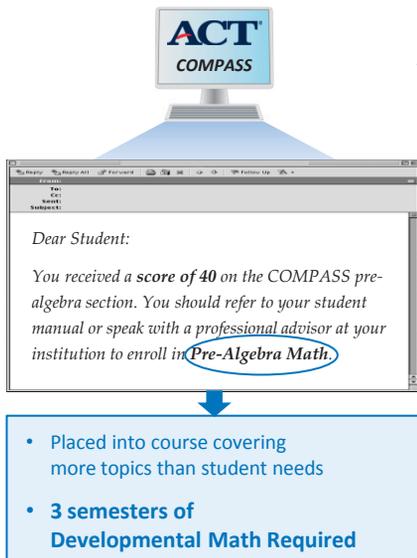
Modular placement exams improve on traditional cut score exams by pinpointing students' specific deficiencies. Institutions with modified math emporiums or modular curriculum can use these placement exams to reduce developmental requirements and prevent overmathing. For example, a student struggling with rational exponents and radicals is required to complete one four-week module, rather than an entire semester course that reviews more topics than the student needs.

## Going Modular

### *Determining Precise Knowledge Gaps Enables Accelerated Remediation*

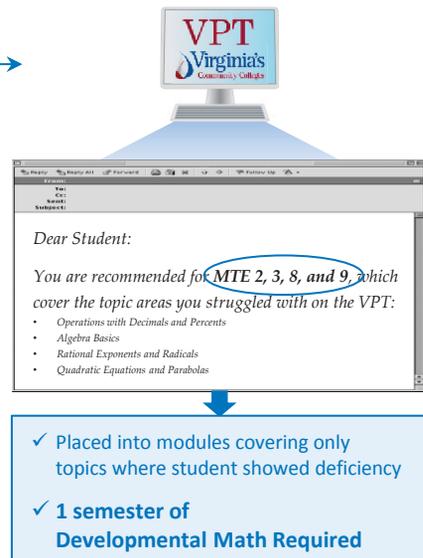
#### Standard Cut Score Diagnoses Generic Need

*Remediation All-Inclusive and Lengthy*



#### Modular Test Diagnoses Specific Deficiencies

*Remediation Limited to Developmental Areas*

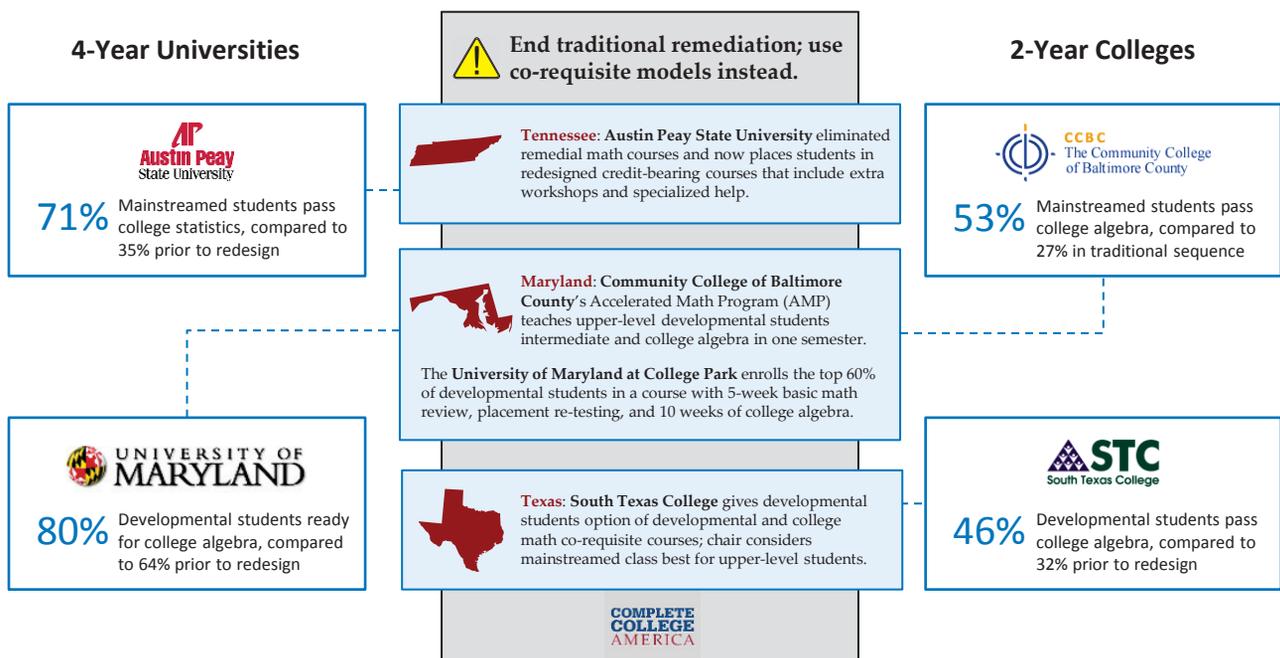


Source: Advisory Board interviews and analysis.

Complete College America is a consortium of state legislators committed to increasing certificate and degree attainment rates across the country. Over the past few years, the organization has brought national attention to the strategy of eliminating front-loaded developmental education in favor of a co-requisite model, otherwise known as mainstreaming. Students who place into developmental education enroll in college coursework, with developmental instructional offered as a supplemental course. A number of four-year universities and two-year colleges have implemented this model and seen a rise in completion rates.

## Mainstreaming in Vogue

### *Policymakers Push for Co-Requisite, Not Frontloaded Remediation*



Source: Complete College America, "Remediation: Higher Education's Bridge to Nowhere," April 2012, <http://www.completecollege.org/docs/CCA-Remediation-final.pdf>; Sandra Kurtinitis and the CCBC Board of Trustees, "Self Study Report," Community College of Baltimore County, March 2012, <http://www.cbcmd.edu/media/accreditation/middlestates/selfstudy2012.pdf>; Advisory Board interviews and analysis.

In spring 2012, South Texas College offered developmental students the opportunity to bypass the traditional developmental sequence and enroll directly in college math. Outcomes data varied across developmental levels; upper-level developmental students succeeded while lower-level students struggled to master college content due to unaddressed knowledge gaps. Faculty devoted a huge amount of time to catch students up, prompting administrators to limit future mainstreamed sections to upper-level developmental students only.

## What the Data Says

### *Big Gains for High Performers, Wrong Answer for Those With Greatest Need*

#### Math Mainstreaming at South Texas College

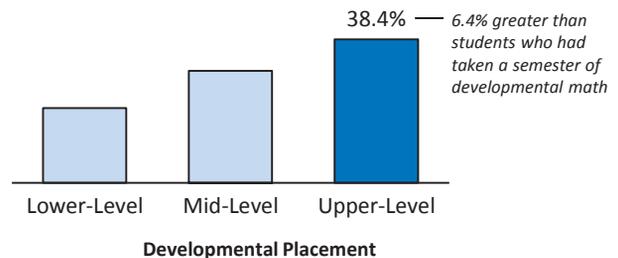


- Spring 2012 pilot placed 146 developmental students directly into 8 sections of college algebra
- 1-hour college algebra class followed by 1-hour developmental class in same classroom 4 days each week
- **Pilot open to all developmental levels, future classes limited to upper-level students**

#### High Placement, High Performance

*Upper-Level Students Outperform Needier Peers*

**Grade 'B' or Better in College Math, Spring 2012**



#### Restrict Mainstreaming to Upper-Level Developmental Students

“Next year we will offer linked courses to the most advanced developmental students, instead of all developmental math students. We found there just wasn’t enough time to give lower-level students enough support. Math is linear; if a student falls behind, it’s very difficult for them to catch up.”

*Aparna Ganguli, Interim Math Department Chair  
South Texas College*

Source: Advisory Board interviews and analysis.

Our interviews with faculty revealed that developmental math students are difficult to mainstream into college courses because math is a linear discipline. Students who struggle with basic concepts risk falling further behind as the class learns advanced concepts that rely on early content. Developmental English and writing students are better-suited for mainstreaming into college courses because knowledge gaps can be swiftly remediated. The Community College of Baltimore County first introduced the mainstreaming model for developmental English students and soon saw a 36% increase in college course completion rates for mainstreamed students.

Math refresher courses have sprung up at more than a handful of colleges around the country to help students prepare for academic placement exams. The courses typically last about a week and are voluntary reviews of the math content that will be tested on the placement exam. Despite the popularity of these courses, Community College Forum research revealed that math refreshers are only effective for a specific student subgroup—populations of highly motivated learners.

## Quadratic Formula Not Top of Mind

### Fayetteville Tech Math Refresher Removes Roadblock to Completion for Special Ops

#### Math Amnesia Universal

“If I walked in today and took a placement exam, I’d probably have to take a remedial class. I’m not implying I don’t know how to do math; my point is that if I was assessed like so many of our students are, I would not perform well either.”

*Community College President*

#### But Refreshers Not for Everyone

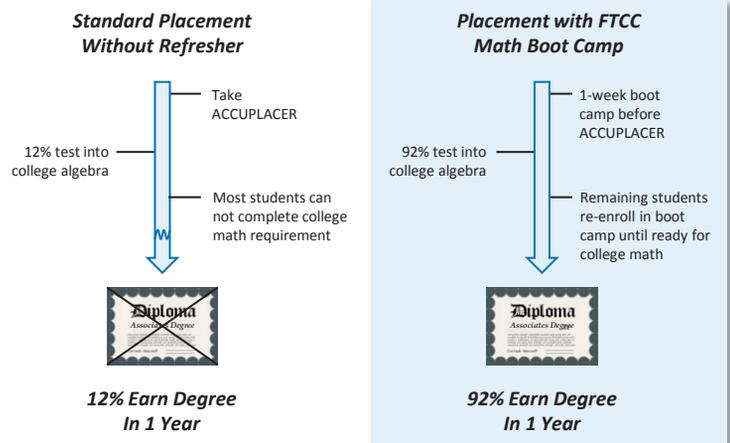
“We were surprised at how few students enrolled in our one-week refresher, and how few completed the coursework. Only the truly motivated were able to benefit without the structure of a full class.”

*Vice President, Student Success*

#### Boot Camps Train Special Ops in Algebra Basics



250 students training to be Special Operations Forces at Fort Bragg, highly motivated, but rusty on math



Source: Advisory Board interviews and analysis.

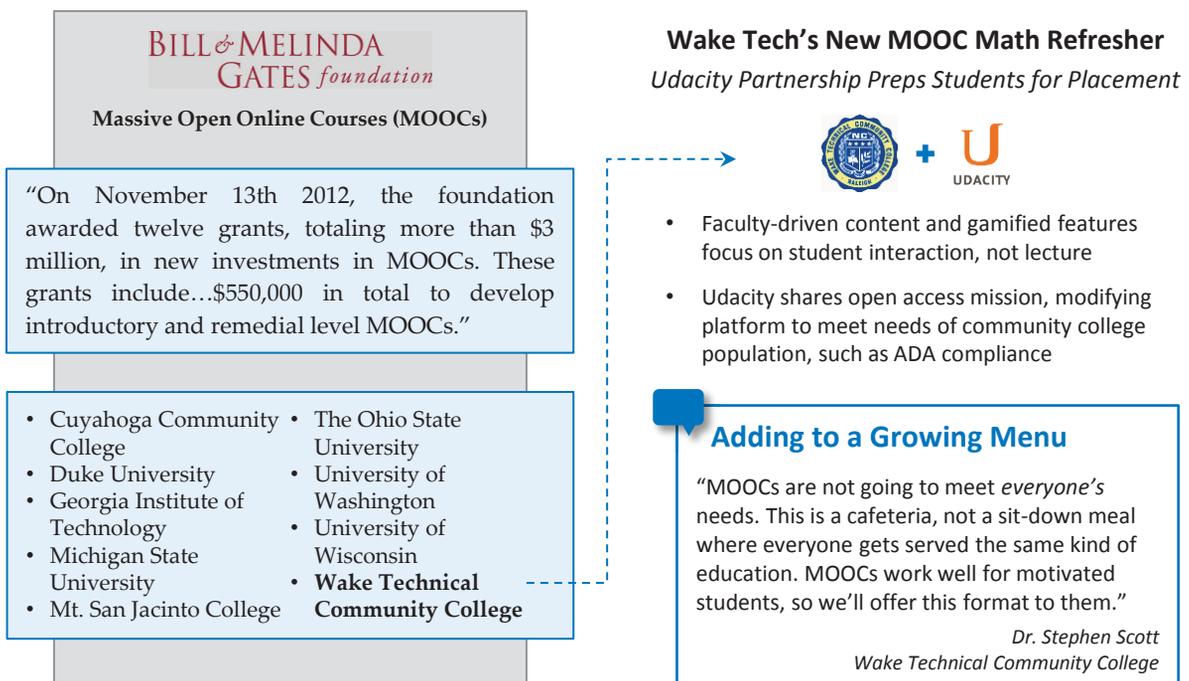
Math refreshers serve highly motivated students best. Success hinges on voluntary enrollment, attendance, and dedication to an intensive multiday math review. Across colleges, veterans, adult learners, and military personnel were the student groups most likely to jump multiple placement levels after attending math refresher courses.

Fayetteville Technical Community College’s math refresher boot camp for Special Ops students from Fort Bragg demonstrates the effectiveness of these courses for highly motivated students. Before implementing the math refresher program, only 12% of Special Ops students placed into college math, virtually erasing their chances of earning an accelerated associates degree in one year. In 2011, the institution began offering a one-week math boot camp for these students to practice before taking the Accuplacer exam. With the refresher, 92% of students tested into college-math, and all 92% went on to earn a degree.

Due to the narrow appeal of math refreshers, we recommend delivering these courses through low-cost modalities, such as emerging massive open online courses, or MOOCs. A 2012 Gates Foundation grant supporting MOOCs for developmental education is expected to herald a new wave of high-quality, freely available math refreshers tailored to meet the needs of community college students.

## Placing a (Small) Bet on Standalone MOOCs

*Our Hypothesis: Only Most Motivated Benefit from New Online Option*



Source: Bill & Melinda Gates Foundation, “Massive Open Online Courses (MOOCs),” accessed Jan. 9, 2013, <http://www.gatesfoundation.org/postsecondaryeducation/Pages/massive-open-online-courses.aspx>; Advisory Board interviews and analysis.

Wake Technical Community College used their Gates Foundation grant to develop a developmental math MOOC refresher in partnership with Udacity. The Introductory Algebra MOOC was launched in May 2013. The course includes gamified features to engage students and modifications to the regular Udacity platform to meet ADA compliance. Administrators at Wake Tech don’t expect MOOC math refreshers to be the right intervention for all students, but want to offer resources for students with strong self-discipline.

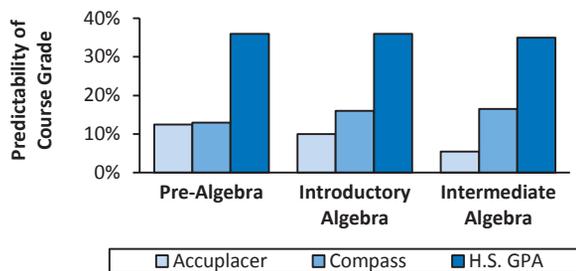
Progressive colleges are seeking methods to identify students' non-academic strengths (like motivation) upon entry. While cut score exams indicate little about a student's non-cognitive characteristics, high school GPA effectively captures these non-academic success factors. A study from the Community College Research Center found that high school GPA was a more predictive indicator of student success than standard placement exams. This measure captures students' motivation to overcome challenges, curiosity, enthusiasm, and self-discipline, all closely related to college success.

## High School GPA Shockingly Predictive

*Measure of Both Academic Aptitude and Non-Cognitive Success Factors*

### HS Performance Best Predictor of Success

*Community College Research Center*



### GPA Measures More Than Academic Aptitude

*Non-Cognitive Indicators Captured by HS Performance*



Motivation to overcome early failures and ongoing challenges



Curiosity about different academic disciplines and topics



Enthusiastic approach to learning, class participation, and knowledge building



Ability to regulate impulses during time intended for learning



### Case in Brief – Long Beach City College

- Promise Pathways program places 1,700 students in English and math courses by senior year grades
- Led to 350% increase in students placing into college math, saving time and tuition
- Students performed on par with peers previously identified as college-ready.

Source: Clive Belfield and Peter Crosta, "Predicting Success in College: The Importance of Placement Tests and High School Transcripts," Community College Research Center, Feb. 2012, <http://ccrc.tc.columbia.edu/Publication.asp?UID=1030>; Paul Bradley, "Making the Cut," Community College Week, Sept. 3, 2012, <http://www.ccweek.com/news/templates/template.aspx?articleid=3216&zoneid=7>; Advisory Board interviews and analysis.

In 2012, as part of the Promise Pathways Initiative, Long Beach City College placed first-time enrollees from the local public school system into English and math courses based on their high school GPAs. Early results data shows that Promise Pathways students are three times as likely to attempt college-level math courses as peers and just as likely to succeed in these courses.

The shift toward using high school grades to place students into college courses relies in large part on collaboration between high schools and community colleges. Long Beach City College asked the local public school district to create and share electronic transcripts for graduating seniors. Representatives from the two institutions also collaborated to ensure curricula from the high schools aligned with college courses; this collaboration is time-intensive but necessary to ensure high school course outcomes meaningfully predict college course performance.

Non-academic factors and their role in student attainment are receiving heightened attention across disciplines. There is a growing consensus that traits like productive persistence, grit, curiosity, optimism, and self-control play a tremendous role in student success.

## “Character” The Unexplained Success Variable

*Non-Academic Factors in Attainment Receive Heightened Cross-Disciplinary Attention*

### You Say Productive Persistence, I Say Character



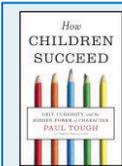
“To help more students successfully complete the Carnegie initiated math pathways, we want them to **persist in their studying and attendance (tenacity) and do so efficiently and effectively (good strategies)**. Productive persistence is core to our work.”

*Carnegie Foundation for the Advancement of Teaching*



“Being mastery-oriented is about having the right mind-set...students who are mastery-oriented think about learning, not proving how smart they are. **When they experience setback, they focus on effort and strategies** instead of worrying they are incompetent.”

*Carol Dweck, Stanford University*



“Economists call these qualities non-cognitive skills. Psychologists call them personality traits. Neuroscientists sometimes use the term executive functions. **The rest of us often sum them up with the word character.**”

*Paul Tough, How Children Succeed*

### Defining Our Terms

*Tenacity*  
*Persistence*  
*Strategic Thinking*

*Mastery-Oriented*  
*Focused Learning*  
*Effortful*

### EAB Definition of Character

Persistence, curiosity, conscientiousness, optimism, and self-control

Source: Carnegie Foundation for the Advancement of Teaching, “Productive Persistence,” accessed Dec. 12, 2012, <http://www.carnegiefoundation.org/productive-persistence>; Education World, “Wire Side Chat: How Can Teachers Develop Students’ Motivation—and Success?” accessed Dec. 12, 2012, [http://www.educationworld.com/a\\_issues/chat/chat010.shtml](http://www.educationworld.com/a_issues/chat/chat010.shtml); Advisory Board interviews and analysis.

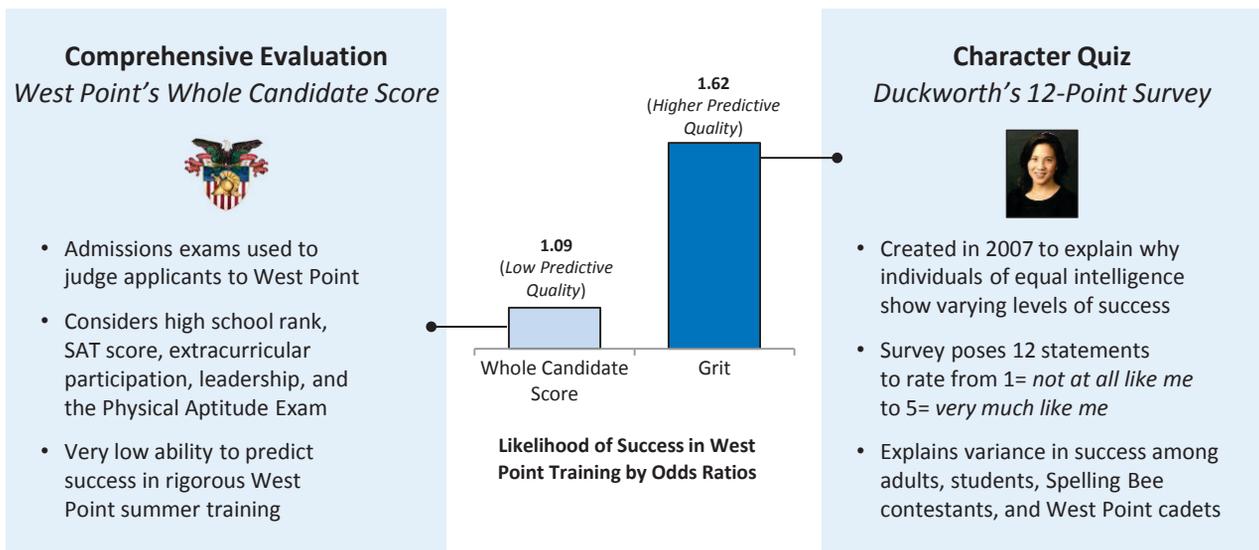
Given the multitude of terms in use, cross-disciplinary dialogue is often impeded by terminology barriers. To further discussion, we use the term “character” to refer to the broad collection of non-academic traits that factor into student success.

Angela Duckworth from the University of Pennsylvania has conducted extensive research on the relationship between grit—a character trait meaning perseverance and passion for long-term goals—and success among students, National Spelling Bee contestants, working adults, and military personnel. Duckworth’s study of military cadets at West Point revealed that a grit survey was more predictive of success in summer training than the military’s own entrance exam, suggesting that character may be more important than academic aptitude in predicting attainment.

## Do You Have GRIT?

### Duckworth’s Character Assessment Highly-Predictive of Student Success

#### Predicting Completion of West Point Training Grittiest Cadets Most Likely to Succeed



Source: Angela Duckworth, Christopher Peterson, Michael Matthews, and Dennis Kelly, "Grit: Perseverance and Passion for Long-Term Goals," *Journal of Personality and Social Psychology*, 2007, <http://www.sas.upenn.edu/~duckwort/images/Grit%20PSP.pdf>; United States Military Academy at West Point, "FAQs: The Admissions Process," accessed Jan. 9, 2013, <http://www.west-point.org/academy/malo-wa/educators/faqs.html>; Advisory Board interviews and analysis.

Readers interested in assessing their own grit levels (or piloting the survey with their students), should complete Duckworth’s short grit survey, available online from the University of Pennsylvania.

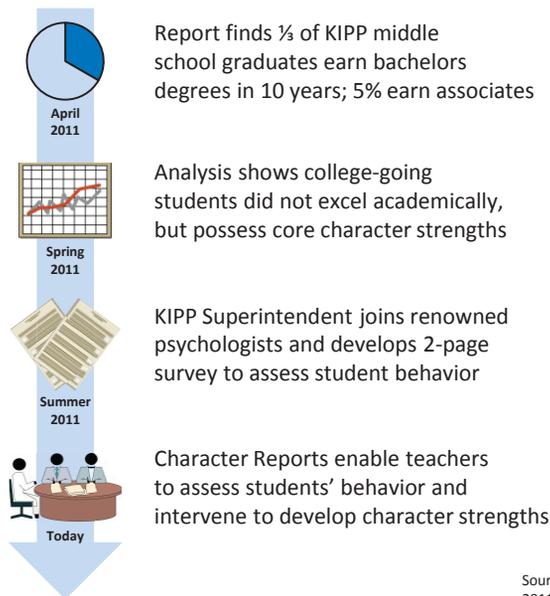
Progressive colleges are not just thinking about measuring students' character and grit—they are seeking methods to teach students how to control and change their own behavior. The KIPP charter school district teaches middle school and high school students character development alongside academic content to improve success rates overall. Faculty at KIPP charter schools in New York City use character report cards to evaluate students and facilitate their character development.

## Teaching Character Alongside Academics

### *KIPP Character Reports Generate Skill Development Plan*

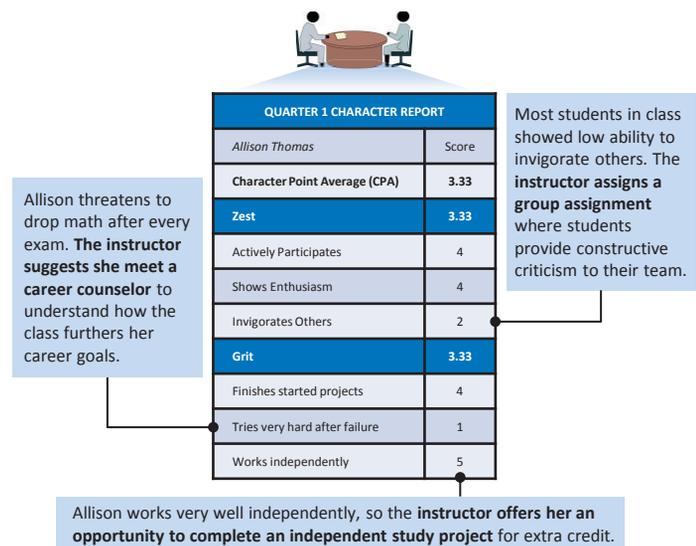
#### Searching For an X-Factor

*Evolution of Character Assessment at KIPP*



#### Facilitating Character Development

*Faculty Interventions with KIPP Character Report Card*



Source: Sarah Sparks, "KIPP Finds One-Third of Its First Students Earned 4-Year Degree," Education Week, April 28, 2011, [http://blogs.edweek.org/edweek/inside-school-research/2011/04/kipp\\_says\\_onethird\\_of\\_its\\_stu.html?qs=KIPP](http://blogs.edweek.org/edweek/inside-school-research/2011/04/kipp_says_onethird_of_its_stu.html?qs=KIPP); Cheryl Williams, "The Science of Good Character," Learning First, Sept. 20, 2011, <http://www.learningfirst.org/science-good-character>; KIPP: NYC, "Character Counts," accessed Jan. 9, 2013, <http://kipnyc.org/about/character-counts/230-kipp-nyc-character-strengths>; Advisory Board interviews and analysis.

In 2011, KIPP published a report that found only one-third of its middle school graduates earned a degree 10 years after graduation. While these results were initially disheartening, a deeper dig into the data found that students who earned degrees were not the ones with the best grades in middle school. These students were notable for possessing high levels of optimism, persistence, and social intelligence. After realizing the importance of these non-academic traits, KIPP focused on developing these skills in the classroom.

Now, KIPP teachers assess students' behavior in the seven core character strengths at the end of each quarter. Scores from every teacher combine to make Character Point Averages ("CPAs"). These CPAs allow for productive conversations between faculty and students about the importance of character strengths and how they can be developed over time.

Character diagnostics are rapidly expanding across higher education, and at Portmont College students are required to demonstrate grit to enroll in an associate degree program. Portmont was founded in 2012 as a partnership between MyCollege Foundation and Mount St. Mary's College in Los Angeles, California. Applicants are allowed to enroll in this program once they've demonstrated grit. Portmont's methods to assess applicants' levels of grit and foster academically successful behavior are detailed below on the right.

## No Character, No Entrance

### *Character as Gatekeeper to Enrollment at Portmont College*

#### Gates' Newest Community College Project

*Adapting Standard Models to Serve Neediest Students*



**Partnership between MyCollege Foundation and Mount St. Mary's College:** Portmont College established in October 2012 to enroll students who demonstrate "grittiness"



**Non-traditional students:** Target low-income, academically underprepared, and working adults likely to struggle in standard programs. Priced at \$5,240 per year for affordability



**Hybrid online and in-person format:** Ideal for selected student population: offers flexible scheduling options and strong personal support network



**Character report dashboards:** Professors coach students through self-paced courses. Faculty dashboards display students' progress in course sequence and non-cognitive skill development

#### Three Steps to Identifying Grittiness and Fostering Successful Behavior

1

##### "Launchpad" Entry Assessment

Free three-week course teaches college success habits and tests non-cognitive skills using analytics platform. Only students with 'character competence' admitted into program

2

##### "Ignition" Orientation

Local cohort of 15 students meets in-person to build on success skills. One-week orientation led by dedicated Success Coach

3

##### "Lift Off and Soar" Success Classes

One-credit courses to develop college success skills. Classes taken alongside degree courses for first two sessions of program

Source: Eric Hoover, "An Enrollment Experiment, Grounded in 'Grit,'" The Chronicle of Higher Education, Oct. 23, 2012, <http://chronicle.com/blogs/headcount/an-enrollment-experiment-grounded-in-grit>; Advisory Board interviews and analysis.

Portmont students learn online and in-person. This allows flexible scheduling but maintains a close-knit cohort of peers and a support network for students. Any student interested in enrolling in a degree program at Portmont first takes a free, three-week "Launchpad" course. The course introduces the college's core ideas, teaches success habits, and teaches students about their own learning styles. Portmont developed an analytics platform to assess students' online course-taking behavior by tracking keystrokes. Officials combine these results with student interviews to predict which students are likely to succeed in the program. At the end of the course, students are rated on a "stoplight" scale—if a student receives a green or yellow signal light, they may enroll.

Upon admission, students complete a one-week orientation program in their local area called "Ignition." Orientation groups are capped at 15 people and convene at least once every eight weeks with their dedicated Success Coach. The coach is responsible for teaching basic academic success skills and behaviors.

Character development continues throughout the academic year. Portmont students take "Lift Off and Soar" success classes to build on their skill development from the orientation session. These one-credit courses are taken in conjunction with two or three other courses pertaining to students' degree focus.

Colleges also use character assessments to guide pathway selection and skill development. Students at Asheville-Buncombe Technical Community College are graded on both academic performance and demonstration of “soft skills,” like professionalism and effort. Soft skills assessments alert instructors of areas where students struggle and may need practice to succeed in the professional world. At Zane State College, advisors use character assessments to guide students to the optimal interventions and program of study.

## Character Assessments Taking Root Across Higher Ed

### *Non-Academic Traits Guide Course Grades and Advising Strategy*

#### Considering Soft Skills for Course Grades

*New Grading Rubric at Asheville-Buncombe Technical CC*



- Officials introduced rubric in December 2012 to assess several soft skills including attendance, timeliness, communication, teamwork, effort, and critical thinking
- Courses that adopt guidelines can factor rating on soft skills rubric into final course grade, up to 10 percent

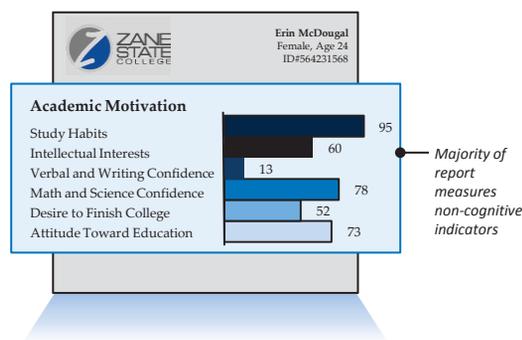
#### Teaching Life Lessons Before It's Too Late

“Students need to know how to be good at holding down a job: coming in on time, being productive, communicating well, all of that. If we don't teach them here, they'll be lost. It's time to get serious about it.”

*Faculty Member*

#### Character Assessments Guide Advising

*College Student Inventory at Zane State College*



- All first-year students take CSI
- Report directs students to campus resources based on levels of coping, motivation, and receptivity to support
- High-risk students directed to meet advisor

Source: Paul Fain, “Grading Personal Responsibility,” Inside Higher Ed, Dec. 13, 2012, <http://www.insidehighered.com/news/2012/12/13/nc-community-college-issue-grades-certificates-soft-skills>; Achieving the Dream, “Zane State College,” accessed Jan. 9, 2013, [http://www.achievingthedream.org/college\\_profile/zane\\_state\\_college](http://www.achievingthedream.org/college_profile/zane_state_college); Advisory Board interviews and analysis.

In December 2012, Asheville-Buncombe Technical Community College announced a new rubric to assess students on eight non-academic characteristics: class attendance, time management, professionalism, communication, quality of work, participation and teamwork, effort, and critical thinking. Faculty have the option to count this soft skills assessment for up to 10% of a student's final course grade. Our interviews with faculty who have incorporated non-academic skill development in their courses revealed that soft skills training directly boosts academic performance. Once students learn to study and take notes, stay motivated through challenges, and work productively with their peers, most perform better overall.

At Zane State College, non-academic character assessments guide advising sessions on campus. All first-year students are directed to take the College Student Inventory (CSI) before the start of classes. The CSI produces two reports, one for advisors and one for the student. The reports rate students on their ability to cope with challenges, stay motivated through challenges, and receive support from others. Depending on the outcomes of the CSI report, students are directed to support resources on campus. Students who are identified as “high-risk” are directed to meet with advisors in-person, and advisors use the CSI reports to guide their recommendations.

Emerging strategies like modular math exams and character assessments allow administrators to form a more precise picture of the individual barriers students face, enabling advisors to guide students to optimal mathpaths. The concept is illustrated below using the three students introduced earlier in this publication.

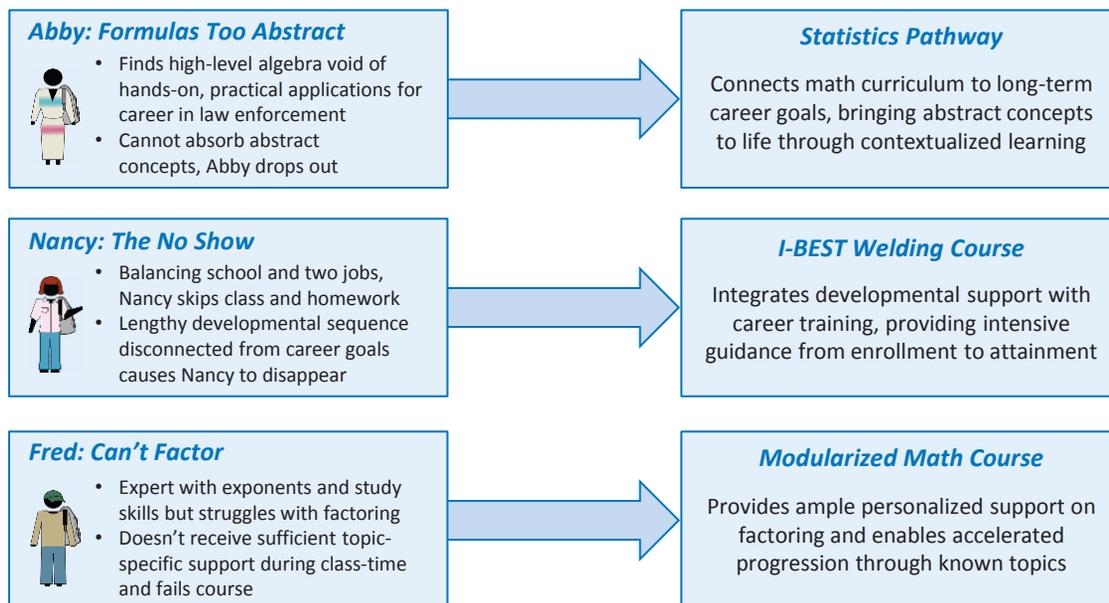
## 360-Degree Assessment Key to Determining Optimal Mathpath

### Student Academic and Non-Cognitive Profiles...

*Former Developmental Math Dropouts*

### ...Guide Selection of Optimal Placement

*Suite of High-Impact Interventions*



Source: Advisory Board interviews and analysis.

The first student is Abby, for whom formulas are too abstract. Abby doesn't understand how lessons on factoring and polynomial equations relate to her dream career in law enforcement. An advisor working with Abby might suggest enrollment in a statistics pathway, where the content was made real and mapped to her career goals.

Nancy the No Show faces many academic and non-academic barriers, needing a course that contextualizes math lessons with technical training. She should enroll in an I-BEST program that furthers her career and offers intensive guidance from enrollment to degree attainment.

Fred, challenged by factoring, needs to enroll in a course that focuses on the topic he struggles with, so he can move on to college math. Any advisor who sees Fred's problem area and recognizes his drive to move on to college algebra would path him to a modularized modified emporium.

A unifying theme throughout this initiative is personalization. As community college student populations become more diverse, it becomes even more important to path students to interventions that effectively prepare them for college success. Our research found that even among high-impact interventions, different strategies are well suited for different student types. Based on over 200 research conversations with innovative colleges across the country, the rubric below summarizes which profiled strategies deliver the greatest return for unique student groups.

## Math Innovation Rubric

*Supporting Campus Strategy, Steering Students to Highest-Impact Pathways*

	Developmental Math Placement 	Academic Concentration 	Motivation Level 	
Highest-Return Strategy for Student Type	<b>Modified Emporium</b>	Medium-High	Declared	Medium-High
	<b>Statistics Pathway</b>	Medium-High	Non-STEM	Medium-High
	<b>Developmental I-BEST</b>	Low-Medium	Applied	Low-High
	<b>MOOC Math Refresher</b>	Medium-High	All	High
	<b>Co-Requisite Mainstreaming</b>	High	All	Medium-High

Source: Advisory Board interviews and analysis.

The rubric is ideal for sparking campus dialogue about where to focus further math redesign efforts. For institutions hoping to boost completion for borderline basic skills-developmental students, I-BEST would be a good investment to consider. Institutions targeting non-STEM student success might invest in statistics-based developmental pathway programs that contextualize abstract math concepts. For institutions that have already invested heavily in math redesign, the rubric can support advisors in connecting students with the resources proven to maximize their likelihood of degree attainment.



You may access the Math Innovation Rubric by referring to the **Implementation Toolkit Resource Center** at [eab.com](http://eab.com).

This research initiative covered a lot of material, from the inner-workings of flipping the classroom to exploring the relevance of algebra and grit in student success. To help members initiate redesign conversations, pilot, short-circuit implementation, and refine strategy, we have created an online developmental math toolkit with additional practices, lessons learned, templates, and resources for leaders across campus. The toolkit is available exclusively to members of the Community College Forum via the Education Advisory Board's website: [eab.com](http://eab.com).

## Reengineering Developmental Math Online Toolkit

*Implementation Guidance and Comprehensive Resource Center for Your Campus*

**On-Demand Best Practices and  
Function-Specific Resources**



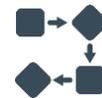
**Administrator's Quick-Guide to  
Top Redesign Questions**



**Interactive Timeline to Optimize  
Math Delivery Redesign**



**Math Innovation Decision  
Flowchart to Maximize ROI**



**Available Exclusively to Members of the Community College Forum at [eab.com](http://eab.com)**





## Appendix

### Reengineering Developmental Math Supplemental Resources

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# Jackson State Community College

## Pacing Calendar

	SATURDAY	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	
Week 1	August 25	August 26	August 27	August 28	August 29	August 30	August 31	
	1 <sup>ST</sup> Module*							
Week 2	September 1	September 2	September 3 Labor Day College Closed	September 4	September 5	September 6	September 7	
Week 3	September 8	September 9	September 10	September 11	September 12	September 13	September 14	
	2 <sup>nd</sup> Module*							
Week 4	September 15	September 16	September 17	September 18	September 19	September 20	September 21	
Week 5	September 22	September 23	September 24	September 25	September 26	September 27	September 28	
	3 <sup>rd</sup> Module*							
Week 6	September 29	September 30	October 1	October 2	October 3	October 4	October 5	
Week 7	October 6	October 7	October 8	October 9	October 10	October 11	October 12	
	4 <sup>th</sup> Module*							
Week 8	October 13	October 14	October 15	October 16	October 17	October 18	October 19	
<b>½ WAY POINT</b>	Mid-Term Break - Classes will not meet. SMART Math Center will be open – Check for Posted Times							
Week 9	October 20	October 21	October 22	October 23	October 24	October 25	October 26	
Week 10	October 27	October 28	October 29	October 30	October 31	November 1	November 2	
	5 <sup>th</sup> Module*							
Week 11	November 3	November 4	November 5	November 6	November 7	November 8	November 9	
Week 12	November 10	November 11	November 12	November 13	November 14	November 15	November 16	
	6 <sup>th</sup> Module*							
Week 13	November 17	November 18	November 19	November 20	November 21	November 22	November 23	
						-Thanksgiving Holiday – College will close at 6:00 p.m. on November 21		
Week 14	November 24	November 25	November 26	November 27	November 28	November 29	November 30	
	7 <sup>th</sup> Module*							
Week 15	December 1	December 2	December 3	December 4	December 5	December 6	December 7	
	Wednesday, December 5 is Final Day of Classes Last opportunity to take Pre-Test or Start New Module					Students may only take Post-Test when their instructor is present.		
Final Exam Week	December 8	December 9	December 10	December 11	December 12	Semester is over!		
	Students may only take Post-Test when their instructor is present. See your instructor for more information.							

# Montgomery College

## Pacing Calendar

### MA094 Setting and Tracking **Student Goals**

Student Name \_\_\_\_\_

Instructor/Class Day/Class Time \_\_\_\_\_

Week	My Starting Point This Week is at ...	My Goal for the End of This Week is ...	Minutes Spent in Flex Lab	Student's Initials	Instructor's Initials
Sep. 5-8					
Sep. 9-15					
Sep. 16-22					
Sep. 23-29					
Sep.30-Oct.6					
Oct. 7-13					
Oct. 14-20					
Oct. 21-27					
Oct.28–Nov.3					
Nov. 4 – 10					
Nov. 11-17					
Nov. 18-24					
Nov.25–Dec.1					
Dec. 2-8					
Dec. 9-15					
Dec.16-21/22					

From your instructor: We will discuss your goals each week during our class meeting.

Watch your MC email between classes.

**CHOOSE SUCCESS – devote enough time to  
Math 094 to allow you to achieve your goals!**

# Northern Virginia Community College

## Pacing Calendar

### MASTER Math Checklist and Deadlines

Tests and quizzes must be 80% or better to pass. If you pass, record the percent and date in the box. Homework requires 90% or higher to move on. Record both date and percent in the box. If you pass a Pre-Test, move on to the next unit Pre-Test. Otherwise, work through Modules A, B & C and take the Post-Test.

Pre-Test	Unit	Module A			Module B			Module C			Post-Test			
		Notes	Hwrk	Quiz	Notes	Hwrk	Quiz	Notes	Hwrk	Quiz				
	0													
	1													
	2													
	3													
	4													
	5													
	6													
	7													
	8													
	9													
		Week	1	2	3	4	5	6	7	8	9	10	11	12
	Class Attendance													
	Lab Attendance													
	# Tests Passed													

My signature confirms that I understand the procedures of this course as outlined on the syllabus: that I need to attend all class sessions and work outside of class an average of 8 hours per week, with a minimum of 2 hours per week in the MASTER Math Lab. I understand and agree to abide by the Academic Honesty policies. I understand that anyone found violating the Academic Honesty policies will receive a U in the course.

Name: \_\_\_\_\_ Signature: \_\_\_\_\_ Date: \_\_\_\_\_

The MINIMUM **pace** is to pass one Test or Quiz each week. You must complete the Units and Modules in order.

Deadline	Unit	Module (Notes Hwrk & Quiz)	Date Completed
Sept 25		A	
Oct 2		B	
Oct 11		C	
Oct 16		Post-Test	
Oct 23		A	
Oct 30		B	
Nov 6		C	
Nov 13		Post-Test	
Nov 20		A	
Nov 30		B	
Dec 7		C	
Dec 14		Post-Test	

Goals	
College Math	Units
MTH 126	0-3
MTH 150, 151, 152, 157	0-5
MTH 115, 181	0-6
MTH 163, 166	0-9

# Cleveland State Community College

## Course Contract

### MATH 0800 Math for Learning Support I Syllabus Agreement

1. I have read the syllabus and I understand the requirements of this course.
2. I understand that in addition to my class attendance, I must complete the assignment required by my instructor before my attendance will be verified.
3. I understand that I must attend the 1 hour class meeting each week. I understand that I am also required to spend a minimum of 2 hours each week working in the Math Lab.
4. I understand that I am expected to complete one module each week. If it takes me more than 3 hours of work to complete a module, then I agree to put in the time that it takes for me to complete that module during that week.
5. I understand that in order to pass the course I must complete each homework set with a score of at least 90%. I understand that I can complete each homework set multiple times and only my best score will count.
6. I understand that in order to pass the course I must pass each module quiz with a score of at least 80% and each unit exam with a score of at least 75%. I understand that I can take each quiz and exam multiple times and only the best score will count.
7. I understand that in order to pass the course my participation grade must be at least 70%. I understand that my participation grade consists of class attendance, lab attendance, filling out module study guides, completing homework, and taking quizzes.
8. I understand that there are 1 – 2 weeks of flexibility built into the course. This means that if I fail a module quiz then I can spend the next week studying the module again and retaking the module quiz. This does not mean that I can miss class several weeks and catch up by completing several modules in one week.
9. I understand that to get credit for class and lab attendance I must be present and working the entire time. This means that if I am tardy or leave class early, I will lose attendance points.
10. I understand that once I successfully complete the course material with an attendance grade of at least 70%, that I am no longer required to attend class. If I finish the course early, I understand that I can start in the next course if I wish to.
11. I agree to bring the following items to the math lab: my student ID card, a pencil, paper, my course folder, and my calculator. I understand that I must have my student identification card with me in order to take module quizzes.
12. I understand that if I am caught cheating, I will receive a 0 on that assignment and be asked to leave the lab immediately. I will be blocked from all course content and will not be allowed to continue working on my course until I have spoken with either my instructor or the department chair. I understand that on the second offense, I will receive an F for the course.
13. I have received a copy of the Math Lab rules and I agree to abide by these rules.

Printed Name \_\_\_\_\_ Signature \_\_\_\_\_

*\*Please fill out the information on the back of the syllabus agreement as well.*

# South Texas College

## Course Contract

**CCA FOCUS Program at South Texas College  
Developmental Mathematics (MATH 0090) and College Algebra (MATH 1414)  
Student Expectation Agreement**

Completion of the FOCUS program includes the course, supplemental components, and an attendance policy.

1. You must complete the application by the end of the first week of class. Failure to do so will result in being dropped from the class. Please log onto the website <http://www.ccafocussouthtexascollege.webs.com> for the link to the application
2. The course includes participation in classroom instruction and program evaluation. You are required to attend the entire semester of instructional activities during the Fall 2012 session. In addition to classroom participation, there are required evaluation materials you must complete:
  - Pre – Tests: ***If you miss any of this you will be dropped from the program.***
    - You must take the mathematics portion of the THEA-IBT within the first two weeks of the class. This exam will be paid for by the CCA Program. This exam is 10% of your MATH 0090 grade.
    - You must complete the LASSI and MARS during the first week of class. The website <http://www.ccafocussouthtexascollege.webs.com> has all of the login information for this assessment.
  - Post – Tests:
    - You must take the mathematics portion of the THEA-IBT within the last two weeks of the class. This exam will be paid for by the CCA Program. This exam is 25% of your MATH 0090 grade.
    - You must complete the LASSI and MARS during the last week of class. The website <http://www.ccafocussouthtexascollege.webs.com> has all of the login information for this assessment.
3. Supplemental Components
  - Attendance and participation in tutoring is required. The tutoring portion is 20% of your MATH0090 grade.
4. Attendance is required for all aspects of the program. This course meets two a day every day of the week. You **must** attend class every day. Any missed classes or tardies need to be discussed with our instructor. You will be administratively dropped from the course and program if any component is missed.

I understand:

- There is a zero tolerance policy for tardies or absences. ***You will be dropped from the program.***
- Failure to comply with these requests will affect my current and renewal status in the program.
- Additional program data may be requested.
- I must return all books, supplies, and materials checked out to me in the condition I received them.
- Tuition and fees for the course will not be paid by the FOCUS program.

\_\_\_\_\_  
Print Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

# Montgomery College

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Emporium 101 Manual

Montgomery College

**MATH 094**

**FACULTY HANDBOOK**

(Last revised August 28, 2012)

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## I. Introduction – Why MA 094?

The primary intended outcome of Montgomery College's Developmental Math Program is to position students to be successful on their first attempt in a college-level math course. Consequently, if a student successfully completes a developmental math course, but subsequently is unable to pass a college level math course on their first attempt, such a student is not deemed a successful outcome to the program. Prior to Fall 2011 the percentage of students who started at an early developmental math level and went on to pass a college level math course on their first attempt was consistently and disappointingly low. By combining the first two developmental courses into one redesigned course called Math Prep (MA 094) we expect a significant improvement in the number and percent of students who emerge from the developmental math program and go on to succeed in a college level math course.

In particular, the new and unique structure of MA 094 addresses the following critical reasons for the unacceptable success rates of the past:

- **Lack of student engagement** – As an open enrollment institution, the diversity of attitude and aptitude is an enormous challenge. Students with low motivation, who see little use for mathematics, are not engaged.
- **Lack of time-on-task** – Students spend too much time listening to and watching others do math. They must begin to take considerably more responsibility for their learning and for their success.
- **Requiring all students to progress at the same pace** – Unlike most other college courses, students have *seen* the material in high school and enter developmental math classes knowing, or believing that they know, many of the topics in the courses. Consequently, they do not pay attention in class and are often *tuned-out* or absent when concepts they have not learned are taught.
- **Inconsistent mastery of basic key math concepts and skills** – Math is hierarchical, yet students move on to new material in a course without first demonstrating a mastery of the essential prerequisite ideas and skills.
- **Inconsistent academic standards and quality of instruction in developmental courses-** Students receive passing grades without having mastered the critical mathematics required for them to be successful in the next course. Some faculty teaching developmental math courses do not have sufficient awareness of the challenges of teaching developmental students and of successful strategies to address these.

Combining the first two levels of developmental math into one course that can be completed **within** two semesters will allow students to move seamlessly, continuously, and at their own pace through the developmental math curriculum, while at the same time, demonstrating mastery of critical math concepts and skills. Furthermore, shifting the instructional model from a traditional lecture/discussion approach to one that is technology based, with faculty working

one-on-one with students in a mentoring/tutoring capacity, will promote the time-on-task and the level of student engagement essential to success in mathematics.

\*\*\*\*\*

## II. Course Structure

**A. Catalog Description:** For students who need review of the fundamentals of arithmetic, a thorough introduction to signed numbers, and a presentation of the basic concepts of algebra. Topics include proportion and percent, polynomials, factoring, inequalities in one variable, linear equations, systems, graphing, integer exponents and quadratic equations. Applications are included throughout the course. This self-paced course has no lecture and incorporates independent computer use; in order to advance through course topics, students must achieve required level of mastery. Students scoring below 46 on the Accuplacer Algebra Placement Test are expected to complete the course in two semesters; students scoring 46 or higher are expected to complete in one semester. *Assessment level: RD 099/103. For computation of tuition, this course is equivalent to three semester hours.*

### B. Key Features of MA 094?

- It is a combination of the Pre-algebra – formerly MA 090/A, now Part I of MA 094 – and Elementary Algebra - formerly MA 091/A/D, now Part II of MA 094.
- The curriculum, homework, testing, and grading is uniform across all sections of MA 094 collegewide.
- Instruction and testing are delivered via Pearson’s MyLabsPlus, a comprehensive, interactive, web-based learning system, with individualized support from faculty.
- Students must set a pace that will allow them to complete their course work.
- Students must achieve 100% on each homework assignment before progressing to the next assignment, and so on until they reach the test on that unit.
- Students must achieve 80% mastery level on all exams before moving on to new material.

### C. Who Should Enroll in MA 094?

- Students who have scored < 62 on Accuplacer Algebra and have not completed a math course with a C
- Students who have passed MA 090/A with a C or better
- Students who were previously enrolled in, but did not pass MA 091D
- Students who were previously enrolled in, but did not pass MA 091/A
- Students who earned a grade of M1, H, or M2 in MA 094 (see section II H on “Special Grading System for MA 094”).
- Students who enrolled in but did not pass MA 094

**Note: Students can attempt MA 094 four times without first seeking Departmental approval.**

**D. Where Do Students Start in the MA 094 Curriculum?**

Faculty will be able to access an up-to-date class list (see Section II I on “Special MA 094 Class Lists”) one week prior to the start of the semester showing where each student should start in the curriculum. For those students who start the course at the beginning of Part II, faculty will need to “dismiss the prerequisite” (See Section V C on “Setting Prerequisites”) for Assignment 9.1 - “Symbols and Sets of Numbers” as soon as possible after the student logs into MyLabsPlus for the first time.

The following table shows the criteria for the different start points in MA 094:

Start Point	Criteria
<b>Beginning of Part I</b>	Scored < 44 on Accuplacer Algebra and has not completed a math course with a C or better
	Previously enrolled in, but did not pass MA 090, MA090A, or MA091D
<b>Beginning of Part II</b>	Has a grade of M1, H, M2, or U in MA 094 more than one year ago
	Scored 45 - 61 on Accuplacer Algebra and has not completed a math course with a C or better
	Passed MA 090 or MA 090A with a C or better
<b>Continuing</b>	Previously enrolled in, but did not pass MA 091 or MA 091A
	U in MA 094 within the last year (prior test scores must be transferred in; see Section V.D)
<b>Continuing in Part I</b>	M1 in MA 094 within the last year (prior test scores must be transferred in; see Section V. D )
<b>Continuing in Part II</b>	M2 or H in MA 094 within the last year (prior test scores must be transferred in; see Section V. D )

**Note: It is important that students understand that regardless of whether a student earns a grade of M1, M2, H, or U for the semester, their tests scores will carry over and they will pick up from where they left off when they enroll in MA 094 the following semester.**

**E. Expected Timeframes for Students to Complete the Course**

The expected timeframe for a student to complete MA 094 is dependent on where they start in the curriculum, as described below

- Students who start at the beginning of Part I are expected to complete the course within 2 semesters (but may take 1 or 3).
- Students who start at the beginning of Part II are expected to complete the course within 1 semester (but may take 2).
- Students who earned an M1, H, or M2 grade and are continuing from where they left off are expected to complete the course within 1 semester (but may take 2)

It is important to note that **because the course is self-paced, students may finish in less than these expected timeframes and should be encouraged to do so.** In fact, students who start at the beginning of Part I have the opportunity to finish the entire curriculum in one semester, thus saving them 3 billing hours and one semester’s time as compared to the developmental program prior to MA 094.

**It is critical that students be discouraged from finishing a semester with a grade of M1 or M2, particularly the latter, since a student with an M2 will have to register and pay for 3 billing hours again for MA 094, despite having to complete at most 20% of the course to earn a passing grade during that next semester.**

#### **F. Course Structure for Students On Each Campus**

In general, all non-distance learning MA 094 students are required to spend a minimum of 225 minutes on their campus each week, either in a classroom setting with their instructor or in the developmental math lab, working on the MA 094 content. Students are also expected to put in additional time working on the material, either on or off campus, in order to be able to complete the course in a timely manner.

The distribution of time spent in the classroom and time spent in the lab varies by campus as described below.

##### Germantown:

A designated 75 minutes in a computer classroom with instructor one day per week  
150 minutes per week in the developmental math lab (at the student's convenience)

##### Rockville:

###### ➤ **M-F Daytime Classes:**

A designated 75 minutes in a computer classroom with instructor one day per week  
A designated 75 minutes in the developmental math lab per week  
75 minutes at the student's convenience in the developmental math lab per week

###### ➤ **Evening Classes (5 PM or later start time):**

A designated 100 minutes twice a week with their instructor, once in a computer classroom and once in the developmental lab.  
25 minutes at the student's convenience in the developmental math lab per week

###### ➤ **Saturday Classes:**

150 minutes in a computer classroom (or the lab) with their instructor on Saturday.  
75 minutes at the student's convenience in the developmental math lab per week.

##### Takoma Park/Silver Spring:

A designated 75 minutes in a computer classroom with instructor one day per week  
150 minutes per week in the developmental math lab (at the student's convenience)

#### **G. Course Structure for Faculty**

- Faculty are credited with 3 ESH (non-lecture) for each assigned section of MA 094. As a consequence of the collective bargaining contract with the College, 3 non-lecture based ESH equates to 200 minutes of instruction, in the (classroom and/or the developmental math lab each week.

- No lecture preparation or grading is required of faculty; the primary responsibilities are one-on-one mentoring, guidance, and instruction.
- Additional ESH may be available to support faculty time in the lab beyond that associated with an assigned section of MA 094. In such cases, one ESH equates to 75 minutes in the lab per week.

#### H. Special Grading System for MA 094

Charts 1 and 2 below establish the criteria for awarding midterm and final grades in MA 094. Note that the letter grades of M1, H, and M2 are unique to MA 094. Students are only eligible for each of these grades once and they depend on whether a student began the current semester in Part I or Part II of the course. Students who began the current semester in Part I are eligible for M1 or H and students who began the semester in Part II are eligible for M2.

Please make these criteria clear to students throughout the semester so that there are no surprises at the end of the semester. Having clear expectations is critical to the success of this course. Furthermore, the deadline for when grades will be calculated must also be clear to students. Grades of incompletes are not allowed without consent of the course coordinator, nor are extensions beyond the last day of the semester.

The H, M1, and M2 grades were established for the following reasons:

##### **“H” grade:**

Students who receive financial aid, are student-athletes, or need to maintain a visa status must demonstrate a minimum course completion percentage each semester. Because a student who starts in Part I of MA 094 is expected to take more than one semester to complete all of MA 094, the “H” grade was created to indicate that at least a one semester’s worth of course material, i.e., at least 6 Tests, has been completed at the mastery level.

**“M1” and “M2” grade:** Because of the mastery learning requirement in MA 094 (students must achieve at least 80% on all tests through Test 9 before being permitted to go on to new material and Test 10 is a comprehensive final requiring a minimum 60% passing score) some students may require longer than one semester to complete one semester’s worth of course material. The M1 and M2 grades indicate that a student has made significant progress at the mastery level during the semester, starting in Parts I or II respectively, since awarding a grade of U to students in such instances would be unduly harsh.

*Note: If a student starts the semester in Part I and completes through Exam 8 in Part II, for financial aid purposes that student must be awarded a grade of H, not M2.*

**Assigning Midterm Grades:** Chart 1 provides guidelines for assigning midterm grades. However, faculty may use their discretion in assigning a midterm grade, in order to send a message to the student that they have not made sufficient progress in the first half of the course if they expect to earn a grade other than a U at the end of the semester.

**Chart 1: Guidelines for Assigning .Midterm Grades**

<b>Students Starting the Semester in Part I of the Course</b>	
Last Test Passed*	Midterm Grade
1B (and <b>passed at least 2 tests</b> in current semester**)	M1
2, 3, 4 (and <b>passed at least 3 tests</b> in current semester**)	H
5,6,7A,7B,8,9 or 10	A, B or C, provided that the student has completed as many tests in the 1 <sup>st</sup> half of the current semester as they need to complete in the 2 <sup>nd</sup> half of the current semester to complete the course.
None of the above	U
<b>Students Starting the Semester in Part II of the Course</b>	
Last Test Passed*	Midterm Grade
7A (and <b>passed at least 2 tests</b> in current semester**)	M2
7B,8,9,10	A, B or C
None of the above	U

\* A passing score for Tests 1 through 9 is 80% or higher; a passing score for Test 10 (Final Exam) is 60% or higher.

\*\* The condition regarding the minimum number of tests passed during the current semester is included to cover continuing students. A continuing student is defined as one who did not start at the beginning of Part I or Part II in the current semester.

**Assigning Final Grades:**

**There is no flexibility when assigning final grades in MA 094;** final grades *must* be assigned according to Chart 2.

**Chart 2: Assigning Final Grades**

<b>Starting the Semester in Part I of the Course</b>	
Last Test Passed*	Grade that must be assigned
4 (and <b>passed at least 5 tests</b> in current semester**)	M1
5,6,7A, 7B,8 or 9 (and <b>passed at least 6 tests</b> in current semester**)	H
10	A, B or C (if required 60% on final is met)
None of the above	U
<b>Starting the Semester in Part II of the Course</b>	
Last Test Passed*	Grade that must be assigned
8,9 (and <b>passed at least 4 tests</b> in current semester**)	M2
10	A, B or C (if required 60% on final is met)
None of the above	U

\* A passing score for Tests 1 through 9 is 80% or higher. Students are not required to achieve an 80% or higher on Test 10 (Final Exam), but are required to score a 60% or higher in order to pass the course. If a student attempts test 10 with a high score of 59% they will earn an H, M2 or U depending on where they began, provided that they have not been awarded that grade in the year prior to the start of the semester.

\*\* The condition regarding the minimum number of tests passed during the current semester is included to cover continuing students. A continuing student is defined as one who did not start at the beginning of Part I or Part II in the current semester.

**Important Notes:**

**1) Regardless of whether a student earns a grade of M1, M2, H, or U for the semester, their tests scores will carry over and they will pick up from where they left off when they enroll in MA 094 the following semester.**

**2) An M1 or M2 grade will automatically turn to a U after one year of MA 094 inactivity.**

The “Grading Graphs” on the nex page provide an additional graphical explanation for assigning final grades in MA 094, *but only for non-continuing students*, that is, students who start at the beginning of Part I or Part II.

**Grading Graphs**  
**MA 094 GRADE OPTIONS FOR STUDENTS WHO START THE SEMESTER IN PART I**

Tests	Part I				Part II							
	1A	1B	2	3	4	5	6	7A	7B	8	9	10 (Final Test)
<b>M1*</b> (COMPLETES TEST 4, BUT NO FURTHER)												
<b>H*</b> (COMPLETES TEST 5)												
<b>H*</b> (CAN EXTEND THROUGH TEST 9 IN PART II)*												
<b>A,B,C</b>												
<b>U</b> (DOES NOT GET THROUGH TEST 4)												

\*Not eligible for an M1 or an H if student has earned an M1 within the year prior to the start of the semester.

**MA 094 GRADE OPTIONS FOR STUDENTS WHO START THE SEMESTER IN PART II OR WITH GRADE OF M1 OR H FROM PRIOR SEMESTER**

Tests	Part I				Part II							
	1A	1B	2	3	4	5	6	7A	7B	8	9	10 (Final Test)
<b>M2*</b> (COMPLETES TEST 8, BUT NO FURTHER)												
<b>A,B,C</b>												
<b>U</b> (DOES NOT GET THROUGH TEST 8)												

\* Not eligible for an M2 if student has earned an M2 within the year prior to the start of the semester.

**Awarding an A, B, or C Grade**

A grade of A, B, or C is awarded when the MA094 Final Test (Test 10) is **completed with a minimum score of 60%**, and the final course average is:

90% – 100%: Grade of A

80% – 89.9%: Grade of B

70% – 79.9%: Grade of C

**A student's final course average is the "overall score" calculated in MyLabsPlus, using the weights adopted by the MA094 course administrator.**

### J. Special MA 094 Class Lists

The following instructions should be used to print out the up-to-date special MA 094 class lists from *Report Central* that will show the Accuplacer scores, most recent math course taken, and the MA 094 starting point for students in your sections. For your continuing students, it will also display the most recent term the student was enrolled in MA094, along with the campus/instructor/day/time of that class. **Because a student's eligibility for an M1, H, or M2 as a midterm or final grade is dependent on whether the student began the semester in Part I or Part II of the course, faculty should retain a printed copy of this class list for reference when awarding grades.**

**Note: Users will have to be working from within the college network or use VPN to connect to the college network from home to access Report Central.**

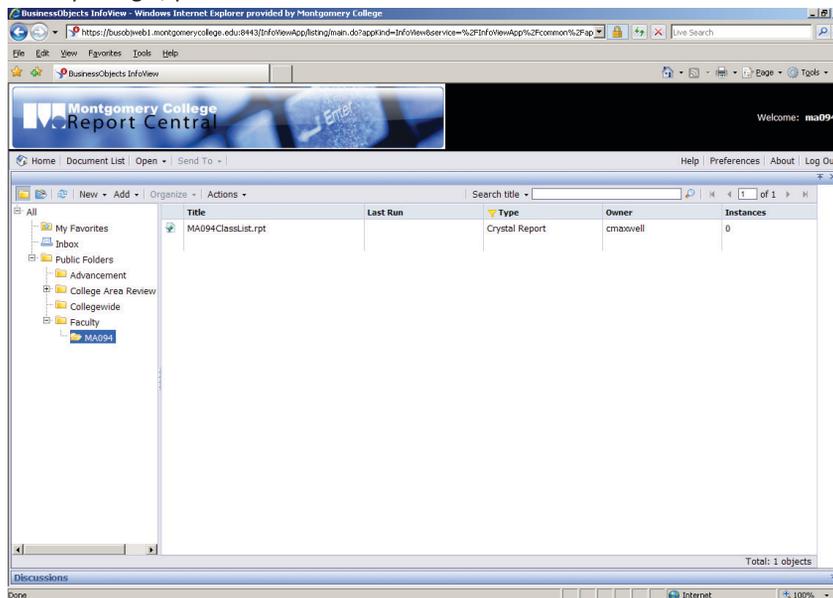
1. Connect to Report Central using the URL:

<https://busobjweb1.montgomerycollege.edu:8443/InfoViewApp/logon.jsp>

(Cut and paste into your browser or put the cursor over the web address, hold down the CTRL key and left click your mouse. It would be helpful to bookmark this address for easy reference later. )

Note: If the user has not previously accessed Report Central from their computer, you will receive a "Security Certificate Warning." The steps necessary to add the certificate to the user's PC are included in the Appendix. You will only need to do this one time.

2. Login to Report Central using the username: ma094 and the current password. (Please contact MyLabsPlus Coordinator for the Math Department on your campus for the password.)
3. When you login, you should see a screen that looks like:



4. Double click on “MA094ClassList.rpt” to launch the special class list report.
5. You will be able to enter three parameters to control the output displayed in the report.

First , enter the desired term code (e.g., For example 201220 indicates Fall 2012).

Second, enter the desired CRN (e.g., 23456). If you do not know the CRN or if you want all of the CRNs taught by an instructor, enter %. The % sign is a wild card.

Third, select the Instructor’s name from the drop down list. You can leave the default value equal to %. If you entered a CRN in the second parameter field and you leave the instructor value set to %, the report will list the students only for the CRN entered, regardless of the instructor. However, if you enter a % for the CRN and a % for the instructor, the report will list all MA094 classes for the selected term.

6. Use the printer icon in the upper left portion of the screen to print the report and click on “Export”. Your report will first be spooled to Acrobat Reader as a pdf document before you can print the report.

Note: If the file is not sent to your printer, it may be due to an Internet Explorer “Download Blocker” on your computer. A message indicating this problem will appear on the bar just above the Report Central logo . Click on the bar, then click “options”, and then click on “download”. You will need to start the print process over again, but the problem should be resolved.

**K. Batch Registration and Late Registrants**

MyLabsPlus has a batch registration capability, which means that up through the first week of classes, students will automatically be uploaded into your MML Gradebook the day after they register for the course. After the first week of classes, you will need to contact your Campus MyLabsPlus Administrator (see Section VI) who has the capability of manually uploading a student into the course.

**L. Tracking Attendance**

Students are expected to spend a minimum of 150 minutes per week in their campus developmental math lab working on MA 094. Faculty will be able to monitor student time in the lab, and are expected to do so, **by requiring students to scan their MC ID card upon arriving and departing from each lab session.** If a student does not do this, there will be no record of his or her time in the lab.

An updated student attendance report will be made available to faculty for their class(es). Please see the MyLabsPlus coordinator on your campus for more information.

\*\*\*\*\*

**III. Role and Expectations of Faculty**

**Arguably, the opportunity for faculty to positively impact student success in developmental math will be greater in the newly redesigned structure of MA 094 than it has been in the traditional, lecture-based classroom.** For while this self-paced, mastery learning approach requires students to take greater responsibility for own learning, it also enables faculty to work one-on-one with their students, not just in an instructional role, but in a mentoring capacity as well.

(It is worth noting that at community colleges where redesign has been implemented, many faculty who were not in favor or were skeptical of the change now say that they would never want to return to the lecture-based instructional model. The redesigned MA 094 course is expected to be no less of a rewarding experience for both student and faculty at Montgomery College as it has been elsewhere.)

**The successful faculty member in this new environment will be one who takes a very proactive approach with the students. It will be a faculty member who is constantly moving about the classroom or the lab ready to assist students at all times, and not one who is seated at a desk waiting for students to approach with questions.**

Certainly, faculty must be ready to answer questions or explain concepts associated with the course when students indicate that assistance is needed. But they must take responsibility for monitoring the progress of students, and intervene where necessary to encourage and prod them to stay schedule so that they complete the curriculum in a timely fashion. After all, working in a self-paced environment requires academic self-discipline, and this is a behavior which many students at this level do not exhibit. An important and effective supplementary

tool available to faculty in this regard is email – **faculty should email students in their section as soon as they fall behind the suggested schedule of target dates for tests or periodically just to comment on their progress in the course.** (Positive reinforcement and encouragement conveyed in such a personal way can be a great motivator.)  
(See section V.H on how to email students in MyLabsPlus.)

Each campus has implemented a program whereby one or more counselors have been designated to provide support for MA094 faculty and students. Faculty are encouraged to join in this effort.

When in the Developmental Math Lab, faculty will often have the dual responsibilities of maintaining the security of the lab and administering tests (See section V. E on “Administering Tests”). It is imperative that ALL faculty enforce the Lab and Testing Rules of their campus. **Students taking tests should be monitored at all times.** Personal and lab instructor passwords should be memorized. **Faculty should not leave the lab instructor account open if the room is not being supervised .** If there are security issues, notify your campus MyLabsPlus administrator (See Section VI) as soon as possible.

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#### IV. Course Materials

##### A. MyLabsPlus Access Codes

- As a consequence of the “batch registration” feature of MyLabsPlus, every student will have free access to the MA 094 course in MyLabsPlus for three weeks, starting one week prior to the start of the semester through the first two weeks of the semester. However, **they must purchase an access code, either online or in the bookstore, by the end of the second week of the semester.**

##### B. Course Workbook – Rockville Campus Only

- Students are required to purchase the customized workbook for the course. They can buy this in the bookstore, either packaged with the Access Code or separately (if they purchase the access code online.)
- Students are required to bring their workbook to each class and each lab session. Their workbook must be complete, contain appropriate answers and should be checked by a faculty member before being permitted to take a test.

##### C. Textbook

- The textbook is *Prealgebra and Introductory Algebra by Martin-Gay*, 3rd edition. An E-version of the entire textbook is embedded in the MyLabsPlus MA 094 course. **Purchase of the print version of the text is optional.**

## D. Student Goals

- Student-teacher interaction is vital! Students need to know that you are paying attention to their progress and that you care about their success.
- On the first day of class, you will give each student in your section a NAME-TENT/GOAL SHEET. The paper can be folded and must be used to display the student's name during class. Assigned instructors and faculty/staff on duty in the lab should address students my name. Inside the fold (on the side opposite the student's name) is a table with one row for each week of the semester. During the assigned class meeting each week, you should have a **brief conversation with each student** during which a goal is set and **written in the table by the student** and signed. The following week, review the goal and see if the student has achieved it. Kudos for those who were successful! For students who did not achieve what **they** set out to do, try to assess why. Did the student complete the required time in the lab? Did the student complete the expected additional time beyond the required lab time? Is the student confused by a math concept? Frustrated? Are there non-academic issues? Recommend resources: your own office hours, a counselor, more realistic goals. Be positive. Be firm. Remind the student that one of the goals of MA094 is to help them take responsibility for learning, for their lives, and to complete the course.
- This is valuable time spent - math is not the only reason we are there!

\*\*\*\*\*

## V. Using MyLabsPlus

### A. Logging In:

#### 1. In Your Class:

- Go to [www.montgomerycollege.mylabsplus.com](http://www.montgomerycollege.mylabsplus.com)
- Your account & login have been automatically created for you:
  - Login: first initial of your name, followed by your last name.
  - Password: Currently the same as your login. Please use the "My Profile" function at the top right of the screen to immediately change your password after your first successful login

#### 2. In the Lab:

- Go to [www.montgomerycollege.mylabsplus.com](http://www.montgomerycollege.mylabsplus.com)
- Log in using the generic lab instructor login name and password. (These can be obtained from your Campus MyLabsPlus Administrator.)

## B. Accessing Your Gradebook

- Click on MML Instructor Tools on left
- Click on MML Gradebook from the list of MyMathLab Instructor Tools at the center of the page.
- Select appropriate course section from drop down menu on top left

## C. Placing Students at the Correct Starting Point -Setting Prerequisites

You will have access to a special class list (see Section II I on “Special MA 094 Class Lists”) which shows where each student should start in MA 094. Note that one week prior to the start of classes, students can access their course. Contact the MyLabsPlus administrator on your campus for details.

Only after a student logs into MyLabPlus for the first time, will you be able to set the appropriate prerequisite that will place that student at the correct starting point in the course. You are encouraged to do this for as many of your students as you can prior to the start of classes, in order to minimize the time you spend on this during the first scheduled class.

- For students starting at the beginning of Part I, no action is required. Students can begin working immediately.
- For students starting at the beginning of Part II, however, you must “Dismiss the Prerequisite” on the first assignment of Part II (Section 9.1 media assignment following Test 5) in order for students to begin working from that point in the course. **Please make clear to the student that they will start in Section 9.1 and proceed from there.**
  - Go to the Gradebook
  - Select the student’s name from the roster
  - Scroll down until you see “Test 5” (this is the end of Part I of the course. Assignment 9.1, “Symbols and Sets of Numbers” is the beginning of Part II
  - Select “Dismiss Prereq” on the drop down menu next to “9.1, Symbols and Sets of Numbers”, and click “Go”
  - Scroll to “9.1, Symbols and Sets of Numbers”. There should no longer be a green prerequisite flag next to this, which means that the student can begin working in Part II.

Note: You will need to repeat these steps for all students who should start at the beginning of Part II, **but only once at the start of the semester.**

#### D. Transferring Test Scores From a Prior Semester

To transfer test scores from a continuing student's most recent MA094 class to the current class follow the steps below. *Note that this process cannot be activated until the student has logged into the current course.*

Step	Objective	Procedure
1.	Determine student's previous class	<ul style="list-style-type: none"> <li>• Each student's previous class will be listed in the Special Class List, accessed on campus through Report Central by the method described in II. J. of this handbook.</li> <li>• There may be a 24-hour delay between when a student registers for the course in Banner and his/her name to appear on your Special Class List.</li> <li>• See your campus MLP administrator if you need assistance.</li> </ul>
2.	Locate the percent score for EACH Test passed by this student.	<ul style="list-style-type: none"> <li>• Login to the Lab account of the campus where your student took the previous course (GTLab, RVLab, TPSSLab) .</li> <li>• Click "Course Listing".</li> <li>• Click on your student's previous course, from within the appropriate semester.</li> <li>• Click on "MML Instructor Tools" in the left margin.</li> <li>• Click "MML Gradebook" and then click on your student's name.</li> <li>• Pick "Tests" from the dropdown near the top. (This will reduce the number of rows to search.)</li> <li>• Find the student's % "Score" for the HIGHEST ATTEMPT of each test. You should write this down this percent, for each test that met the 80% minimum.</li> <li>• Repeat Steps 2 for each Continuing MA094 Student.</li> <li>• Logout.</li> </ul>
3.	Enter Grades into current semester.	<ul style="list-style-type: none"> <li>• Login to your MLP instructor account.</li> <li>• Select your current course from the Course List</li> <li>• Click "MML Instructor Tools" in the left margin, then ""MML Gradebook".</li> <li>• Click on the student's name.</li> <li>• Pick "Tests" from the dropdown near the top.</li> <li>• Select "Submit Score" from the "Choose" dropdown box in the Actions column for each Test which your student earned at least 80%.</li> <li>• Compute the appropriate "Points Correct" for this student's test and enter it in that box.</li> <li>• Repeat Steps 3 for each Continuing MA094 Student.</li> </ul>

## E. Administering Tests

Students should be encouraged to take tests during their regularly scheduled class period, but may also take tests in the developmental math lab (on their campus only). Note, these are the only two locations where students may take tests. They cannot take tests off-campus; taking a test requires the permission of an instructor and must be proctored.

### 1. Requirements That Must Be Met In Order to Take a Test

- Student must complete all homework sections, including the review before the test, with 100%. If the student is retaking a test, they must have also completed the Test Corrections assignment from the previous attempt, also with 100%.
- Student is required to present a picture ID, a personal notebook for homework and notes and/or completed workbook depending on the policy of your campus.
- Students may not receive help during testing and may only use calculators on Tests 5-10. Sanctions given in response to violations will be governed by the College Student Code of Conduct.

### 2. Providing Access to a Test

When a student has completed all the prerequisite assignments, so that the green “prerequisite flag” no longer appears next to the appropriate test, the student will request that they be allowed to take the test.

In order to eliminate the need for passwords, the “due date” for tests is originally set for the first day of classes. Consequently, all tests are labeled “past due”. Students cannot access a test until a faculty member or lab coordinator changes or deletes this date.

#### a. Allowing a Student’s First Attempt at a Test:

- Log into MyLabsPlus at [www.montgomerycollege.mylabsplus.com](http://www.montgomerycollege.mylabsplus.com) on the instructor computer (not the one that the student is using) **with the generic Lab Instructor login and password** (your Campus MyLabsPlus Administrator will provide these). **Do not use the login and password for your own class.**  
(Note: You may not need to do this, as the first person in the lab that day will have likely already logged in this way.)
- Select the appropriate term; e.g. “Fall 2011 (8/29/11- 12/18/11)”  
Note: Saturday classes are listed as a separate term; e.g. “Fall 2011Saturday Term”
- Select the appropriate course. **Note: Each course starts with an 11 digit number; the last 5 digits are the CRN.**
- Go to the Gradebook and select the student.
- Scroll to the appropriate test and select “Settings Per Student” from the drop down menu. Click “Go”. A “Settings Per Student” window will open.
- Select “Use Individual Student Settings” (may already be checked)
- Highlight the due date and hit either the “delete” or “backspace” key on the keyboard to delete the due date.
- Click on “OK”. The student can now begin the test.

### b. Allowing a Student to Retake a Test:

Students are allowed to take a test as many times as necessary in order to achieve the 80% score necessary to go on to new material. There should be no exceptions to this rule. If a student does not achieve at least 80%, a Test Corrections assignment is generated in MyLabsPlus which is based on the test problems missed by the student. Students must complete this assignment with a 100% prior to be allowed to retake a test. (Note: occasionally a student will complete the Test Corrections, but neglect to hit "Submit" when they're done.) It is a good idea to also refer students to other resources to help ensure that they master the material before attempting the test again.

- Log into MyLabsPlus at [www.montgomerycollege.mylabsplus.com](http://www.montgomerycollege.mylabsplus.com) on the instructor computer (not the one that the student is using) **with the generic Lab Instructor login and password** (your Campus MyLabsPlus Administrator will provide these). **Do not use the login and password for your own class.**  
(Note: You may not need to do this, as the first person in the lab that day will have likely already logged in this way.)
- Select the appropriate term; e.g. "Fall 2011 (8/29/11- 12/18/11)"  
Note: Saturday classes are listed as a separate term; e.g. "Fall 2011Saturday Term"
- Select the appropriate course. **Note: Each course starts with an 11 digit number; the last 5 digits are the CRN.** (The first six digits are the fiscal year, followed by the semester code – "20" for fall; "30" for spring; "40" for summer I; "10" for summer II.)
- Go to the Gradebook and select the student.
- Scroll to the appropriate test and verify that the Test Corrections assignment has been completed with a 100%.
- Select "Delete" from the drop down menu; click "Go." **(This is important to do, so that a new Corrections Assignment can be generated based on the next test attempt.)**
- Scroll to the appropriate test and select "Setting Per Student" on the drop down menu. Click "Go".
- Add "1" to the number in the "Limit number of attempts to" field to allow student to retake the test again. Click "OK". The student can now begin the test retake.

### **F. Power or Internet Failure**

If a power or internet failure should occur while a student is taking a test, all their work to that point will automatically be saved. When service is restored, anyone who was in the middle of a test will see the notation "Access Needed" in red next to the test on which they were working.

- Select "Enable Access" on the drop down menu next to the appropriate test and click "Go". The student will be able to pick up from where they left off.

### **G. Correcting a Test Score**

**This procedure should be used very, very sparingly and with great caution.** It is intended only in an instance where student has the correct answer on paper, but has mistyped it in MyLabsPlus. Be certain that this really the case, before making a test score correction. Note, for example, that incorrect notation, e.g., writing an ordered pair without the parentheses, does

not qualify for a test score correction. If student(s) become aware that you are easily amenable to making a test score correction, it becomes a very slippery slope.

- Go to the Gradebook and select the student.
- Scroll to the appropriate test and select “Review” to view both the student responses and the correct responses on test.
- Navigate to the problem in question. The correct answer shows in the grey box. Scroll the mouse over the grey box to see the student’s response.
- If you think the mistake is worthy of a correction, change the number in the grade field at the bottom of the page, in order to mark the student correct on that question.
- Click on “Submit Grade”. The test score at the top right will change.
- Use the “Comment” button on the right to briefly explain why you changed the grade.
- Click on “Close”. You will now see an asterisk next to the test grade, indicating that it has been manually changed.

#### **H. Emailing Students**

For many students, success in MA 094 will be very much dependent on how motivating and encouraging their instructor is, and the degree to which the instructor takes responsibility for keeping them on track to complete the course in a timely manner. Emailing your students through MyLabsPlus is an essential and effective tool for achieving that goal.

- Go to the Gradebook
- Click on the green arrow next to “More Gradebook Tools”.
- Select “Search/Email” by criteria. This will allow you the option of emailing students based on three criteria:
  - By Assignment Performance
  - By Work Activity  
(For students who haven’t worked in MyLabsPlus in a specified number of days, specify a number of days and a list of students will appear who have not worked in MyLabsPlus in that timeframe. You can send an email to all of them at once.)
  - By Name

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#### **VI. Contact Persons for Issues or Problems**

For problems that you cannot resolve on your own, please contact your MyLabsPlus Campus Administrator. For Fall 2011, these individuals are:

- John Hamman or Bill Witte, Germantown
- Nancy Shaw or Stephanie Pepin, Rockville
- Nancy Lawrence Hill, Takoma Park/Silver Spring

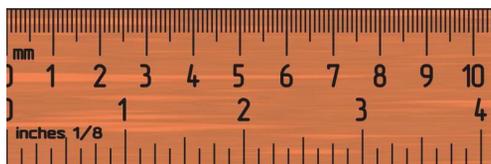
# Montgomery College

## Sample Lecture Scripts

### MA094 face2face class meeting – Week of September 19 – 25, 2012

Prior to having individual goal-setting meetings with each student, the first several minutes should engage the entire class. Here are a few suggestions:

1. **Intro** – Good morning/afternoon! *Has anyone passed a test already?* (Kudos – by name – to those who have. Ask how many think they can pass one prior to the next face2face class meeting.) *Does everyone have 2 notebooks?*
2. **Motivation** – *MA094 is set up so that you can take responsibility for your progress. We all learn and remember by doing – by practicing. Watching someone else do something doesn't make you good at it. MA094 was designed so that you are doing math – and learning. The more you do, the faster and better you will master the concepts.*
3. **Study skill** – *It's the third week of class. At the end of this week, 3 out of 15 weeks in the semester will be over. What fraction of the semester will be over? What percent of the semester is that? Have you completed 20% of your goal for the semester? Do you have time schedule, during the week, in addition to the required lab time, when you work on math? Make and stick to scheduled study times. Make sure you don't have distractions. The ability to concentrate really has an impact on what you remember. Review concepts out loud so that you see it as you read it and hear it. Ask a couple of students – by name - what helps them learn math.*
4. **Test taking tip** – *Those of you who have taken a test - - what are some tips you can share for doing well?*  
Add to the list if you started one last week.  
*Read the problem carefully and copy it carefully. You don't get any credit for working the wrong problem correctly. Sorry. Then start with the first step. Don't worry about the answer. Think and work carefully through each step and the answer will take care of itself.*
5. **Who uses this stuff, anyway?** – *Quantities get measured in different units. Sometimes you need to convert a number that was measured in one unit to find the equivalent measure in another unit. In the US, we use English units like inches, feet, yards, and miles. Most of the rest of the world uses the metric system because it's so easy. Unit conversions will come up in your science classes. For example, 1 inch = 2.54 cm. We call that a conversion factor. How many centimeters are in 2 inches? 10 inches? How can we figure out how many inches are equivalent to 1 cm? Look at the image. Is 1 cm more or less than 1 inch? Can we figure out how many inches are equal to 15 cm?*



**MA094 face2face class meeting – Week of September 26 – Oct. 2, 2012**

**Prior to having individual goal-setting meetings with each student, the first several minutes should engage the entire class. Here are a few suggestions:**

Ideas from your colleagues are included, below.

1. **Intro** – Good morning/afternoon! *Raise your hand if you passed a test since the last class?* (Kudos – by name – to those who have.) *How many notebooks do you have? \_\_\_ Why two?* (Please remind students and stress that we are trying to help them develop the habits of good students - - at no extra charge. ;-)  
*If you haven't already introduced yourself to the people sitting next to you, please do – now.*
2. **Motivation** – *As you are working on math this week, think about the problem solving strategies that you are developing and using. All of you won't use all of the math that you learn, but all of you will have to solve problems. That is a skill employers pay for. When you begin a new problem, don't worry about what the answer is. First – think about what to do first. How do you decide that to do first?* (Use the example below or make up a problem and get a student to explain the first step and how he/she knows what to do first.)
3. **Study skill** – *There are 168 hours in a week. Every week. If you haven't mapped out and planned how you will spend every one of those hours – get busy! In your notebook, have a weekly plan and STICK TO IT. Plan for the time you will be in the lab – and be there. See that person sitting next to you? Make a date. Meet in the lab and hold each other to it. Have a goal for what you will accomplish. One section? Two? Three? And reward yourself if you achieve your goal. Later in the day or evening, review the notes you took and rework a couple of problems from the other notebook – relaxed.*
4. **Test taking tip** – *Before attempting a test, give yourself a practice test. If you miss a problem, go over it with the lab instructor. You do the talking. Make sure that you understand and can explain the concept.*
5. **Who uses this stuff, anyway?** –  
(You might ask if anyone in the class wants to be a nurse. This is a typical nursing math problem. Remember, we're trying to illustrate ways that students really will use math, as well as some interesting bits, along the way.) *If the neonatologist orders 25 mg per kg of Cefotaxime (an antibiotic) for a newborn that weighs 8.2 pounds, how many mg of Cefotaxime should you administer?*  
What do you need to know to figure this out? Get students to think through the process.

# Sinclair Community College

Student Journalistic Magazine

## THE DEVELOPMENTAL EDUCATION **INITIATIVE**



# MATH MODULES PILOT

by Talya Flowers, JonVelle McCray

**M**ath phobia is a common issue among some Sinclair Community College students, causing many students to fear and even avoid math classes. Some students have been out of school for a while and their math skills are rusty; others never fully understood the basic math concepts. The goal of the Math Modules initiative is to help students overcome those obstacles in order to succeed in math.

Math Modules is the name of the Accelerated 297 course for math. Initiated in the fall of 2010, it targets students who don't test into the

regular college math courses, yet test at the high level for Developmental (DEV) 085 or test directly into DEV 108. The course focuses on developing basic arithmetic through introductory algebra skills using modules on the computer in a specialized math course consisting of various modules that incorporate the college's Developmental sections 085 and 108. Valerie Cope, an instructor in the Math Modules initiative, says a major advantage of the course is that students are able to work at their own pace.

"This class is based on

breaking math down into modules," Mrs. Cope says. "The beauty of the class is that students don't need to wait for the class [other students] to catch up with them. Or if they are struggling with something, they can spend more time on it than a normal class will allot."

The course has practice assignments imbedded within the software so that students who need reinforcement can repeat the assignments several times. Tutors are available before, during, and after class time to provide one-on-one help to students. The school is also considering linking tutorial videos to the software to personally address the needs of those who struggle in certain areas.

"There is no pressure of feeling like you have to learn the material right here and right now," Mrs. Cope says.

The computer-based modules allow students the flexibility of completing math assignments and quizzes online, similar to Distance Learning. However, Mrs. Cope says that Distance Learning is different, because

**Valerie Cope assists student Amber Wills in Sinclair's Math Lab. The Math Lab is open to all students who need help.**



it lacks the face-to-face personalized instruction those students receive from professional and student tutors in the Math Modules class.

In addition to being able to work at their own pace, students can test out of modules and advance more quickly. Motivated students can actually cover both of the DEV courses in one term, allowing them to start the college-level math courses sooner. Another advantage is that DEV 085 and 108 books and codes are combined to minimize the amount of money students spend on class materials.

Though the program is still

in developmental stages, the results from the pilot are promising. Four out of 82 students from the Fall Quarter sessions were able to complete two courses in one quarter, saving time and money on tuition. Of the 82 students who participated in the fall pilot, 58.53 percent passed with an A, B, or C as compared to a 50.4 percent success rate in the conventional sections of DEV Math 085. During the Winter Quarter, 44 out of 46 students who took the comprehensive final examination for DEV 085 Math Modules passed.

“The ultimate goal from my perspective is to provide students with everything that they would get out of a



Math Lab tutor Stacey Joseph aids a student in the Sinclair Math Modules Lab.

traditional classroom. I want students to come in and say, ‘there is really everything here for me,’” Mrs. Cope says.

**“The beauty of the class is that students don’t need to wait for the class to catch up with them.”**

—Valerie Cope

**58.5%**  
Mathematics Module Pilot Course

**50.4%**  
Standard Dev. Math Course

Initial Math Module Pilot Success Rates for Fall 2010

## GREETINGS



I am pleased to share with you the exciting work we have done as a result of the Developmental Education Initiative. As you browse through these pages, written, designed, and edited by Sinclair journalism students, you will see several ways that Sinclair is helping students progress more quickly through their foundational courses, in order to be successful.

The college is committed to helping more people graduate with a degree or certificate. One of the first opportunities a student has to improve their chances of long-term success is to build solid skills in reading, writing, and mathematics. Whether you have been a strong student in the past and simply need a quick brush-up, or you have struggled with these subjects your whole life, Sinclair wants to help you be successful.

There are four major initiatives that have been funded by the Developmental Education Initiative:

- Math Modules
- Accelerated English
- Boot Camps
- Early Support

Once you take the placement exam, talk to your advisor about which of these programs is right for you!

Best regards,

**Kathleen Cleary**

Associate Provost for Student Success

**This magazine is a product of a Special Topics Journalism class at Sinclair Community College, which included Journalism and Visual Communication students. It was produced by the following students:**

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## THE DEVELOPMENTAL EDUCATION INITIATIVE ACCELERATING TO SUCCEED

by Talya Flowers, Steven Schwerin, JonVelle McCray

**N**o one goes to college with the goal of spending his or her first year — and possibly thousands of dollars — on developmental classes before getting into college-level courses. Yet, this is what happens to some students. Foundational courses are meant to develop skills for collegiate success, but the faculty are identifying alternatives to the traditional path through Academic Foundations, also known as Developmental Education on many campuses.

“So many of our students get stuck in developmental courses and never make it to graduation,” says Kathleen Cleary, the Associate Provost for Student Success. The Developmental Education Initiative is a national effort to help students overcome these barriers and advance toward completing their educational goals.

For students whose Accuplacer scores place them into pre-college courses, the initiative offers alternatives to traditional instruction.

There are four major initiatives that have been funded by the Developmental Education Initiative:

**Math Modules** allow students to work at their own pace, while still adhering to deadlines, so they can stay on track to succeed. This class is ideal for students who get frustrated by sitting through lecture-based classes that cover material they already know, when they need more help with the material they struggle with. This is a great choice for students who have gaps to fill in basic arithmetic or introductory algebra. Instructors and tutors are in the room to help, allowing students to get a head start or even finish a second course in one term.

**Accelerated English** allows students who place just below college-level writing on the placement exam the opportunity for an intensive review of basic writing skills that is provided along side of the college-level writing class.

**Boot Camps** are intensive, one-week courses that are perfect for those students wanting a quick brush up of skills they once had but have forgotten.

**Early Support** in the Academic Resource Center provides wrap-around support to current high school students to enable them to work toward

college readiness. Partnered with various high schools, the Academic Resource Center assists students in preparing for college level courses before they arrive at the college, therefore reducing the need for developmental courses.

“These alternatives help students complete their developmental classes quickly and graduate sooner. It is all about helping students build the skills they need to be successful as quickly as possible,” Dr. Cleary says.

The Developmental Education Initiative is made possible by the Bill and Melinda Gates Foundation. According to the Foundation website, the Foundation has awarded \$16.5 million in grants to 15 community colleges with the goal of dramatically increasing graduation rates.

“We know that to increase our graduation rates, one of the first things that we need to do is increase success in developmental education,” Dr. Cleary says. “We want to boost students to get them to college level but do it in a way that is most supportive of their long term success.”

“It is all about helping students build the skills they need to be successful as quickly as possible.”

—Dr. Kathleen Cleary

## DEFEATING MATH PHOBIA

by Talya Flowers, JonVelle McCray

**A**udra Mrenak, 20, is not your typical Sinclair Community College student. She was the first out of the initial group of students in the Math Modules pilot to successfully complete both Developmental (DEV) Math courses, 085 and 108, in the same quarter. The following quarter, she began her traditional college algebra courses.

Audra says she's never been good at math. By her own admittance, she is far more comfortable with words than numbers.

"I was never good in math when I was in school," Audra says. "I was intimidated by math before taking the course. But now I enjoy the different aspects of it and the different learning styles involved with the course."

Accelerated Math 297 helped change her perception of math.

**“I was intimidated by math before taking the course.”**  
— Audra Mrenak

It is a course that allows students the opportunity to complete DEV 085 and DEV 108 at their own pace and acquire the necessary math skills to advance into college-level math.

"They sent me an email telling me that I qualified [for the Accelerated Math 297 course]



because my Accuplacer test scores were between DEV 085 and 108," Audra explains.

She admits that when she stepped into the class the first day, she was hesitant because she didn't know what she was getting herself into. But now, she is proud of herself because she stayed motivated and completed the course. She credits her success to the small class size, one-on-one instruction, and being able to work at her own pace.

"In high school, we had to make sure that no student was left behind in our classes," she says. "But with this class you were on your own and that was really nice. If you have the ambition, you could complete both courses in the given time frame."

After successfully completing the course, Audra was approached by Valerie Cope, an instructor for the course, who asked her to become a student tutor. She readily took the student tutor position and was inspired to continue helping others face their math demons.

"It is a good feeling to know that you can help other students out," Audra says.

She says she would definitely recommend the course because of the self-confidence she gained and the respect she received from the instructors.

"It is a good feeling to know that others are encouraging you," Audra says. "You know that you are not alone in this process. I enjoyed every minute — it was all worth it."

## MATH IN THE FAST LANE

by Talya Flowers, Steven Schwerin

Christina Wunder, 28, had a plan. She would take her classes at Sinclair Community College and complete her associate degree. Next, she would obtain her bachelor's and master's degrees at Wright State University and then move on to attain her Ph.D. in Psychology.

But there was a barrier standing in her way: Upon completing her Accuplacer placement test, she tested into Developmental Math 085. Placement into Dev 085 requires students to take a series of math classes before they can advance on to college-level courses.

To help Christina on her educational journey, an academic advisor told her about the Math Modules pilot (Accelerated Math). "Before I came to Sinclair, I was very bad in math, and in high school I hardly passed it," Christina says.

She says she liked the lab format of the class, which allowed her to move at her own pace. She excelled in the course and was able to complete DEV 085 and 108 in the time frame of one class.

She says being able to test out of some of the modules cut down on the work she had to cover in the course. "Before

you take a module, you take a test," says Christina. She tested out of three of the nine modules.

Another advantage of the class is that teachers have a chance to explain things in a variety of ways in the lab, whereas in a traditional classroom you would have to meet teachers after class to receive personal attention.

"There is always someone there. The teachers make sure that you really understand it [the material]," Christina says.

Passing both courses gave Christina the motivation to advance on to college Algebra 101. "It helps a lot because a lot of stuff that they are going over now was covered in 108. That really helps," she says.

As for the course, she says she would recommend the accelerated course to students who are familiar with computers and who are willing to put in the work.

"[The accelerated course] is really a lot of work," Christina says. "But it also depends on if you are ready and if you want to complete the two courses."



“The teachers make sure that you really understand it.”

—Christina Wunder

# BASIC SKILLS BOOT CAMP

by Talya Flowers, Georgia Howard, Steven Schwerin

**W**hat is the cheapest and quickest way to get through developmental courses at Sinclair Community College? Attend Boot Camp.

Boot Camp is probably one of the last things on students' minds when they enroll in classes at Sinclair, but for those needing developmental classes (DEV), the Basic Skills Boot Camp could be one of their best options in advancing toward a degree.

"What do they do in boot camp? They throw a whole lot of instruction at you — organized instruction — to help you become a better person," explains Bernice Brown, a professor in Academic Foundations. "To help you with time management, organization

skills, staying on task, and to test you to see if you can complete all of this stuff in a short amount of time."

Self-discipline, organization, and a lot of intense work are what Basic Skills Boot Camp is all about. The camp, which meets three hours each day for one week, is a condensed version of the developmental courses. It's designed to help students get through DEV quickly, efficiently, and with the necessary skills to succeed in college-level classes.

Boot Camps were initially offered in August of 2010 for the developmental math courses, but the success rate was so high, it was expanded in December to include all of the developmental classes.

In one week, students learn the core aspects of the developmental course and successfully complete the prerequisites to move on to another section. It is a rigorous, structured course because of the constraints of compiling a full-term course into one week. "It is a condensed version of everything to get to the core of the coursework," Professor Brown says.

If students are not grasping the material, tutoring is available outside of class at the Tutoring and Learning Center in the library. "But what you will find is that our instructors spend extra time with students," Professor Brown says. "We just don't teach and leave."

Boot Camps are offered during winter, spring, and summer breaks, allowing students to test out of developmental courses in preparation for the upcoming quarter. Courses are scheduled so that students can take two Boot Camps at the same time if they want: one in the morning from 9 to noon and a second in the afternoon from 1 to 4 p.m. This allows



Professor Bernice Brown is enthusiastic about the success of the Boot Camps.

students who need to complete more than one DEV class to finish two within a week's time before the next quarter begins.

"Anytime we can get a young person through two of our courses in one week, that gets them started on their degree plan a whole lot faster," Professor Brown says. "But we also want to make sure they are prepared."

Boot Camps are a good option for students whose skills are rusty or those who have forgotten material that was covered years before in their education.

One student who excelled in both the Math and Reading Boot Camps told Professor Brown that she just needed a refresher in math. As for reading, she said she simply hadn't paid attention when she was young. The student said once the instructor reviewed the material, it clicked.

Stories like this are the reason Professor Brown thinks Boot Camps hold so much potential. Students don't have to sit through an entire term of a class — they are out in one week.

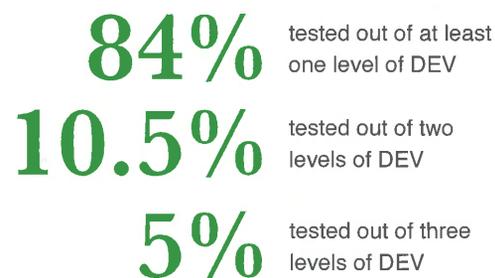


Instructor Amity Jetton helps student Beth Stamper during a Math Boot Camp.

“Anytime we can get a young person through two of our courses in one week, that gets them started on their degree plan a whole lot faster.”

—Professor Bernice Brown

#### Initial Results for Basic Skills Boot Camp for Fall 2010



# Jackson State Community College

## Major Module Matcher



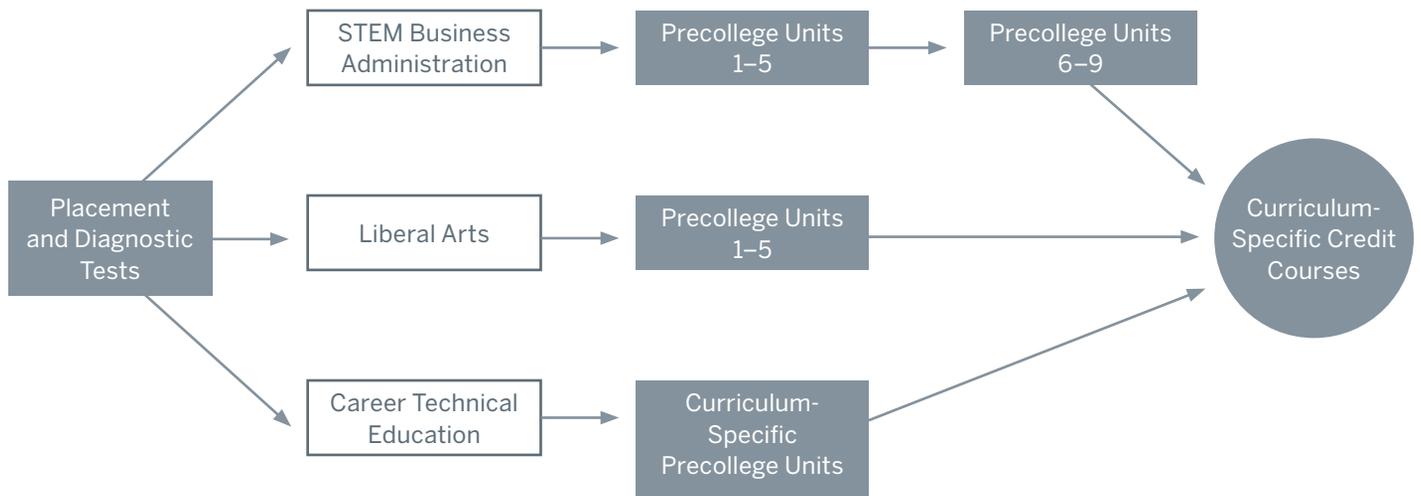
### SMART Math Major Rubric

revised 12-8-2011.

Abbre	Minimum	1010	1410	1420	1530	1630	1710+	Other	Major	Degree
ACC	Mod 1-12						12	1830	Accounting	AS
AGR	Mod 1-7				7	7	12	1910	Agriculture	AS
ART	Mod 1-7	7	8	8	7	7	12	1720+	Art	AS
BIOL	Mod 1-12						12	1720+	Biology	AS
BUS	Mod 1-12						12	1830	Business Administration	AS
CHEM	Mod 1-12						12	1910	Chemistry	AS
COM	Mod 1-7	7	8	8	7	7	12	1720+	Communication	AS
CJUS	Mod 1-7				7	7	12		Criminal Justice	AS
EDU	Mod 1-8		req'd	req'd	7	7	12		Education	AS
ENGL	Mod 1-7	7	8	8	7	7	12	1720+	English	AA/AS
GENS	Mod 1-7	7	8	8	7	7	12	1720+	General Studies	AA/AS
GENSRODP	Mod 1-7	7	8	8	7	7	12	1720+	General Studies RODP	AA/AS
PHED	Mod 1-7				7	7	12	1910	Health and Physical Education	AS
HIST	Mod 1-7				7	7	12	1720+	History	AA/AS
IS	Mod 1-7	7	8	8	7	7	12	1720+	Information Systems	AS
MATH	Mod 1-8				7		12	1720+	Mathematics	AS
PHIL	Mod 1-7	7	8	8	7	7	12	1720+	Philosophy	AA/AS
PHYS	Mod 1-12						12	1720+	Physical Science	AS
POLS	Mod 1-7				7	7	12		Political Science	AA/AS
PENG	Mod 1-12						12	1910	Pre-Engineering	AS
PLAW	Mod 1-7				7	7	12		Pre-Law	AS
PMED	Mod 1-12						12	1830/ 1910	Pre-Med	AS
PNUR	Mod 1-12						12		Pre-Nur	AS
PSY	Mod 1-7	7	8	8	7	7	12	1720+	Psychology	AS
PUAD	Mod 1-7				7	7	12		Public Administration	AA/AS
SOCW	Mod 1-7	7	8	8	7	7	12	1720+	Social Work	AA/AS
SOC	Mod 1-7	7	8	8	7	7	12	1720+	Sociology	AA/AS
TEA	Mod 1-8		req'd	req'd	7	7	12		Teaching K-6 Integrative Studies	AST
BUSAD	Mod 1-7	7	8	8	7	7	12	1720+	Business Studies - Administrative Office Management Concentration	AAS
BUSBC	Mod 1-7	7	8	8	7	7	12	1720+	Business Studies Major - Business Concentration	AAS
CIS	Mod 1-7		8	8	7	7	12	1720+	Computer Information Systems - Cisco CCNA Concentration	AAS
CISIA	Mod 1-7		8	8	7	7	12	1720+	CIS - Information Assurance Concentration	AAS
CISNA	Mod 1-7		8	8	7	7	12	1720+	CIS - Network Administration Concentration	AAS
CISPC	Mod 1-7		8	8	7	7	12	1720+	CIS - PC Support & Help Desk Concentration	AAS
CISSD	Mod 1-7		8	8	7	7	12	1720+	CIS - Software Developer Concentration	AAS
ECED	Mod 1-8		8	8	(Advisor's Approval Req'd)				Early Childhood Education	AAS
GENT	Mod 1-7	7	8	8	7	7	12	1720+	General Technology	AAS
ITAM	Mod 1-7				7	7	12	1720+	Industrial Technology - Applied Manufacturing Concentration	AAS
ITEM	Mod 1-7				7	7	12	1720+	Industrial Technology - Electromechanical Concentration	AAS
ITQS	Mod 1-7				7	7	12	1720+	Industrial Technology - Quality Sciences Concentration	AAS
MLT	Mod 1-7								Medical Laboratory Technician	AAS
NUR	Mod 1-8								Nursing	AAS
NURLPN	Mod 1-8								Nursing - LPN Mobility Track	AAS
PTA	Mod 1-7								Physical Therapist Assistant	AAS
PROFRODP									Professional Studies - Information Technologies Concentration-RODP	AAS
RAD	Mod 1-7				7	7	12	1720+	Radiography	AAS
RCT	Mod 1-7		8		7	7	12	1720+	Respiratory Care Technology	AAS
BEMT	Mod 1-4								Basic Emergency Medical Technician	TCC
EMTP	Mod 1-7								Emergency Medical Technician - Paramedic	TCC

# Northern Virginia Community College

## Major Module Matcher



# Northern Virginia Community College

## Major Module Matcher



Academic Plan	Program Name	Credential	Entry level credit math course	Units required to enroll in entry level math course
2030	<u>Accounting A.A.S.</u>	AAS	MTH 151*	Units 0-5
221-203-02	<u>Accounting Career Studies Certificate</u>	CERT	NONE	NONE
2040	<u>Bookkeeping Certificate</u>	CERT	MTH 151*	Units 0-5
4000	<u>Administration of Justice A.A.S.</u>	AAS	MTH 151*	Units 0-5
4060	<u>Administration of Justice Certificate</u>	CERT	NONE	NONE
221-405-43	<u>General Forensic Investigation Career Studies Certificate</u>	CERT	MTH 151*	Units 0-5
221-405-45	<u>Advanced Forensic Investigation Career Studies Certificate</u>	CERT	NONE	NONE
221-400-02	<u>Security Management Career Studies Certificate</u>	CERT	NONE	NONE
221-407-95	<u>National Security Career Studies Certificate</u>	CERT	NONE	NONE
9040	<u>Air Conditioning and Refrigeration A.A.S.</u>	AAS	MTH 151*	Units 0-5
9030	<u>Air Conditioning and Refrigeration Certificate</u>	CERT	MTH 151*	Units 0-5
221-903-10	<u>HVAC-R and Facilities Services Technology Career Studies</u>	CERT	NONE	NONE
6400	<u>American Sign Language to English Interpretation A.A.S.</u>	AAS	MTH 151*	Units 0-5
221-640-01	<u>American Sign Language Career Studies Certificate</u>	CERT	NONE	NONE
221-640-03	<u>American Sign Language Interpreting Career Studies Certificate</u>	CERT	NONE	NONE
9010	<u>Architecture Technology A.A.S.</u>	AAS	MTH 115 OR MTH 163 OR MTH 166	Units 0-6 for MTH 115  OR Units 0-9 for MTH 163/166
9300	<u>Architectural Drafting Certificate</u>	CERT	MTH 115 OR MTH 163 OR MTH 166	Units 0-6 for MTH 115  OR Units 0-9 for MTH 163/166
9090	<u>Automotive Technology A.A.S.</u>	AAS	MTH 151*	Units 0-5
9091	<u>Emissions Specialization</u>	CERT	MTH 151*	Units 0-5
221-909-01	<u>Automotive Maintenance and Light Repair Career Studies</u>	CERT	NONE	NONE
221-909-10	<u>Collision Repair Technology Career Studies Certificate</u>	CERT	NONE	NONE
221-920-02	<u>Diesel Mechanics Technology Career Studies Certificate</u>	CERT	NONE	NONE
1490	<u>Biotechnology A.A.S.</u>	AAS	MTH 157, 181, 241 or 271	Depends on course-see prerequisite table.
221-149-01	<u>Biotechnology Lab Technician Career Studies Certificate</u>	CERT	NONE	NONE

Academic Plan	Program Name	Credential	Entry level credit math course	Units required to enroll in entry level math course
2130	<a href="#">Business Administration A.S.</a>	AS	MTH 163	Units 0-9
2120	<a href="#">Business Management A.A.S.</a>	AAS	MTH 151	Units 0-5
2124	<a href="#">Administrative Support Technology Specialization</a>	AAS	MTH 151	Units 0-5
2123	<a href="#">Finance Specialization</a>	AAS	MTH 151	Units 0-5
2125	<a href="#">Healthcare Administration Specialization</a>	AAS	MTH 151	Units 0-5
2121	<a href="#">International Business Specialization</a>	AAS	MTH 151	Units 0-5
2122	<a href="#">Public Management Specialization</a>	AAS	MTH 151	Units 0-5
2320	<a href="#">Small Business Management Certificate</a>	CERT	NONE	NONE
221-212-15	<a href="#">Business Information Technology Career Studies Certificate</a>	CERT	NONE	NONE
221-212-04	<a href="#">Business Management Principles Career Studies Certificate</a>	CERT	NONE	NONE
221-299-04	<a href="#">Desktop Publishing Career Studies Certificate</a>	CERT	NONE	NONE
221-212-10	<a href="#">Entrepreneurship Career Studies Certificate</a>	CERT	NONE	NONE
221-212-16	<a href="#">Information Processing Career Studies Certificate</a>	CERT	NONE	NONE
221-212-17	<a href="#">International Business Career Studies Certificate</a>	CERT	NONE	NONE
221-212-13	<a href="#">Leadership Development Career Studies Certificate</a>	CERT	NONE	NONE
221-298-13	<a href="#">Word Processing Career Studies Certificate</a>	CERT	NONE	NONE
5110	<a href="#">Communication Design A.A.S.</a>	AAS	MTH 151*	Units 0-5
5113	<a href="#">Interactive Design Specialization</a>	AAS	MTH 151*	Units 0-5
2970	<a href="#">Multimedia Design Certificate</a>	CERT	NONE	NONE
221-352-02	<a href="#">Web Design Specialist Certificate</a>	CERT	NONE	NONE
2460	<a href="#">Computer Science A.S.</a>	AS	MTH 166	Units 0-9
9170	<a href="#">Construction Management Technology A.A.S.</a>	AAS	MTH 115 OR MTH 163 OR MTH 166	Units 0-6 for MTH 115 OR Units 0-9 for MTH 163/166
221-917-01	<a href="#">Construction Supervision Career Studies Certificate</a>	CERT	NONE	NONE
2480	<a href="#">Contract Management A.A.S.</a>	AAS	MTH 151*	Units 0-5
2500	<a href="#">Contract Management Certificate</a>	CERT	NONE	NONE
1180	<a href="#">Dental Hygiene A.A.S.</a>	AAS	NONE	NONE
1090	<a href="#">Diagnostic Medical Sonography A.A.S.</a>	AAS	MTH 151*	Units 0-5

Academic Plan	Program Name	Credential	Entry level credit math course	Units required to enroll in entry level math course
1091	<a href="#">Echocardiography Specialization</a>	AAS	MTH 151*	Units 0-5
1092	<a href="#">Vascular Sonography Specialization</a>	AAS	MTH 151*	Units 0-5
221-882-01	<a href="#">Drivers Education Career Studies Certificate</a>	CERT	NONE	NONE
6360	<a href="#">Early Childhood Development A.A.S.</a>	AAS	MTH 151*	Units 0-5
6361	<a href="#">Early Childhood Development School-Age Child Specialization, A.A.S.</a>	AAS	MTH 151*	Units 0-5
6320	<a href="#">Early Childhood Development Certificate</a>	CERT	NONE	NONE
221-636-04	<a href="#">Early Childhood Development Career Studies Certificate</a>	CERT	NONE	NONE
221-636-06	<a href="#">Infant and Toddler Care Career Studies Certificate</a>	CERT	NONE	NONE
221-629-03	<a href="#">Paraprofessional Teacher Assistant Career Studies Certificate</a>	CERT	MTH 151*	Units 0-5
1460	<a href="#">Emergency Medical Services A.A.S.</a>	AAS	NONE	NONE
221-146-01	<a href="#">Emergency Medical Technician – Basic Career Studies</a>	CERT	NONE	NONE
221-146-03	<a href="#">Emergency Medical Technician – Intermediate Career Studies Certificate</a>	CERT	NONE	NONE
221-146-05	<a href="#">Paramedic Career Studies Certificate</a>	CERT	NONE	NONE
8310	<a href="#">Engineering A.S.</a>	AS	MTH 166	Units 0-9
8311	<a href="#">Electrical Engineering Specialization</a>	AS	MTH 166	Units 0-9
9680	<a href="#">Engineering Technology A.A.S.</a>	AAS	MTH 166	Units 0-9
9681	<a href="#">Civil Engineering Technology Specialization</a>	AAS	MTH 166	Units 0-9
9682	<a href="#">Drafting Specialization</a>	AAS	MTH 166	Units 0-9
9683	<a href="#">Mechanical Engineering Specialization</a>	AAS	MTH 166	Units 0-9
221-729-01	<a href="#">Computer Aided Drafting and Design Career Studies Certificate</a>	CERT	NONE	NONE
221-514-23	<a href="#">Electronic Media in Design Rendering and Animation Career Studies Certificate</a>	CERT	NONE	NONE
221-915-01	<a href="#">Land Planning, Survey and Development Career Studies</a>	CERT	NONE	NONE
5290	<a href="#">Fine Arts A.A.</a>	AA	MTH 151-152	Units 0-5
5300	<a href="#">Fine Arts A.A.A.</a>	AAA	MTH 151	Units 0-5
5301	<a href="#">Photography Specialization</a>	AAA	MTH 151	Units 0-5
4270	<a href="#">Fire Science Technology A.A.S.</a>	AAS	MTH 151*	Units 0-5
221-460-01	<a href="#">Fitness Career Studies Certificate</a>	CERT	NONE	NONE

Academic Plan	Program Name	Credential	Entry level credit math course	Units required to enroll in entry level math course
6990	<a href="#">General Studies A.S.</a>	AS	MTH 151*	Units 0-5
6993	<a href="#">Recreation, Parks and Leisure Studies Specialization</a>	AS	MTH 151*	Units 0-5
221-460-20	<a href="#">Outdoor Recreation and Resource Management Career Studies</a>	CERT	NONE	NONE
221-460-30	<a href="#">Recreation Programming and Administration Career Studies</a>	CERT	NONE	NONE
221-719-71	<a href="#">Geographic Information Systems Career Studies Certificate</a>	CERT	163*	Units 0-9
1520	<a href="#">Health Information Management A.A.S.</a>	AAS	Place in MTH 126	Units 0-3
221-152-01	<a href="#">Clinical Data Coding Career Studies Certificate</a>	CERT	NONE	NONE
221-286-01	<a href="#">Medical Transcription Career Studies Certificate</a>	CERT	NONE	NONE
221-648-03	<a href="#">Historic Preservation Career Studies Certificate</a>	CERT	NONE	NONE
3350	<a href="#">Horticulture Technology A.S.</a>	AAS	NONE	NONE
3353	<a href="#">Landscape Design Specialization</a>	AAS	NONE	NONE
7750	<a href="#">Hospitality Management A.A.S.</a>	AAS	MTH 151*	Units 0-5
7752	<a href="#">Hotel Management Specialization</a>	AAS	MTH 151*	Units 0-5
7751	<a href="#">Food Service Management Specialization</a>	AAS	MTH 151*	Units 0-5
7753	<a href="#">Nutrition Management Specialization</a>	AAS	MTH 151*	Units 0-5
2450	<a href="#">Culinary Arts Certificate</a>	CERT	NONE	NONE
2670	<a href="#">Meeting, Event, and Exhibition Management Certificate</a>	CERT	NONE	NONE
3400	<a href="#">Information Technology A.S.</a>	AS	MTH 163	Units 0-9
2990	<a href="#">Information Systems Technology A.A.S.</a>	AAS	MTH 151*	Units 0-5
221-299-06	<a href="#">Application Programming Career Studies Certificate</a>	CERT	NONE	NONE
221-299-11	<a href="#">Database Specialist Career Studies Certificate</a>	CERT	NONE	NONE
221-299-09	<a href="#">IT Technical Support Career Studies Certificate</a>	CERT	NONE	NONE
221-732-01	<a href="#">Network Administration Career Studies Certificate</a>	CERT	NONE	NONE
221-732-04	<a href="#">Network Engineering Specialist Career Studies Certificate</a>	CERT	NONE	NONE
221-732-09	<a href="#">Network Security Career Studies Certificate</a>	CERT	NONE	NONE
221-352-03	<a href="#">Web Design and Development Career Studies Certificate</a>	CERT	NONE	NONE
5200	<a href="#">Interior Design A.A.S.</a>	AAS	MTH 151*	Units 0-5
6480	<a href="#">Liberal Arts A.A.</a>	AA	MTH 151-152	Units 0-5
6489	<a href="#">Art History Specialization</a>	AA	MTH 151-152	Units 0-5
6486	<a href="#">International Studies Specialization</a>	AA	MTH 151-152	Units 0-5

Academic Plan	Program Name	Credential	Entry level credit math course	Units required to enroll in entry level math course
648B	<a href="#">Psychology Specialization</a>	AA	MTH 151-152	Units 0-5
6482	<a href="#">Speech Communication Specialization</a>	AA	MTH 151-152	Units 0-5
221-648-01	<a href="#">African-American Studies Career Studies Certificate</a>	CERT	NONE	NONE
221-648-02	<a href="#">Chinese Studies Career Studies Certificate</a>	CERT	NONE	NONE
221-648-04	<a href="#">Japanese Studies Career Studies Certificate</a>	CERT	NONE	NONE
221-648-05	<a href="#">Latin American Studies Career Studies Certificate</a>	CERT	NONE	NONE
221-529-02	<a href="#">Theatre Career Studies Certificate</a>	CERT	NONE	NONE
2510	<a href="#">Marketing A.A.S.</a>	AAS	MTH 151	Units 0-5
2513	<a href="#">eCommerce Specialization</a>	AAS	MTH 151	Units 0-5
2514	<a href="#">International Marketing Specialization</a>	AAS	MTH 151	Units 0-5
2515	<a href="#">Public Relations Specialization</a>	AAS	MTH 151	Units 0-5
221-251-01	<a href="#">eCommerce Career Studies Certificate</a>	CERT	NONE	NONE
221-251-02	<a href="#">Marketing Career Studies Certificate</a>	CERT	NONE	NONE
221-251-03	<a href="#">Promotion &amp; Public Relations Career Studies Certificate</a>	CERT	NONE	NONE
221-251-04	<a href="#">Retail Management Career Studies Certificate</a>	CERT	NONE	NONE
221-179-01	<a href="#">Massage Therapy Career Studies Certificate</a>	CERT	NONE	NONE
1510	<a href="#">Medical Laboratory Technology A.A.S.</a>	AAS	Place in MTH 163	Units 0-9
5550	<a href="#">Music A.A.</a>	AA	MTH 151-152	Units 0-5
5590	<a href="#">Music A.A.A.</a>	AAA	MTH 151 OR 152	
5591	<a href="#">Jazz/Popular Music Specialization</a>	AA	MTH 151	Units 0-5
5570	<a href="#">Music Recording Technology Certificate</a>	CERT	MTH 151	Units 0-5
1560	<a href="#">Nursing A.A.S.</a>	AAS	Place in MTH 151	Units 0-5
1560+6990	<a href="#">Nursing A.A.S. + Nursing A.S./General Studies (MOMENTUM 2 + 1)</a>	AAS+AS	MTH 241-see catalog	Prereq: MTH 152, 181, 163, or 166
2600	<a href="#">Paralegal Studies A.A.S.</a>	AAS	MTH 151*	Units 0-5
221-151-02	<a href="#">Phlebotomy Career Studies Certificate</a>	CERT	NONE	NONE
5020	<a href="#">Photography A.A.S.</a>	AAS	MTH 151	Units 0-5
1800	<a href="#">Physical Therapist Assistant A.A.S.</a>	AAS	MTH 151	Units 0-5
2650	<a href="#">Professional Writing for Business, Government, and Industry Certificate</a>	CERT	NONE	NONE
1720	<a href="#">Radiography A.A.S.</a>	AAS	Place in MTH 151	Units 0-5

Academic Plan	Program Name	Credential	Entry level credit math course	Units required to enroll in entry level math course
1720	<a href="#">Radiography A.A.S. 2010-2011</a>	AAS	Place in MTH 151	Units 0-5
2730	<a href="#">Real Estate Brokerage Certificate</a>	CERT	NONE	NONE
221-273-03	<a href="#">Real Estate Brokerage Career Studies Certificate</a>	CERT	NONE	NONE
221-273-02	<a href="#">Real Estate Residential Appraisal Career Studies Certificate</a>	CERT	NONE	NONE
1810	<a href="#">Respiratory Therapy A.A.S.</a>	AAS	Place in MTH 151	Units 0-5
8800	<a href="#">Science A.S.</a>	AS	MTH 163 or 166*	Units 0-9
8802	<a href="#">Mathematics Specialization</a>	AS	MTH 166	Units 0-9
8820	<a href="#">Social Sciences A.S.</a>	AS	MTH 151-152	Units 0-5
8823	<a href="#">Deaf Studies Specialization</a>	AS	MTH 151-152	Units 0-5
8821	<a href="#">Psychology Specialization</a>	AS	MTH 151-152	Units 0-5
8824	<a href="#">Political Science Specialization</a>	AS	MTH 151-152	Units 0-5
8822	<a href="#">Teacher Education Specialization</a>	AS	MTH 151-152	Units 0-5
4030	<a href="#">Substance Abuse Rehabilitation Counselor Certificate</a>	CERT	NONE	NONE
2430	<a href="#">Travel and Tourism Certificate</a>	CERT	NONE	NONE
221-249-02	<a href="#">Tour Guiding Career Studies Certificate</a>	CERT	NONE	NONE
1880	<a href="#">Veterinary Technology A.A.S.</a>	AAS	MTH 126	Units 0-3
221-995-01	<a href="#">Welding: Basic Techniques Career Studies Certificate</a>	CERT	NONE	NONE