AMATYC Is Making a Positive
on Student Success
Standards Committee Themed Session -
AMATYC Conference 2021 - Phoenix, AZ
Taking Action and Making a Positive IMPACT on Student Success

Julie Phelps
AMATYC’s Signature Documents

1995 CROSSROADS IN MATHEMATICS
Standards for Introductory College Mathematics Before Calculus

2007 BEYOND CROSSROADS
Implementing Mathematics Standards in the First Two Years of College

2017 Guide IMPACT:
Improving Mathematical PROWESS and College Teaching
Affirms the previous standards with current research
The Four Pillars of PROWESS

PR oficiency
OWNership
Engagement
Student Success
Student Success

Stimulating Student Achievement in Mathematics

“Action is the fundamental key to success.”
~Pablo Picasso
Definition of Student Success

The fulfillment of a student’s academic or professional goals or outcomes.
Indicators of Student Success

- Student Persistence
- Educational Attainment
- Academic Achievement or Successful Course Completion and Success in Subsequent Courses
- Holistic Development
Achieving Student Success

Student Success requires the entire college community to:
● work together to advise and place students into appropriate coursework
● create a positive learning environment
● utilize a collaborative spirit that unites college leadership, faculty, staff, and policy makers to produce and sustain a learning environment that promotes student achievement.
Enhancing Student Success by Design

- Initial Assessment and Placement – multiple measures
- Advising Students – multiple options
- Learning Environment
  - inside the classroom
  - outside the classroom
  - online and blended
Institutional Responsibility for Enhancing Student Success

- Hiring Qualified Faculty and Staff
- Promote Professional Development
- Institution Responsibility for Creating Learning Support Environments
- Linking Developmental Math with Student Success
Using Metacognitive Prompts to Facilitate a Transition to Proficiency

Sidra Van De Car
The Four Pillars of PROWESS

PRoficiency
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What does it mean to be mathematically proficient?
National Research Council (2001, as cited in IMPACT document) defines mathematical proficiency with five interdependent strands:

- **Conceptual Understanding**
  - comprehension of mathematical concepts, operations, and relations.

- **Procedural Fluency**
  - skill in carrying out procedures flexibly, accurately, efficiently, and appropriately.

- **Strategic Competence**
  - the ability to formulate, represent, and solve mathematical problems.

- **Adaptive Reasoning**
  - the capacity for logical thought, reflection, explanation, and justification.

- **Productive Disposition**
  - the habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy.
Metacognition

• Is most frequently defined as “thinking about one’s own thinking”
• Involves transitioning from passive receptacle to the skill of active problem solver in the curation of one’s own thought processes
• Fosters adaptation of knowledge to novel situations

Students struggle to learn *if they don’t know how to learn*
Breaking down metacognition

- Metacognitive knowledge
  - Declarative
  - Procedural
  - Conditional
- Metacognitive regulation
  - Planning
  - Monitoring
  - Evaluating
- Metacognitive experiences

(Flavell, 1979)
Metacognition and Proficiency

- Improved problem-solving (Hoffman & Spatariu, 2008; Kramarksi & Friedman, 2014)
- Moderates math anxiety (Legg & Locker, 2009)
- Benefits low performers (Pennequin et al., 2010)
- Declarative metacognition affects mathematical performance (Schneider & Artelt, 2010).
Hoffman & Spatariu (2008, as cited in Kramarski & Friedman, 2014) define metacognitive prompting as:

“an externally generated stimulus that activates reflective cognition or evokes strategy use with the objective of enhancing learning”
Metacognitive prompts

- Image from Schraw (1998)

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**Planning**
1. What is the nature of the task?
2. What is my goal?
3. What kind of information and strategies do I need?
4. How much time and resources will I need?

**Monitoring**
1. Do I have a clear understanding of what I am doing?
2. Does the task make sense?
3. Am I reaching my goals?
4. Do I need to make changes?

**Evaluating**
1. Have I reached my goal?
2. What worked?
3. What didn’t work?
4. Would I do things differently next time?

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*Figure 2. A regulatory checklist.*
References


Ownership Isn’t Just about Cars and Houses!

Karen Gaines
The Four Pillars of PROWESS

PRoficiency
OWNership
Engagement
Student Success

All too often, students are just doing

- A student is **doing** when they can state the task in front of them or recite what they are doing.

- A student is **understanding** when they can explain the skill they are learning.

- A student is **owning** when they can articulate what skill they are learning, why they are learning it, how they will demonstrate they have learned it, and how they will use it later.
Students should be able to answer these questions about **Curriculum**

- What am I learning?
- Why am I learning this?
- How will I demonstrate I have learned?

I have to solve these problems.

We are learning to use units to solve problems. We are practicing solving them and then comparing our answers with our partner to see which ones we got correct.

We have been learning how to make approximations when we are solving problems. Right now, we are solving some problems that practice using units to solve problems. We will use our approximations and math solutions with units to justify our answers. I use the mathematical practice of approximations to make sure my thinking is robust and that the math makes sense.
Teachers should ask themselves these questions when considering Curriculum

- What will my students learn?
- Why are my students learning this?
- How will my students demonstrate they have learned it?
- How will I share these decisions with my students?

Write the information on the board or on a slide: what will students be learning, how and why they will be learning it and how they will demonstrate it to the instructor.
Students should be able to answer these questions about Instruction

- How will I learn this?
- How will this strategy help me learn this?
- How can I use this strategy in the future and in different situations?

I have to make a picture of each number.

I am working with my elbow partner. We are making models of our addition problems. Then we write them using numbers.

We learned that the numbers on both sides of the equal sign must be the same. You can’t use an equal sign if this is not true. Today we have to tell each other if the problems are true or false. Then we make a model with blocks to show if it is true. If it is true, our model shows this. If it is false, we have to fix it.

Responses from 1st grade math
Teachers should ask themselves these questions when considering Instruction:

- How will my students learn this?
- How will this strategy help my students learn this?
- How will my students use this strategy in the future and in different situations?
- How will I share these decisions with my students?

Active Learning Principles:

1. Students’ deep engagement in mathematical thinking (PRoficiency),
2. Instructors’ interest in and use of student thinking (OWNership),
3. Student-to-student interaction (Engagement), and
4. Instructors’ attention to equitable and inclusive practices (Student Success)
Students should be able to answer these questions about Assessment

- How well am I learning?
- How will I know I am progressing in my learning?
- What can I do if I am struggling?

We have a quiz on Friday that will tell me.

We are subtracting decimals. Once I solve the problem, I use addition to see if it is correct. This helps me know if my math is getting better.

Today we are learning to subtract decimals. Once we finish a problem we ask our partner, “How did you get that?” and, “How do you know if you subtracted correctly?” We will use addition to show how we have subtracted correctly. If it is wrong, we will work together to find out where we made a mistake and fix it. We don’t have to wait for the teacher to tell us.

Responses from 5th grade math
Teachers should ask themselves these questions when considering **Assessment**

- How will my students know they have learned it?
- How will my students know they are progressing in their learning?
- What can my students do if they are struggling?
- How will I share these decisions with my students?

**Self Assessment groups**

- ready to practice and could help a friend if needed - help other 2 groups
- ready to practice but may need some help - work with each other
- need more help before practicing - work with instructor
Students should be able to answer these questions about Climate

- What is my role in the class?
- How will I support others in their learning?
- How will I take academic risks in my learning?

We sit in groups and work together.

When the bell rings we get right to work. We do a starter activity to remind us what we are learning. My job is to learn.

We are learning to identify equivalent expressions. It can be confusing, so we work in groups to help each other out. We get to ask each other questions and talk about our mistakes. We have to decide as a team which expressions are equivalent and which ones are not. We have to tell why we know we are trite. Our teacher makes us talk it through. This helps us practice and learn. I wish all of my classrooms let us work together.

Responses from 6th grade math
Teachers should ask themselves these questions when considering **Climate**

- What is the student’s role in the class?
- How will my students support others in their learning?
- How will my students take academic risks in my learning?
- How will I share these decisions with my students?

**Community member**

- Trust
- Respect
- Optimism
- Intentionality
Ownership Mindset

“We have defined student ownership as a mindset; a mindset of those students who know they have the authority, the capacity, and the responsibility to own their learning. We have shown that the most efficient manner to build this mindset is for the teacher to model the thinking behind the ownership, explicitly teach the skills of ownership, and, most important, be willing to delegate the authority, capacity, and responsibility to the students.”

Developing Student Ownership - Jane Kennedy and Robert Crowe
Exploring the Elements of an Engaging Learning Environment

Charity Jones
The Four Pillars of PROWESS

PRoficiency
OWNership
Engagement
Student Success
Developing Intellectual Curiosity and Motivation in Learning Mathematics

“The students who are most engaged are the ones who think they matter to the teacher… When students feel like they have a voice at school, they are 7 times more academically motivated.”

~Quaglia, 2016, p. 6
Engaging students intellectually in the process of learning mathematics through active and cognitive activities is fundamental for improving student achievement in the first two years of collegiate mathematics.

Engaging faculty in the pursuit of excellence in teaching through innovative best practices results in an invigorated commitment to teaching and innovation, which benefits students, the department, the college, and society as a whole.
Engaging Students In and Out of the Classroom

Robust learning environments have 3 components:

● Learner-centered
● Knowledge-centered
● Reflective learning (Bishop, Carson, & King, 2014)
A LEARNER-CENTERED Environment allows students to acquire new knowledge based on previous knowledge. This requires active learning tasks that have at least one of the following features.

- Inquiry-based
- Allows students to solve real, interesting contextual problems using diverse methods
- Promotes student to student discourse
- Requires intuitive “sense-making” strategies to support conceptual understanding (Givvin et al., 2011)
A KNOWLEDGE-CENTERED Environment is one where “once students begin to appreciate the value of figuring things out and have begun to lay the foundation of powerful concepts, we can reintroduce procedures… (Givvin et al., 2011)

This includes:

● Big ideas, concepts, and math properties are explicit and emphasized repeatedly
● Procedures are practiced in collaborative groups
● Homework, tests, and quizzes require conceptual thought
A **REFLECTIVE LEARNING** Environment is one where mistakes are valued, there are opportunities to learn from them, and improvement is rewarded.

- Class discussions and sharing misconceptions/mistakes
- My Favorite Mistake
- Test/Quiz Retakes, Test Corrections
Weaving these three components into classroom instruction provides opportunities for students to engage in meaningful mathematical practices that “can create an atmosphere of comfort, invite open expression, invite meaningful class discussions, allow for the development of peer learning, and nurture student-teacher and student-student connections” (Bishop, Caston, & King, 2014, p. 60).

---Impact Document Chapter 5
Engaging Faculty

Our “Active Learning Pursuit” at Weber State University
Inclusive Teaching Practices that Promote Equity and Inclusion

Nancy Sattler (she/her)

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Source: Association of College and University Educators (ACUE)

10 Inclusive Teaching Practices

Ensure your course reflects a diverse society and world

- Examine your course – when students who see people who look like them represented in course materials, they will put forth more effort
- Be mindful of stereotypes – avoid images that reflect stereotypes
- Seek out images that reflect diversity – be intentional about representing a wide variety of cultural perspectives

EXTRA TERRESTRIAL SCHOOL
STORY CHARACTERS

CONTRACTOR

APPRENTICE

STUDENTS

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The contractor has you in charge of ordering blocks for an end-structure of a retaining wall.

He shows you the construction procedure from the first step to the third step. He says it repeats with the same pattern over and over.

Your job is to get ready to predict how many blocks will be needed.

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STORY PROBLEM TASK part 2/2

The contractor says he will call you later with more information. He is waiting on the architect and structural engineer first.

He thinks it might be about 30 steps, but it may be 50, depending on the final design they will adapt due to specifics of the terrain. He is not sure yet the exact number of steps.

Since you are just out of school, he says you could use your mathematical knowledge and skills to get organized and have something ready to predict quantities quickly and accurately.

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INSTRUCTIONS FOR THE APPRENTICE

How will you use your mathematical knowledge and skills?

How will you demonstrate you are mathematically educated and the contractor can trust you with doing a good job?

Let's think about it on your own for 10 minutes. Then we will form groups and you will share where you are with your teammates.

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Ensure course media are accessible

- Make video and audio following accessibility laws, policies, and standards.
  - Use YouTube captioning
  - AMARA (https://amara.org/en/)
  - Use Panopto (https://www.panopto.com/)
  - Use VoiceThread (https://voicethread.com/)

- Also think about emails, presentations, and other documents

Additional Resource:  https://digitalaccess.missouri.edu/
Ensure your syllabus sets the tone for diversity and inclusion

- Include diversity statement in your syllabus
  One of the 8 components of the conceptual framework at Walden University is Diversity: The candidate acts in ways that honor multiple perspectives and affirm the dignity and respect of all individuals internal and external to the learning environment.

- Post your syllabus online
- Consider creating low-stakes syllabus quiz or syllabus scavenger hunt

Additional Resource:
Use inclusive language

- People feel included when teachers use correct words
- Inclusive language is about human dignity and demonstrating respect

Additional Resource:
https://blogs.umsl.edu/diversity/files/2020/06/InclusiveLanguage_Resource_Sheet_0001.jpg
Share your gender pronouns

- Model inclusive practices
  
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- Send message that your course is a safe place for students across the gender spectrum

- If you make a mistake, apologize and move on

Additional Resources:  https://www.mypronouns.org/  
https://apastyle.apa.org/style-grammar-guidelines/bias-free-language
Learn and use students’ preferred names

- Preferred names may not be the same as what is on the course roster
- Calling students by their preferred name shows respect

Additional Resource:
https://www.genderinclusiveschools.org/names-and-pronouns
Engage students in a small group introductions activity

- Create a community of learners
- By asking questions
  - Ask students to find something that they have in common
  - What are two truths and a lie about you?
  - What is unique about you?
  - Would you rather … or …
- Using technology
  - Jamboard
  - Discussion board

Additional Resource:
https://www.tpsemath.org/teaching-strategies-and-practices
Use an interest survey to connect with students

- Allows you to get to know your students as individuals
- Ask questions, keep answers on a spreadsheet
- Walden Class Café - requirement for all faculty
  - Where are you from? What do you like to do in your spare time?
  - What name would you like your instructor and classmates to use when addressing you?
  - Is there anything else you would like to share?
- Myers-Briggs

Offer inclusive office hours

- Offer a variety of times to meet
  - Day
  - Evening

- Offer a variety of formats
  - In person
  - Video conference (zoom, skype, Facetime, Blackboard collaborate)
  - Phone call
  - Text message
  - Email

- Structures
  - One-on-one
  - Small groups

- Consider listing “student hours” rather than “office hours”
Set expectations for valuing diverse viewpoints

- Share course norms or create them with students in the course

- AMATYC webinars:
  Be open to new ideas and kind in comments to others.

Additional Resource:
https://www.ascd.org/el/articles/making-diverse-classrooms-safer-for-learning
Something to think about . . .

**Equality**

The assumption is that everyone benefits from the same supports. This is equal treatment.

**Equity**

Everyone gets the supports they need (this is the concept of "affirmative action"), thus producing equity.

**Justice**

All 3 can see the game without supports or accommodations because the cause(s) of the inequity was addressed. The systemic barrier has been removed.
What one thing will you change in your classroom as a result of attending this session?
Thank you for thinking about diversity, equity, and inclusion

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IMPACT Live!
Evan Evans
What is IMPACT Live!

- IMPACT document
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- Spotlight of the month
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Weekly Discussion

- PROWESS
- Interaction
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- Keeps IMPACT living
Meet Karen Gaines

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