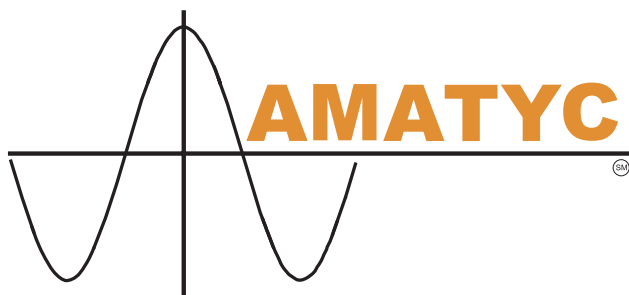


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**Third National Mathematics Summit:  
For Math in the First Two Years of College**

November 13-14, 2018  
Coronado Springs Resort  
Orlando, FL

National experts from the Carnegie Foundation, the Charles A. Dana Center, the Mathematics Association of America, the National Center for Developmental Education, Paul Nolting, NADE, and AMATYC offer workshops that focus on implementing, improving, and assessing redesigns.

# Acknowledgments

Thank you to the following:

**Charles A. Dana Center, UT Austin** for printing the programs for the National Math Summit

**Valencia College** for printing the nametags for the National Math Summit

# Third National Mathematics Summit: For Math in the First Two Years

Tuesday, November 13, 2018

1:00 – 1:15 pm      **Welcome - Jim Ham, AMATYC President**  
Fiesta 5

1:15 – 2:35 pm      **Panel Discussion**  
Fiesta 5  
**Moderator: Nancy Sattler**  
**Panel Members:** Paula Wilhite (AMATYC), Patti Brown (NCDE),  
Ann Edwards (Carnegie Math Pathways/WestEd), Annette Cook (NADE),  
Rebecca Hartzler (Dana Center), Julie Phelps (MAA), Paul Nolting (Paul Nolting)

2:35 – 2:45 pm      **Break**

### Breakout sessions I

<b>2:45 – 3:50 pm</b>	<b>Room</b>	<b>Presentation</b>
	Fiesta 5	<b>IMPACT: Improving Mathematical Prowess and College Teaching</b> Julie Phelps and Nancy Sattler (AMATYC)
	Monterrey 1	<b>Flipping the Equation: Transforming Monotony into Meaningful Math Experiences through Active Learning Strategies</b> Andrew Sebok (NADE)
	Monterrey 2/3	<b>Developing Counter-narratives Through Anti-deficit Teaching</b> Aditya Adiredja (MAA)

3:50 – 4:00 pm      **Break**

### Breakout sessions II

<b>4:00 – 5:05 pm</b>	<b>Room</b>	<b>Presentation</b>
	Fiesta 5	<b>Strategic Integration of Support Services and Math Classrooms</b> Patti Brown
	Monterrey 1	<b>Shifting mindsets for learning: Strategies for promoting students' productive persistence in mathematics</b> Rachel Beattie (Carnegie)
	Monterrey 2/3	<b>Growing What Works: Taking Successful Redesign to Scale</b> <b>How do you take a successful pilot to scale?</b> Tanya Madrigal (NADE)

5:30 – 7:00 pm      **Reception (cash bar and light hor d'oeuvres)**  
Fiesta 5

# Third National Mathematics Summit: For Math in the First Two Years

Wednesday, November 14, 2018

## BREAKOUT SESSIONS III

<b>8:00 – 9:05 am</b>	<b>Room</b>	<b>Presentation</b>
	Fiesta 5	<b>Throwing Out The Textbook: Creating Math Courses Using Open-Source Educational Resources</b> Suzanne Etheridge, Mary Monroe-Ellis, Amy Tankersley (NADE)
	Monterrey 1	<b>The MAA Instructional Practices Guide: A Resource for Change</b> Doug Ensley and April Strom (MAA)
	Monterrey 2/3	<b>Beyond X and Y: Utilizing Non-Cognitive Skills in Co-Requisite Math Courses to Promote Success</b> Heather Howington and Mike Sieve (AMATYC and Carnegie)
	Yucatan 1/2	<b>Faculty Development and Equity in an Era of Mathematics Reform</b> Alycia Marshall and Lucy Michal (Dana Center)

9:05 – 9:15 am      **BREAK**

## BREAKOUT SESSIONS IV

<b>9:15 – 10:20 am</b>	<b>Room</b>	<b>Presentation</b>
	Fiesta 5	<b>Integrating Math Study Skills into the Classroom, Co-Requisite &amp; Emporium Model: Improve Grades</b> Paul Nolting, Craig Hardesty, Dawn Hood (Paul Nolting)
	Monterrey 1	<b>Transitional Math: The Next Frontier in Developmental Math Reform</b> Kathy Almy (AMATYC)
	Monterrey 2/3	<b>Increasing Active Learning in Mathematics using Daily Mathstarters, Math Games, and Exit Tickets</b> Labonnie Smith (NADE)
	Yucatan 1/2	<b>Everyone But Me: Facilitating Curricular Change in Academic Isolation</b> Chris Oehrlein (MAA)

10:20 – 10:30 am      **BREAK**

# Third National Mathematics Summit: For Math in the First Two Years

## BREAKOUT SESSIONS V

<b>10:30 – 11:35 am</b>	<b>Room</b>	<b>Presentation</b>
	Fiesta 5	<b>Meeting Students Where They Are: Successful Co-requisite Course Design</b> Connie Richardson (Dana Center)
	Monterrey 1	<b>Mathematics Anxiety Solutions: Current Research and Classroom Strategies</b> Paul Nolting (Paul Nolting) and Linda Zientek (AMATYC)
	Monterrey 2/3	<b>Mathematics Pathways Re-design in the Florida College System</b> Carrie Henderson (Florida College System) and Toby Park (Center for Postsecondary Success - Florida State)
	Yucatan 1/2	<b>Bridging Upper Division and Lower Division Pathways Through Activities and Experiences</b> Karen Gaines (AMATYC), Michael Dorff (MAA) and Ann Sitomer (AMATYC)

11:35 am – 1:00 pm **Lunch on Your Own**

## BREAKOUT SESSIONS VI

<b>1:00 – 2:05 pm</b>	<b>ROOM</b>	<b>Presentation</b>
	Fiesta 5	<b>Supporting Effective Implementation of Math Reform at Scale: Lessons about Instructional and Institutional Change from the Carnegie Math Pathways</b> Ann Edwards (Carnegie)
	Monterrey 1	<b>Research Review of Successful Math Strategies: How Do I Know Which Ones To Use?</b> Paul Nolting and Libby Watts (Paul Nolting)
	Monterrey 2/3	<b>Build Your Own Co-Requisite Statistics Learning Support</b> Markus Pomper (AMATYC)
	Yucatan 1/2	<b>Using Technology for Strategic Integration Support Services in Math Classrooms</b> Barbara Illowsky (NCDE)

2:05 – 2:15 pm **BREAK**

2:15 – 3:20 pm **National Practitioners Networking Session**

**Fiesta 5**

Meet with presenters and other practitioners about similar areas of interest on how to help the students who need community colleges the most.

3:20 – 3:30 pm **BREAK**

# Mathematics Summit: For Math in the First Two Years

3:30 - 4:10 pm

**Panel Discussion**

**Fiesta 5**

**Moderator: Nancy Sattler**

**Panel Members:** Linda Zientek (AMATYC), Barbara Illowsky (NCDE), Mike Sieve (Carnegie Foundation), Connie Richardson (Dana Center), Julie Phelps (MAA), Patrick Saxon (NADE), Paul Nolting

4:10 - 5:00 pm

**Closing Session**

**Fiesta 5**

**Curricular Modernization in Turbulent Times: A Search for True North**

Uri Trisman

## **National Math Summit Planning Team**

### **Co-Chairs**

**Annette Cook**

**Paul Nolting**

**Julie Phelps**

**Nancy Sattler**

### **Committee Members**

**Rochelle Beatty**

**Anne Dudley**

**Ann Edwards**

**Rebecca Goosen**

**Rebecca Hartzler**

**Beverly Vance**

**Paula Wilhite**

Please give us feedback by completing the survey found at

<https://www.surveymonkey.com/r/2018NatMthSummit>

## **Sessions Descriptions**

1:15 – 2:35 pm, Tuesday, November 13, 2018

### **Panel Discussion**

**Moderator: Nancy Sattler**

**Panel Members: Paula Wilhite (AMATYC), Patti Brown (NCDE), Ann Edwards (Carnegie Math Pathways/WestEd), Rebecca Hartzler (Dana Center), Julie Phelps (MAA), Annette Cook (NADE), Paul Nolting (Paul Nolting)**

2:45 – 3:50 pm, Tuesday, November 13, 2018

### **IMPACT: Improving Mathematical Prowess and College Teaching**

**Presenters: Julie Phelps and Nancy Sattler (AMATYC)**

This presentation offers an introduction to AMATYC's newest standards guide through an active learning discussion. Participants will have an opportunity to discuss the four pillars of PROWESS: PROficiency, OWNership, EngagemenT, and Student Success with other higher education stakeholders to learn how they are making contributions to support student learning for students in the first two years of college.

2:45 – 3:50 pm, Tuesday, November 13, 2018

### **Flipping the Equation: Transforming Monotony into Meaningful Math Experiences through Active Learning Strategies**

**Presenter: Andrew Sebok (NADE)**

Involved math students are successful math students! This presentation will introduce active learning strategies that, in conjunction with a semi-flipped model of instruction, will engage developmental mathematics students. Additionally, participants will receive tips for successful implementation, modeling, and examples of authentic, engrossing activities that transform passive students into active learners!

2:45 – 3:50 pm, Tuesday, November 13, 2018

### **Developing Counter-narratives through Anti-deficit Teaching**

**Presenter: Aditya Adiredja (MAA)**

This session focuses on anti-deficit perspectives of students' mathematical work, and their role in supporting equity goals in undergraduate mathematics. It will begin with an overview of findings from existing equity research in undergraduate mathematics education. Adiredja will note the importance of established societal narratives about students (and women) of color as both an influence on and a target for change in our work as mathematics instructors. He will draw from research about student mathematical sense-making to uncover implicit principles supporting a common deficit perspective on students' work. Challenging a system of deficit narratives about students (and women) of color, Adiredja will offer an anti-deficit perspective that accurately values and respects students' identities and their intellectual work.

4:00 – 5:05 pm, Tuesday, November 13, 2018

### **Strategic Integration of Support Services and Math Classrooms**

**Presenters: Patti Brown**

Students are more likely to succeed in the math classroom if they have: a purpose for being in college, self-efficacy toward math, access to assistance when they need it, and support in confronting personal issues. Strategic integration provides a means of collaborating selectively with support services in ways that contribute to student development in these areas. This presentation describes methods for selecting support services to collaborate with, identifies the components of collaboration, and provides examples of how we can effectively collaborate with colleagues in student support services to improve student performance.

4:00 – 5:05 pm, Tuesday, November 13, 2018

**Shifting Mindsets for Learning: Strategies for Promoting Students' Productive Persistence in Mathematics**

**Presenter: Rachel Beattie (Carnegie)**

Students' mindsets about their ability to learn and belong in a college classroom setting play a critical role in the motivation to put forth effort, seek help from others, and use new learning strategies. In the Carnegie Math Pathways (CMP), this set of behaviors has been defined as productive persistence, or the tenacity to persist in the face of challenge combined with useful strategies to overcome these challenges. This session offers participants the opportunity to reflect on common classroom experiences using a shared framework to adapt practical routines that have been shown to promote and sustain academic and social mindsets in CMP classrooms across the country. Participants will also learn how they can use practical data to constantly improve their practice.

4:00 – 5:05 pm, Tuesday, November 13, 2018

**Growing What Works: Taking Successful Redesign to Scale**

**Presenter: Tanya Madrigal (NADE)**

This session will examine the steps necessary to take a successful pilot to scale for an institution. Consideration will be given to financial impact at the institution, program capacity, the comprehensive nature of the redesign in meeting state mandates, and does the pilot provide enough information to take to scale.

8:00 – 9:05 am, Wednesday, November 14, 2018

**Throwing Out the Textbook: Creating Math Courses using Open-Source Educational Resources**

**Presenters: Suzanne Etheridge, Mary Monroe-Ellis, Amy Tankersley (NADE)**

With the proliferation of open-source educational resources, faculty have more options for creating effective math courses than using expensive textbooks that dictate curriculum. Faculty teaching a co-requisite survey of math course share how to create online homework using free open-source websites, as well as collaborative classroom activities and applications-based projects.

8:00 – 9:05 am, Wednesday, November 14, 2018

**The MAA Instructional Practices Guide: A Resource for Change**

**Presenters: Doug Ensley and April Strom (MAA):**

The MAA Instructional Practices Guide presents evidence-based methods for engaging students. Beyond documenting active-learning classroom strategies, the guide also includes practices for assessment and course design that support these strategies. This session will give an overview of the guide and suggestions for its use in effecting change in instructional practices.

8:00 – 9:05 am, Wednesday, November 14, 2018

**Beyond X and Y: Utilizing Non-cognitive Skills in Co-requisite Math Courses to Promote Success**

**Presenters: Mike Sieve and Heather Howington (Carnegie and AMATYC)**

Co-requisite remediation is sweeping the nation. Additionally, success in a math class depends on more than just mathematical ability. In order for students to succeed, it is becoming increasingly important that they possess non-cognitive or "soft" skills. This session combines these two notions by utilizing strategies and activities developed in conjunction with the Carnegie Math Pathways. Weekly activities that help support non-cognitive skills, which enhance students' mindset, and ways to incorporate these into co-requisite classes will be discussed.

8:00 – 9:05 am, Wednesday, November 14, 2018

**Faculty Development and Equity in an Era of Mathematics Reform**

**Presenters: Alycia Marshall and Lucy Michal (Dana Center)**

This session will present research on faculty professional development processes and findings from qualitative and quantitative analyses in equality, equity, and student success in current mathematics pathways efforts. Topics will include sustained faculty engagement, addressing equity goals, and ongoing review lead to improving student achievement.



9:15 – 10:20 am, Wednesday, November 14, 2018

**Integrating Math Study Skills into the Classroom, Co-requisite and Emporium Model: Improve Grades**

**Presenters: Paul Nolting, Craig Hardesty, Dawn Hood (Paul Nolting)**

Institutions are continuing to change or improve their math curriculum as a result of the national math redesign movement requiring students to become independent, fast and efficient learners. However, they have not been taught motivation and math study skills especially in co-requisite designs which can represent 41% of their grade. This workshop focuses on developing designs, motivation and integrating assessment, note-taking, reading, anxiety reduction, homework, test-taking and reducing procrastination strategies.

9:15 – 10:20 am, Wednesday, November 14, 2018

**Transitional Math: The Next Frontier in Developmental Math Reform**

**Presenter: Kathy Almy (AMATYC)**

Transitional math courses, which are high school courses that provide seniors the preparation and placement for college level math, are taking off around the country. Illinois is scaling them using the approach and content of pathways courses like Math Literacy. Transitional math courses complement corequisite remediation and developmental math pathways to form a successful approach to developmental education. Attendees will learn about the course content and approach as well as the implementation model being used in Illinois, a local control state with significant numbers of community colleges and high schools.

9:15 – 10:20 am, Wednesday, November 14, 2018

**Increasing Active Learning in Mathematics using Daily Mathstarters, Math Games, and Exit Tickets**

**Presenter: Labonnie Smith (NADE)**

In this session, participants will be guided through instructional strategies to increase active learning in mathematics classroom and create a collaborative setting where all are working towards a common goal of mathematical mastery using Mathstarters and Math Games. Practical instructional strategies and activities will be shared during this session.

9:15 – 10:20 am, Wednesday, November 14, 2018

**Everyone But Me: Facilitating Curricular Change in Academic Isolation**

**Presenter: Chris Oehrlein (MAA)**

Participants in this session will explore the challenges of those mathematics faculty in a small department and/or of being the sole or one of the very few mathematics faculty interested in implementing many of the best practices and guidelines put forward by their national professional societies and supported by evidence-based scholarly research into the teaching and learning of mathematics at the college level. What resources are available for curriculum and assessment development? What supporting resources can mathematics faculty interested in transforming their courses use to present to colleagues in mathematics, partner disciplines, academic advisors and school administrators? How might the college mathematics education community better create and sustain support networks for isolated faculty?

10:30 – 11:35 am, Wednesday, November 14, 2018

**Meeting Students Where They Are: Successful Co-requisite Course Design**

**Presenter: Connie Richardson (Dana Center)**

The need for well-designed co-requisite courses has greatly increased due to recent statewide mandates eliminating prerequisite developmental courses. Participants will plan for action as they engage in activities addressing key considerations for designing successful co-requisites. These include course structure, aligned content, calendaring, placement, assessment, staffing, and examining successful case-studies.

10:30 – 11:35 am, Wednesday, November 14, 2018

**Mathematics Anxiety Solutions: Current Research and Classroom Strategies**

**Presenters: Linda Zientek (AMATYC) and Paul Nolting (Paul Nolting)**

Mathematics students around the world are exhibiting high levels of anxiety at all skills levels. Using self-efficacy, anxiety reduction and study skills strategies can reduce anxiety. This session discusses anxiety and self-efficacy research along with classroom strategies to increase the mastery, social, physiological, vicarious areas of self-efficacy and reduce anxiety.

10:30 – 11:35 am, Wednesday, November 14, 2018

### **Mathematics Pathways Re-design in the Florida College System**

**Presenters: Carrie Henderson (Florida College System) and Toby Park (Center for Postsecondary Success at Florida State)**

This session will provide an overview of the current mathematics pathways redesign efforts across the Florida College System to identify strategies for better aligning high school and college instruction and content in mathematics; examine the most appropriate mathematics courses and sequences based on a student's program; and, for students intending to transfer, ensure the mechanisms are in place so courses will articulate and excess credit hours accumulation will be minimized. The Center for Postsecondary Success at Florida State University will present findings regarding student course-taking behavior and student success that have been used to inform discussions across the system. Participants will learn how to gather resources to elevate evidence-based practices in mathematics re-design efforts.

10:30 – 11:35 am, Wednesday, November 14, 2018

### **Bridging Upper Division and Lower Division Pathways through Activities and Experiences**

**Presenters: Ann Sitomer, Karen Gaines (AMATYC) Michael Dorff (MAA)**

This presentation will focus on initiatives that serve as catalysts for new experiences and opportunities at the community college and universities for both faculty and students. Attendees will learn about:

- Project SLOPE - AMATYC's recently NSF-funded project, Project SLOPE (Scholarly Leaders Originating as Practicing Educators in Two-Year College Mathematics) is undertaking a feasibility study and pilot of a program within AMATYC to build and sustain a network of two-year college faculty engaged in the Scholarship of Teaching and Learning (SoTL).
- Student Research League - AMATYC's Student Research League (SRL) was created in 2017 as an opportunity to encourage students to engage in research problem solving and to motivate an interest in extracurricular mathematics activities among two-year college students. The SRL is an annual competition modeled after Moody's Mega Math Challenge Annual High School Research Contest as organized by the Society for Industrial and Applied Mathematics.
- PIC Math - preparing students for jobs in business, industry, and government (BIG). This is an MAA program that has been used in math departments at over 100 institutions including community colleges. The program centers around a semester class run by you at your institution in which students (from freshman to seniors) spend most of their class time working in groups on an unsolved problem coming directly from BIG and then at the end of the course presenting their solution to people from the company that gave the problem.

1:00 – 2:05 pm, Wednesday, November 14, 2018

### **Supporting Effective Implementation of Math Reform at Scale: Lessons about Instructional and Institutional Change from the Carnegie Math Pathways**

**Presenter: Ann Edwards (Carnegie)**

Effecting math pathways reform that provides students with meaningful learning experiences promoting student success requires support for faculty and administrators in the design and implementation of courses and programs. The Carnegie Math Pathways has developed support programs for faculty and institutional teams that have been instrumental in the effectiveness of the CMP programs. This session will share approaches taken and lessons learned in CMP about how to support: the curricular design of math pathways; student-centered and collaborative mathematics teaching practices; interventions that address students' persistence and mindset; and institutional implementation of robust and sustainable math pathways reforms.

1:00 – 2:05 pm, Wednesday, November 14, 2018

### **Research Review of Successful Math Strategies: How Do I Know Which Ones to Use?**

**Presenters: Paul Nolting and Libby Watts (Paul Nolting)**

Instructors need to know which strategies are the best for different instructional designs, including online and co-requisite courses and different math students including repeaters. The workshop reviews research based strategies that improve math success. Discussion focuses on student assessments, placement, students' past math histories, motivation, different instructional strategies, academic support collaboration, and math study skills. These elements of student success also include designing math learning plans for students who struggle in math or who simply want to perform higher than their previous achievements. When students increase self-efficacy by using self-regulatory behaviors and obtain effective instruction/support, they are more likely to pass math to pursue their desired careers that involve math and science.

1:00 – 2:05 pm, Wednesday, November 14, 2018

**Build Your Own Co-requisite Statistics Learning Support**

**Presenter: Markus Pomper (AMATYC)**

The presenter will provide an example of a successful co-requisite learning support course at a community college in Tennessee. This model proved useful for a community college with eight campuses which serves a large rural area that straddles two time zones. The presentation will include a description of the structure of the co-requisite support system, and will highlight some of its successes with respect to course completion. The session will be highly interactive, and participants will be challenged to develop an outline for learning support modules for a statistics lesson of their choice. The session will close with discussion of the results of the workshop and with ample time for Q&A for audience members.

1:00 – 2:05 pm, Wednesday, November 14, 2018

**Using Technology for Strategic Integration Support Services in Math Classrooms**

**Presenter: Barbara Illowsky (NCDE)**

Attendees learned from Dr. Boylan about strategic integration support services. In his presentation, these services were delivered face-to-face. More and more, however, students are learning in online or blended environments. Even in face-to-face classes, support services can be offered online. This presentation describes methods to integrate such services via technology. Participants will learn how tutoring, counseling, and self-efficacy strategies can be effectively delivered via technology. These technology services are valuable in face-to-face classes, as well as in distance and blended courses.

2:15 – 3:20 pm, Wednesday, November 14, 2018

**National Practitioners Networking Session**

Meet with presenters and other practitioners about similar areas of interest on how to help the students who need community colleges the most. Topics include:

- Active Learning
- Co-requisite Models
- Mathematics Pathways
- Multiple Measures Placement
- Affective Characteristics
- Mathematical Rigor
- Assessing Student Success
- Learning Support

3:30 - 4:10 pm, Wednesday, November 14, 2018

**Panel Discussion**

**Moderator: Nancy Sattler**

**Panel Members: Linda Zientek (AMATYC), Barbara Illowsky (NCDE), Mike Sieve (Carnegie Math Pathways), Connie Richardson (Dana Center), Julie Phelps (MAA), Patrick Saxon (NADE), Paul Nolting (Paul Nolting)**

4:10 - 5:00 pm, Wednesday, November 14, 2018

**Curricular Modernization in Turbulent Times: A Search for True North**

**Presenter: Uri Treisman - Closing Remarks**

The forces reshaping postsecondary mathematics reform are arguably stronger and more varied than at any time since Sputnik, if not WWII. Gateway course structures, especially those designed to serve students deemed to need remediation, are being replaced at scale by executive orders, legislation, and, in a growing number of cases, by administrative fiat in response to changing norms of responsible professional practice. Influential philanthropies, now more powerful given a vacuum in federal and state higher education leadership and support, are shifting away from pilot studies to supporting change at scale.

The forces emanate from a potent mix of enrollment declines, financial exigencies, structural shifts in the economy affecting the demand for workers, and on the positive side, advances in mathematics education and the learning sciences. In response, individual colleges and higher education systems are implementing math pathways, co-requisite instruction, intrusive advising, guided pathways, and a host of “solutions” designed to improve institutional outcomes.

My talk will present a framework for sensemaking in this new environment and for anchoring necessary changes in the core missions of our institutions and professional societies. The goal: to ensure that mathematics education is worthy of our students, our institutions, and our discipline.

# NOTES

## **Biographies**

Aditya Adiredja      [adiredja@math.arizona.edu](mailto:adiredja@math.arizona.edu)

Aditya P. Adiredja is an Assistant Professor of Mathematics at The University of Arizona. His research is situated in the intersections between post-secondary mathematics, equity, and cognition. His work looks at ways that perspectives on epistemology and learning determine the kinds of knowledge and students that get privileged in the classroom. This focus is part of a larger goal of turning undergraduate mathematics classrooms into spaces where underrepresented students can personally, intellectually, and professionally succeed as they critically engage with and learn mathematics.

Kathy Almy      [kalmy@niu.edu](mailto:kalmy@niu.edu)

Kathleen Almy is a mathematics research associate for Northern Illinois University's Center for P-20 Engagement as well as the Illinois Director for Transitional Math. She leads projects for state agencies related to transitional and developmental math initiatives. Prior to joining the P-20 Center, she was a mathematics professor with 20 years of experience in high school and college classrooms. Her degrees include a B.S. in Mathematics Education from Southern Illinois University and an M.S. in Pure Mathematics from NIU. Kathleen is pursuing a doctorate in higher education with an emphasis on community college leadership.

Rachel Beattie      [beattie@carnegiefoundation.org](mailto:beattie@carnegiefoundation.org)

Rachel Beattie is the director of productive persistence and director of Student Agency Improvement Community at the Carnegie Foundation. Productive Persistence refers to the combination of tenacity and good strategies that is necessary to help more students successfully complete their academic goals. Before coming to the Carnegie Foundation, Rachel was a postdoctoral researcher at the Ohio State University where she supported cognitive neuroimaging research on reading, language, and mathematical development. She has a BSc (Hons) in psychology from Staffordshire University, and an MA and Ph.D. in psychology from the University of Southern California, where she conducted research on the underlying factors that contribute to the development of learning differences. Rachel also taught undergraduate psychology courses at Occidental College and the University of Southern California.

Patricia Levine Brown      [levinebrownp@appstate.edu](mailto:levinebrownp@appstate.edu)

Patti Levin Brown is currently an assistant professor in the department of Leadership and Educational Studies at Appalachian State University. She received a doctorate in higher education, with a concentration in community college leadership, from the University of Texas at Austin. Additionally, she holds an Ed.S. in developmental Education from Appalachian State where she also completed the Kellogg Institute earning a certificate as a Developmental Education Specialists. Patti has published a number of articles and texts related to the field, primarily in the disciplines of English and reading, and prior to coming to Appalachian State she worked a number of years in the community and state college system in Florida. During her tenure in Florida she served as president of the Florida College Reading Council, on the board of the Florida Developmental Education Association (FDEA), and in 2013 served as the president of the National Association for Developmental Education (NADE), the largest organization of professional developmental educators in the country. Her areas of expertise included the following: developmental education, student access and success, meta-major pathways, early college, college readiness programs, professional development training, online teaching, integration of support services, corequisite course development, and peer coaching.

Annette Cook      [conferencemanager@thenade.org](mailto:conferencemanager@thenade.org)

Annette Cook has been an educator for 34 years, primarily serving as a math instructor at the college, high school, and middle school levels. In addition to being an instructor, she has served as a Division Chair, Director, and Associate Dean. Cook has worked extensively with student support programs, building collaborations with staff and faculty. She currently serves as the Executive Assistant and Conference Manager for the National Association for Developmental Education (NADE). She is a past Vice-President of AMATYC and a member of Cohort 5 of Project ACCESS. She holds B.S. and M.A. degrees in Mathematics Education, and is a graduate of the Kellogg Institute as a Certified Developmental Education Specialist.

Michael Dorff [mdorff@mathematics.byu.edu](mailto:mdorff@mathematics.byu.edu)

Michael Dorff is the department chair and professor of mathematics at Brigham Young University. He earned his Ph.D in 1997 from the Univ. of Kentucky in complex analysis, has published about 35 refereed papers, and has given about 500 talks on mathematics. He is interested in undergraduate research, in non-academic careers in mathematics, and in promoting mathematics to the general public. He is the President-Elect of the MAA. Also, he is a Fellow of the American Mathematical Society, a Fulbright Scholar in Poland, received a national Haimo Teaching Award from the MAA, and co-directs the PIC Math (Preparation for Industrial Careers in the Mathematical Sciences). He is married with 5 daughters. In any free time he has, he enjoys reading, running, and traveling.

Ann Edwards [aedward@wested.org](mailto:aedward@wested.org)

Ann Edwards is the Director of Learning and Teaching in the Carnegie Math Pathways at WestEd. She oversees the development and implementation of the CMP curricula, assessments, pedagogy, and professional development. Her research interests include mathematics teaching, teacher learning, and professional development, particularly for teachers of underserved student populations. She has published in numerous journals and books including the NADE Digest, Journal of Teacher Education, Journal for Research in Mathematics Education, Teachers College Record, and the Handbook of Research on Learning and Instruction. She has taught secondary and collegiate mathematics and worked with teachers K-16. She has a B.A. in applied mathematics from Harvard University and an M.A./Ph.D. in education in mathematics, science, and technology from the University of California, Berkeley.

Doug Ensley [densley@maa.org](mailto:densley@maa.org)

Doug Ensley was Deputy Executive Director of the MAA from 2016 to 2018. In this position Doug oversaw MAA communities such as Sections and SIGMAAs as well as all of MAA's alphabet soup of sponsored programs, including PICMath, CoMInDS, StatPREP, Progress through Calculus, NREUP, Tensor, and the Instructional Practices Guide. In addition, he served as Interim Director of Competitions and Outreach for the 2016-17 academic year, while the leadership structure of that program was under revision. As a co-PI on the NSF-funded project to develop the Instructional Practices Guide, Doug was one of the primary editors of the final document. Doug is currently Professor of Mathematics at Shippensburg University, but he maintains a part-time position with MAA as its Associate Director of Programs.

Suzanne Etheridge [scetheridge@pstcc.edu](mailto:scetheridge@pstcc.edu)

Suzanne Etheridge is an associate professor of Mathematics at Pellissippi State Community College where she has been teaching for 14 years. She began her career teaching high school mathematics, and formerly served as the Curriculum Coordinator for Learning Support Mathematics at Pellissippi State.

Karen Gaines [KGaines@stlcc.edu](mailto:KGaines@stlcc.edu)

Karen has been active in AMATYC for the 23 years she has been teaching at St. Louis Community College. She has been involved with multiple NSF grants that have been geared towards creating activities for the classroom. She also served as the Project ACCESS Coordinator helping to educate new hires in the community college. She has been involved with IMPACT since its inception as a member of the task force, steering committee, writing team, editing team and website design. She is currently the Coordinator of the newly created Student Research League. Because of her first career as an electrical engineer she is always looking for applications as a way to engage students. She is very interested in brain research and learning theory.

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Dr. Rebecca Goosen is the Associate Vice Chancellor for College Preparatory at San Jacinto College. She is a former president of the National Association of Developmental Education (NADE), a CLADEA fellow, was awarded the CASP Lifetime Achievement Award and obtained the status of American Leadership Forum Senior Fellow. At San Jacinto College she provides administrative support systems that assist faculty and students in maximizing learning, development and success. The program was awarded the John Champaign Memorial Award for Outstanding Developmental Education Program in 2016. Dr. Goosen received her doctorate degree from Grambling State University in Higher Education Leadership specializing in developmental education

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Jim Ham has been teaching at Delta College, a Michigan two-year college, since 1994, teaching classes in all the pathways He has been a member of AMATYC and several of its regional affiliates since 1994. He has also been a 32-year member of NCTM and a 23-year member of the MAA, and a recent member of NADE. Jim has served in several leadership positions in AMATYC, including his current role as AMATYC President. Jim has also served as an AMATYC affiliate (MichMATYC) president and vice chair of the Michigan Section of the MAA. Jim represents AMATYC at the annual CBMS meetings, on TPSE-MAG, and at several other national organizations, initiatives, and committees.

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Originally from the coalfields of southern West Virginia, Dr. Hardesty holds a B.S. and an M.A. degree in Mathematics as well as an Ed.D. in Higher Education Leadership Studies from Marshall University in Huntington, West Virginia. He has over 22 years of mathematics teaching experience at the community college level in West Virginia, Kentucky, Maryland and Florida. In addition to teaching, he has served in various leadership roles including Developmental Mathematics Coordinator, Mathematics Department Chair and campus Academic Dean. He currently serves as a mathematics professor and Department Chair for Associate in Science Programs at the SouthShore Campus of Hillsborough Community College in Ruskin, Florida. Dr. Hardesty was an early champion of distance learning and has taught mathematics online for over 17 years. He was honored in 2011 with a Blackboard Catalyst Award in Exemplary Course Design for his online College Algebra course. This was one of only 20 courses nationwide to receive this honor in that year. Dr. Hardesty is a NISOD award recipient (2010) and was voted Outstanding Faculty Member of the Year at Hillsborough Community College (2007). He is a founding member of WVMATYC and has been an active AMATYC member throughout his career. He has presented at numerous professional conferences including NADE, AMATYC, WVMATYC, FTYCMA, and the Suncoast Region of MAA.

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Rebecca Hartzler manages the The Charles A. Dana Center's higher education advocacy initiatives in support of strategic implementation and national scaling of the Dana Center Mathematics Pathways. She leads projects advocating on a national scale for improvements in mathematics preparation in the first two years of college, including the pathway to Calculus, statistics pathways, and mathematics pathways for nursing and data science majors. Rebecca is the Center's higher education liaison with national mathematics and academic associations. Rebecca most recently served as a faculty member and director of special projects in STEM at Seattle Central College. She taught physics, engineering, and mathematics in Washington state two-year colleges for 28 years and served as a dean for science and mathematics.

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Dr. Carrie E. Henderson serves as the Executive Vice Chancellor of the Florida College System. In this role, she provides leadership over academic and student affairs, research and analytics, and financial policy. Prior to becoming Executive Vice Chancellor, Dr. Henderson served as Associate Vice President for Institutional Effectiveness and Accreditation at Florida State College at Jacksonville and as Associate Director of Programs at Achieving the Dream, Inc. Her interest and experience include institutional effectiveness, strategic planning, resource development, and institutional research. Dr. Henderson holds a Ph.D. in Higher Education Administration and a graduate certificate in institutional research from Florida State University, a master of public administration from the University of North Carolina at Chapel Hill, and a bachelor of arts in history and political science from the University of Central Florida.

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Dawn Hood currently teaches at Morehead State University, where she has served as mathematics instructor, Developmental Math Coordinator, and Director of College Readiness. Her main focus for the last few years has been designing and implementing co-requisite mathematics courses for the university. Student success is at the heart of her personal mission. In addition to 20 years teaching at the university level, Dawn has taught both middle school and high school mathematics and served as the mathematics coordinator for Extended School Services. She resides in the scenic foothills of Appalachia with her husband of 20 years,

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Heather Howington is an Assistant Professor of Mathematics at the University of North Georgia, Gainesville campus. She has a B.S. in Applied Mathematics from the Georgia Institute of Technology and a M.Ed. in Mathematics Education from the University of Georgia. Over the past 23 years she has taught a wide variety of courses from Developmental Math through Calculus. Her most recent interests include motivating students' success in their path from developmental mathematics to quantitative literacy. Heather's work with the Carnegie Math Pathways includes serving as a Faculty Mentor, a member of the Curriculum Committee, Instructor Notes Design Team, and is a Carnegie National Faculty.

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Dr. Barbara Illowsky has been a mathematics and statistics professor at De Anza College, Cupertino, CA since 1989. She served as the first project director of the California Community Colleges' Basic Skills Initiative, went on to oversee that program at the state Chancellor's Office, and analyzed the research and results from the then-113 California Community Colleges. Most recently, Barbara served as Chief Academic Affairs Officer for the California Community Colleges Online Education Initiative. In that role, Barbara oversaw integration of academic support services, including tutoring, proctoring, plagiarism detection, accessibility support and Open Educational Resources into online learning courses. She has been a board member of several state, national and international educational and community organizations including president of CMC3 (California Community Colleges Mathematics Council). Barbara is co-author of "Collaborative Statistics", "Introductory Statistics", and "Introductory Business Statistics", free and open textbooks published by OpenStax College that are used by hundreds of colleges, universities, and high schools throughout the country and world.

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Tanya Madrigal is the Department Chair for College Prep at San Jacinto College Central Campus. Prior to this role, she served as a College Prep Math Faculty Lead/Professor at San Jacinto College and was a former math teacher in Deer Park ISD. She is from Pasadena, TX and is the first in her family to earn a degree. She earned an Associate of Arts in Teaching from San Jacinto College Central Campus, Bachelors of Arts in Interdisciplinary Studies from University of Houston Clear Lake (UHCL), Masters in Educational Administration (UHCL) and a second Masters in Instructional Technology from UHCL. She is working on her Doctorate of Education in Learning and Organizational Change at Baylor University. She is married with three kids, two fur babies and enjoys volunteering at area pet shelters during her spare time.

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Dr. Alycia Marshall is the Associate Vice President for Learning and Academic Affairs and a tenured, Full Professor of Mathematics at Anne Arundel Community College (AACC) in MD. She holds a Ph.D. in Mathematics Education (University of Maryland College Park), a Master of Arts degree in Teaching (Bowie State University) and a Bachelor of Arts degree in Mathematics (University of Maryland Baltimore County). Marshall is a Dana Center Mathematics Pathways Leadership Fellow with over 18 years of teaching experience in mathematics. Having served five years as the Department Chair of math at AACC, she was awarded the 2015 INSIGHT Into Diversity Magazine's "100 Inspiring Women in Stem Award" and the John and Suanne Roueche Excellence Award from the League of Innovation (2017). Dr. Marshall is an Expert Advisory Board Member for Strong Start to Finish working to improve college completion among low-income, minority and returning adult students.

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Lucy Hernandez Michal is a retired mathematics professor from El Paso Community College. She served as Research Projects Assistant to the Vice President of Instruction and Workforce Education, Achieving the Dream Coordinator, and led the College's Mathematics Pathways Team. She currently serves as a Leadership Fellow for the Dana Center Mathematics Pathways (DCMP). Dr. Michal continues to advocate for equity in education and the central challenges faced during education reform.

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Dr. Mary Monroe-Ellis is a professor of Mathematics at Pellissippi State Community College, where she has taught for 28 years. Prior to teaching at the college, she taught both middle school and high school mathematics.



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Dr. Paul Nolting for over 30 years worked at State College of Florida as an undergraduate instructor, a learning specialist, an institutional test administrator, Title III director and math lab coordinator. He also has been a graduate instructor for assessment and measurement courses. He is an expert on assessing math learning problems, developing effective student learning strategies, math study skills, assessing institutional variables that affect math success, math redesigns, and tutor training. He has consulted nationally and internationally with over a 100 college/university campuses to improve math success, retention and on their QEPs. He is now an adjunct professor at Hillsborough Community College in Tampa.

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Chris Oehrlein has been teaching at Oklahoma City Community College for 21 years. He primarily teaches mathematics, but he also teaches Business Statistics and College Physics. Prior to moving to Oklahoma, he taught at Marshall Community and Technical College for two years. Chris was 2002's Carnegie Oklahoma Professor of the Year, and he has twice been a NISOD Teaching Excellence awardee. He regularly presents at national and regional conferences, and he is currently serving his second term as chair of the MAA Committee on Two-Year Colleges. Outside of his academic life, Chris has umpired ten Oklahoma high school state baseball championships, three South Central regional Connie Mack championships, and an NAIA regional baseball championship. Every year February through May, he umpires NCAA Division II and III and NAIA baseball. He also serves as a clinic instructor and mentor for high school umpires in Oklahoma.

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Dr. Toby Park is Associate Director of the Center for Postsecondary Success, and Associate Professor of Education Policy at Florida State University. Dr. Park's primary research utilizes quasi-experimental methods and large statewide data sets to investigate student outcomes in postsecondary education and explore potential policy initiatives that could improve student success, with a particular focus on non-traditional students. In his ongoing research, Dr. Park is involved in collaborate work examining student success within the context of the higher education landscape of Florida, with a particular focus on pre-college preparation, developmental education, community colleges, and minority serving institutions. Dr. Park is a Co-PI on a multi-year project investigating developmental education reform in Florida, funded in part by the U.S. Department of Education's Institute for Education Sciences (IES), and the Bill & Melinda Gates Foundation. Dr. Park teaches courses on the economics of education, large-scale database management, and advanced quantitative methods.

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For the past 21 years, Dr. Julie Phelps, Professor of Mathematics at Valencia College in Orlando, FL, has studied ways to increase student engagement, learning, retention and success among mathematics students in the first two years. This research focus coupled with her AMATYC role as the chair of the AMATYC Mathematics Standards committee has strengthened her belief that that focusing on applications of concepts help students make connections to their own interests through engagement, combined with a connection to other support services, provides individuals the much-needed direction to become truly successful college mathematics students.

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Markus Pomper holds a PhD in Mathematics from the University of Illinois. He currently serves as the Dean of the Division of Math and Sciences at Roane State Community College. In this position, he secured grant funding to initiate a two-year program in Mechatronics, provided leadership in the design of an online program in Computer Information Technology and implemented a co-requisite model of developmental education in mathematics. Previously he chaired the Mathematics Department at Indiana University East, where he designed several online programs in Mathematics and dramatically increased the enrollment of the program. Dr. Pomper's research focuses on the community and collaboration in teaching and academic leadership

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Connie Richardson leads the curriculum development team for the mathematics courses for the Dana Center Mathematics Pathways. She also supports the development of DCMP's professional learning offerings related to curricular redesign, co-requisite supports, and pedagogy. In this work, Connie collaborates with faculty to identify best practices and disseminate to the field. Connie has 14 years of experience at the high school level, teaching a wide variety of courses, including Advanced Placement Calculus and Statistics. She also has more than nine years of experience at the university level, teaching both developmental and college-level courses as well as teacher preparation courses. In addition, she served as co-director of several teacher quality grant projects and supervised student teachers

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Nancy Sattler serves as co-chair of IMPACT and has taught mathematics continuously since 1982 at Terra Community College in Fremont, OH, and for master's degree students at Walden University since 2007. She has a Ph.D. in higher education with minors in educational technology and research and measurement. She is the 2013 Adjunct Faculty of the Year winner for the state of Ohio and is Dean Emerita for Terra. She is a Past President of AMATYC and also served as Mid-Western Vice President and Treasurer. Sattler was founding chair of the Distance Learning Committee and is a past chair of the Placement & Assessment Committee for AMATYC and is a past president and the historian of OhioMATYC, a founding member of the Ohio Mathematics and Science Coalition and their current Treasurer. In 2005, Sattler won OhioMATYC's Distinguished Service Award. Her areas of interest are teaching at a distance and student engagement and student success.

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Dr. D. Patrick Saxon is a Professor and Director of the fully online Developmental Education Administration Doctoral Program at Sam Houston State University. He has published extensively in the field of developmental education and is a coauthor of the book *Attaining Excellence in Developmental Education: Research-Based Recommendations for Administrators*. For 22 years he managed the research activities of the National Center for Developmental Education. He is the editor of *Research in Developmental Education*, a member of the National Association for Developmental Education Executive Board, and serves on the Editorial Review Board of the *Journal of College Reading and Learning*. He is an advisor for the Kellogg Institute at Appalachian State University and a consultant for the Charles A. Dana Center at the University of Texas at Austin. In 2015, he was inducted as a Fellow in the Council for Learning Assistance and Developmental Education Associations.

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Andrew Sebok has been a mathematics instructor in the Division of College Preparatory Studies at Texas Southmost College in Brownsville, Texas since January, 2016. Previously, he taught and tutored a variety of courses at various community colleges throughout central Illinois. He holds an A.S. degree from Richland Community College in Decatur, Illinois, a B.A. from Eastern Illinois University in Charleston, Illinois, both in mathematics, and is currently working on a Master's degree in mathematics, with an emphasis on active learning and its effect on the developmental math classroom in community colleges, at the University of Texas Rio Grande Valley. Mr. Sebok is passionate about teaching, and he loves working with his students and fellow faculty to promote the community college mission of providing quality higher education for all. In his spare time, he enjoys tending to his balcony garden, playing the piano, and working on his novel.

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Mike Sieve is a Professor of Mathematics at Ridgewater College in Hutchinson, Minnesota. He earned his B.A. in Mathematics and Computer Science from St. Mary's University and his M.S. in Mathematics from Northern Arizona University. His teaching experience spans over 20 years at both the university and community college level. He has taught courses that run the gamut from developmental mathematics through the calculus sequence. Recently, his focus has been on developmental mathematics, specifically for non-STEM students. He became involved with the Carnegie Math Pathways Quantway program in 2012. Mike continues to work within Carnegie's Networked Improvement Community serving as a faculty mentor and is actively involved with the Assessment Team, the Curriculum Committee and the Instructor Notes Design Team.

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Ann Sitomer is currently a Visiting Assistant Professor of Mathematics Education at Portland State University (PSU). Ann's work at PSU builds on 18 years' experience teaching the first two years of college mathematics at community colleges and focuses on improving students' learning in large enrollment introductory mathematics courses. Ann is the chair of AMATYC's Research Committee and a co-PI on AMATYC's Project SLOPE grant. Ann's research interests began with adult returning students' proportional reasoning and has transitioned to faculty learning and organizational change, because she believes that faculty learning about how to build on students' mathematical contributions is the foundation upon which transforming developmental mathematics education will be built.

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Labonnie Wise Smith currently works as an education consultant and adjunct faculty at various universities in the Washington metropolitan area. Over the past twenty-four years in education, she has worked in a variety of sectors and served in various roles. Her credentials include a master of education degree; postgraduate professional license in chemistry, middle school mathematics, and special education; and certification in online teaching and course development at the University of the District of Columbia. Throughout her career, her achievements include designing and implementing the first piloted co-requisite course in mathematics that led to increased course retention and pass rates, coordinating the development of online training modules for faculty teaching co-requisite courses in mathematics and English at the community college, leading the design and implementation of supplemental instructional learning modules in mathematics coursework that led to increased improvement in delivery of pedagogy and content learning in mathematics at the at the University of the District of Columbia Community College; and spearheading the development of online modules for teachers-in-training to prepare for the initial PRAXIS test in mathematics and increase scores for entry into a teacher preparation program at Urban Teachers.

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April Strom has taught mathematics at the community college level for 2 years and she has served as Principal Investigator for an NSF-funded project titled the Arizona Mathematics Partnership, which was a professional development and research project focused on middle school mathematics teachers in Arizona. Strom currently serves on the Steering Committees for AMATYC's IMPACT work, as well as MAA's Instructional Practices Guide. She also currently serves as AMATYC's Southwest Vice President and ArizMATYC's President. Strom received her Ph.D. in Curriculum & Instruction (emphasis in Mathematics Education) from Arizona State University (2008), M.A. Mathematics (1998) and B.A. Mathematics (1997) from Texas Tech University.

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Uri Treisman is University Distinguished Teaching Professor, professor of mathematics, and professor of public affairs at The University of Texas at Austin where he serves as director of the Charles A. Dana Center. He is active in the leadership of organizations working to improve American higher education and in particular, mathematics education. He is a founding member of TPSEmath and serves as a representative of the American Mathematical Society to the AAAS. Uri is a Distinguished Senior Fellow at the Education Commission of the States and is chairman of the Strong Start to Finish Campaign. He has served on the STEM working group of the President's Council of Advisors on Science and Technology and the 21st-Century Commission on the Future of Community Colleges. Uri was named a MacArthur Fellow in 1992 and Harvard Scientist of the Year in 2006. He received the AMATYC Mathematics Excellence Award in 2016.

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Libby A. Watts is a Professor of Mathematics at Tidewater Community College on the Norfolk campus. She earned AAS in Computer Science in 2002 from Monroe Community College. She then transferred to the State University of New York (SUNY) at Geneseo as an undergraduate in mathematics where she earned a BA in Mathematics in 2004. Finally, Libby transferred to SUNY Potsdam in 2004 and earned her MA in Mathematics in 2005. Libby began her teaching career at Clinton Community College in Plattsburgh, New York in 2005 as an adjunct instructor in math. In 2007 Libby moved to Newport News, Virginia and accepted a full-time math instructor position at Thomas Nelson Community College. In 2012 Libby transferred to Tidewater Community College and was promoted to Assistant Professor in 2014 and to Associate Professor in 2018. During her teaching career, Libby has been dedicated to helping students in developmental math by implementing programs such as SSUMM (Student Success Using Math Modules) in 2009 and SEAM (Students in English and Math) in 2013. In 2015 Libby converted all of her classes to OER and received a CIF grant in 2015 to implement MyOpenMath (MOM) training throughout the VCCS. In 2017 she received another professional development grant to create a free online class to help students with Math Anxiety. Libby has been a member of VMATYC and AMATYC since 2007 and served on the VMATYC board since 2011. Libby served as the Eastern Region VP from 2011-2014 and has been the Webmaster since 2013.

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Paula Wilhite, Professor of Mathematics, leads instruction in math, physics, and engineering at Northeast Texas Community College. Her passion for teaching mathematics to students in underserved populations has shaped her career for four decades. As the principal investigator for a National Science Foundation scholarship grant for students who were eligible for a Federal Pell Grant, her focus on active learning, constructive persistence, and interdisciplinary application resulted in two of three participants earning an undergraduate degree in the STEM area. Wilhite was a member of the Course Design Team for the Mathways Project developed by the University of Texas Dana Center. She was awarded the 2004 Texas Mathematical Teaching Excellence Award and the 2013 American Mathematical Association of Two-Year Colleges Teaching Excellence Award. Since 2016, she has served as Chair of the AMATYC Developmental Mathematics Committee.

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Linda Zientek, PhD is an Associate Professor in Mathematics Education at Sam Houston State University in the Department of Mathematics and Statistics. She is an active member of the Southwest Educational Research Association (SERA) and serves as SERA Executive Director. For 10 years, she was a community college mathematics instructor. Her research interests include research on community college initiatives, developmental mathematics, and quantitative research methods. Linda is interested in researching students' self-efficacy beliefs, the origins of these beliefs, and the impact these beliefs have on academic achievement. Linda has served as President of the Texas Mathematical Association of Two-Year Colleges, Conference Chair for the 2007 Southwest Regional Conference of the American Mathematical Association of Two-Year Colleges, and as Chair of the AMATYC Developmental Mathematics Committee.

## Common Definitions

### Active Learning

Active learning includes teaching techniques and classroom practices that engage students in activities, such as reading, writing, discussion, or problem-solving, that promote higher-order thinking.

CBMS full statement can be found at:

[http://www.cbmsweb.org/Statements/Active\\_Learning\\_Statement.pdf](http://www.cbmsweb.org/Statements/Active_Learning_Statement.pdf)

### Co-requisite Models

Co-requisite is an instructional strategy whereby undergraduate students are enrolled in a college level course paired with an intervention/support program that supports the learning in that college level course.

The paired component provides support aligned directly with the learning outcomes, instruction, and assessment of college level course, and makes necessary adjustments as needed in order to advance students' success in the college level course.

### High Quality **Mathematics Pathways** in the First year of College

- Mathematics curricula are differentiated to meet the needs of different meta-majors or both STEM and non-STEM programs of study.
- Students can earn credit for their respective college-level gateway course within the first year of enrollment.
- Student support services are aligned across the institution to guide, place, and advise students into and through their chosen pathway.
- Faculty adapt and implement curricula and pedagogical practices that are grounded in research on effective instructional practices for all students.
- Math Pathways courses transfer and meet degree requirements at a college's primary transfer institutions and their students' chosen programs of study.

### Multiple Measures Placement

The practice of using cognitive and non-cognitive measures to place students in courses rather than just using a single placement score.

### Affective Characteristics

Educational affective characteristics are based on Bloom's student learning model that includes cognitive entry skills (knowledge), instruction and affective characteristics. The affective characteristics model now includes non-cognitive skills and learning skills. These affective characteristics include attitudes, self-esteem, self-efficacy, motivation, tenacity, locus of control, productive persistence, social belonging, relational trust, mindsets, mathematics anxiety, study skills, and test-taking skills. These student based affective characteristics have shown to improve math success.

**Mathematical Rigor:**

- 1) Attention to precision, structure and patterns,
- 2) Inference, interpretation, reasoning,
- 3) Mathematical habits of the mind and ways of thinking and
- 4) Helping students develop their mathematics identity.

In a rigorous course students are asked to: 1) Struggle with real, non-routine problems in context; 2) Identify strategies to solve problems; 3) Communicate about mathematical ideas with clarity and precision; and 4) Justify solutions. (Michael Oehrtman, AMATYC IMPACT and The Charles A. Dana Center)

**Assessing Student Success:**

Student success is the fulfillment of a student's academic or professional goals or outcomes. During the past decade, various key performance indicators have been standard practices used in higher education literature as well as all six regional higher education accreditation agencies to measure student success (Community College Research Center [CCRC] & American Association of Community Colleges [AACCC], 2015a), Cuseo, 2012). These include

- Academic Achievement or Successful Course Completion (Grade of A, B, or C) and Success in Subsequent Courses
- Student Persistence or Term-to-term Persistence
- Educational Attainment: entering students' persistence to completion of their degree, program, or educational goal
- Student Advancement: student's successful progress and completion of college degree or program
- Holistic Development: students' development not only intellectually, but also emotionally, socially, artistically, and creatively as they progress through and complete their college experience

**Supportive Learning Environment:**

Students and faculty must be knowledgeable about research on how students learn mathematics and the effects of variables such as age, race, gender, career goals, socio-economic background, and language skills. Instructors must recognize the need to create a nurturing environment that raises students' self-esteem and encourages them to continue their study of mathematics. Learning supports include services often found in Learning Support Centers such as tutoring, advising, supplemental instruction, assessment help sessions, and more. Instructors need to be ready to share when and where these services are available. In this environment, faculty, support service personnel, and students must be a team.

# NOTES

