Cracks in the Mathematics Pipeline: The Transition Years

2021 AMATYC Annual Conference

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The Transitional Years
Together we can Change the Narrative

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https://tinyurl.com/AMATYC-JWS
Setting the Stage for Our Conversation

**Essential Question**
How might we, strengthen, support, and advocate for issues related to improving the experiences and outcomes for our students as they complete their transition years of schooling (last two years of high school and the first two years of postsecondary)?

**Context Matters**
- Common Core Era Standards
- College and Career Ready
- Transition Courses
- Dual Enrollment
- Developmental vs Co-requisite courses
Christian
Black Man
Husband
Father
Educator
Leader
Advocate
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Why *LY-MathLN*?

How might we, the *LY-MathLN*, strengthen, support, and advocate for issues related to improving the experiences and outcomes for our students as they complete their transition years of schooling (last two years of high school and the first two years of postsecondary)?

**Actions organizations can take to**

- Make changes on a big scale.
- Equip their members to act as local change agents.
Launch Years Math Organizations Leadership Network

Math Organizations Leadership Network

The Dana Center has established a Launch Years Math Organizations Leadership Network (LY-MathLN) that brings together mathematics organizations interested in collaborating to strengthen—and advocate for—work improving the experiences and outcomes for students transitioning from the last two years of high school into the first two years of postsecondary education.

The network’s charge includes using the collective power of its participating organizations to advocate with their members for necessary changes at their local institutions and systems.

https://www.utdanacenter.org/our-work/k-12-education/launch-years/launch-years-math-organizations-leadership-network
People

**Recommendation 6:** State agencies and education systems, institutions, and schools build a strong shared understanding of—and commitment to—goals among their constituents. ([Launch Years Resource Kit | UT Dana Center](https://example.com))
Mathematics Identity

• Mirror/Window
• Positioning in the classroom
• Bringing in your whole self
• Representation matters
• Agency – We Can Do This!
Key Recommendations

• Each and every student should learn the Essential Concepts in order to expand professional opportunities, understand and critique the world, and experience the joy, wonder, and beauty of mathematics.

• High school mathematics should discontinue the practice of tracking teachers as well as the practice of tracking students into qualitatively different or dead-end course pathways.

Three Significant Structural Barriers

• Tracking students into course pathways that do not prepare students for **continued study** of mathematics.

• Tracking teachers in ways that deny certain students **access** to high-quality instruction.

• Providing **inadequate instructional supports** both before and during high school.

Role of Families in Transition Years

What role do families play in:

- Course selection
- Career selection
- Designing the Pathways
- Course Frameworks
- A focus on a holistic approach that includes both parents and students to foster behavioral, emotional, academic, and social outcomes.
Essential Core Beliefs

- All parents/families have dreams for their children and want the best for them.
- All parents/families have the capacity to support their child’s college and career pursuits.
- Parents/families and school/program staff should be equal partners in supporting a child’s pathways journey.

Source: https://ptopnetwork.jff.org/sites/default/files/Family_Engagement.pdf
Alliance of Indigenous Math Circles

Our Partners

The AIMC is privileged to be a Special Project of the American Institute of Mathematics.

We are humbled by the founding support of the Mathematical Sciences Research Institute and the Carnegie Corporation of New York. We seek additional organizations who might include our efforts (and our impacts) in their portfolios. We are also looking for mathematics professionals with experience leading math circles to join us in the effort. Contact us if you are interested!

The support of the Mathematical Association of America (www.maa.org) and the Tensor-SUMMA award makes possible the 2018, 2019, and 2021 AIMC Math Camps at Navajo Preparatory School. We are grateful for their support.

Numerous other donors and believers contribute their time, talent, and treasure to our effort. Their contributions are having lasting impacts and represent a direct investment in our future. Thank you.

The American Indian Science & Engineering Society shares our values and we are grateful for their support and encouragement in our work. Get involved at aises.org

aimathcircles.org
Higher Education Needs to Know:

- What content is being taught in 8-12
- How it is being taught
- How students are selecting “pathways”
- Where students are being advised to go next

Higher Education Can Share with PK-12:

- Placement processes -- idiosyncratic!!
  - 60% internally developed at PhD institutions
  - ACT and SAT scores are often involved
“Policies”

**Recommendation 5**: State agencies and education systems develop policies that enable smooth student transitions from secondary to postsecondary mathematics.  
([Launch Years Resource Kit | UT Dana Center](Launch Years Resource Kit | UT Dana Center))
Engaging Stakeholders

- Developing a Policy Agenda ([blog post](#))
- Cross-sector collaboration ([Launch Years State Profile TEXAS](#))
- Cultivating Buy-In ([Launch Years State Profile GEORGIA](#))
- Building Consensus ([Launch Years State Profile Washington](#))
Policy Recommendations

1. Close the Digital Divide
2. Strengthen Distance and Blended Learning
3. Assess What Students Need
4. Ensure Supports for Social and Emotional Learning
5. Redesign Schools for Stronger Relationships
6. Emphasize Authentic, Culturally Responsive Learning
7. Provide Expanded Learning Time
8. Establish Community Schools and Wraparound Supports
9. Prepare Educators for Reinventing Schools
10. Leverage More Adequate and Equitable School Funding


StudentsMakingChange.org
Changing Mindsets

- Families & Communities
- Students
- Teachers
- Administrators & School Boards
- Legislators
- Counselors & Advisors

Washington Office of Superintendent of Public Instruction
Connecting Reform to Classroom Teachers
Call to Action

• Challenge policies, practices, and structures that restrict students’ access to high quality mathematics.

• Create space for educators to collaborate on professional learning, equitable teaching, and shifting deficit perspectives to spaces that leverage strengths.
Pathways

**Recommendation 1**: Secondary and postsecondary institutions offer multiple effective and aligned mathematics pathways. ([Launch Years Resource Kit | UT Dana Center](#))
Diversity of Preparation and Pedagogy

- Large lectures
- Problem-based courses
- Inquiry-based courses
- Active learning
- Project-based courses
- Collaborative learning
- Online/Hybrid/Independent
Implementing Equitable Mathematics Instruction

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<th>Early Childhood and Elementary</th>
<th>Middle School</th>
<th>High School</th>
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<td>Implementing Equitable Mathematics Instruction</td>
<td>Mathematics instruction should be consistent with research-informed and equitable teaching practices that nurture children’s positive mathematical identities and strong sense of agency.</td>
<td>Mathematics instruction should be consistent with research-informed and equitable teaching practices that foster students’ positive mathematical identities and strong sense of agency.</td>
<td>Classroom instruction should be consistent with research-informed and equitable teaching practices.</td>
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Recommendation 3
Catalyzing Change
Implementing Equitable Mathematics Instruction

Ideas and Strategies to Further Establish Equitable Mathematics Instruction

• Culturally Relevant Pedagogy (Ladson-Billings 1995; 2014)
• Culturally Responsive Teaching (Gay 2000; 2018)
• Complex Instruction (Cohen et al. 2002; Featherstone et al. 2011; Horn 2012)
• Five Equity-Based Mathematics Teaching Practices (Aguirre, Mayfield-Ingram, and Martin 2013)
• Nine Equitable Mathematics Teaching Practices (Bartell et al. 2017)
• Universal Design for Learning (UDL; CAST 2018)

• NCTM’s (2014) Eight Mathematics Teaching Practices
• Mathematics Teaching Framework (Smith, Steele, & Raith 2017)
• Research-informed and inherently represent good teaching
Call To Action

Professional development is necessary for all faculty teaching grades K-12 through higher education to ensure that new directions in the teaching of mathematics are accessible to them and to aid them in effectively teaching mathematics.
Diverse First Year Curricula

- Remediation
- General Education
- Flavors of Calculus
- Flavors of Statistics
- Specialty Curricula
Algebra at the Middle School

Competence with algebra is the foundation for learning the more complex mathematics demanded in science, technology, engineering, and mathematics (STEM) fields

Pathway A: Geometry & Measurement First

- Grade 9 First Semester: Geometry and Measurement
- Grade 9 Second Semester: Statistics and Probability
- Grade 10 & Grade 11 First Semester: Algebra and Functions

Pathway B: Integrated Approach

- 1st year, or semesters 1 and 2: Geometry and measurement, descriptive statistics, and graphing in the coordinate plane.
- 2nd year, or semesters 3 and 4: Algebra and introduction to exponential equations and to functions and function notation.
- 3rd year, or semesters 5 and 6: Analysis of function families related to quadratic and exponential functions, probability, and statistical inference and its connection to probability.

Statistically Proficient Students Are

- “healthy skeptics” of statistical information;
- capable of asking questions to assess the validity of statistical findings;
- cognizant of the power of statistical analyses to find information and meaning in data;
- capable of documenting both their data and their analyses so that others can reproduce their analysis; and
- mindful of the ethical consequences of their experiments and analyses.

Undergraduate Students Should

- become critical consumers of statistically-based results reported in popular media, recognizing whether reported results reasonably follow from the study and analysis conducted;

- be able to recognize questions for which the investigative process in statistics would be useful and should be able to answer questions using the investigative process;

- be able to produce graphical displays and numerical summaries and interpret what graphs do and do not reveal;

- recognize and be able to explain the central role of variability in the field of statistics;

- recognize and be able to explain the central role of randomness in designing studies and drawing conclusions;

- gain experience with how statistical models, including multivariable models, are used;

- demonstrate an understanding of, and ability to use, basic ideas of statistical inference, both hypothesis tests and interval estimation, in a variety of settings;

- be able to interpret and draw conclusions from standard output from statistical software packages; and

- demonstrate an awareness of ethical issues associated with sound statistical practice.

2016 GAISE College Report
Students who take MOWWM or CTE/Science as 3rd credit may take Modern Algebra II as 4th credit.
Determination of need statewide

Modeling Our World with Mathematics

- Meaningful mathematics for students who have not achieved with high success rates
- Additional options for 3rd credit of math
- Support for ongoing development of high school math skills and processes for students not yet ready for Algebra II
- Support for Collection of Evidence course and tasks (originally)

Washington Office of Superintendent of Public Instruction
Contextual Modular Design for Relevance and Flexibility

- Getting Started
- Health & Fitness
- Environmental Science
- Civic Readiness
- Finances for Life
- The Arts
- The Digital World
Course Frameworks for Mathematics Pathways

Frameworks for new courses are among the tools developed as part of the Launch Years initiative. These frameworks are designed to help systems build math pathways from high school through higher education and into the workplace.

Our teams of content experts in K-12 and higher education are designing frameworks for:

- a high school-to-college transition course encompassing multiple domains of mathematics;
- a modern Algebra II course; and
- a high school data science course.

https://www.utdanacenter.org/our-work/k-12-education/launch-years/launch-years-course-frameworks
WEBINAR 3

Content that Matters for Transition Courses: Meaningful Content for Model Courses

Thurs., Nov. 18
6:00 pm CT
How will you hold yourself accountable to make a difference?

**Essential Question**

*How might we,* strengthen, support, and advocate for issues related to improving the experiences and outcomes for our students as they complete their transition years of schooling (last two years of high school and the first two years of postsecondary)?
Launch Years Resource Kit

Information, Tools, and Resources to Implement the Launch Years Recommendations

Implementation Resources for Launch Years Recommendations

In Launch Years: A New Vision for the Transition from High School to Postsecondary Mathematics, seven recommendations offer concrete strategies to establish policies, practices, and structures that enable students to transition seamlessly from high school to postsecondary and toward fulfilling careers and active participation in our data-driven society. The report also explains the ways in which these recommendations will lead to more equitable outcomes. An abbreviated version of the

https://www.utdanacenter.org/our-work/k-12-education/launch-years/launch-years-resource-kit
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