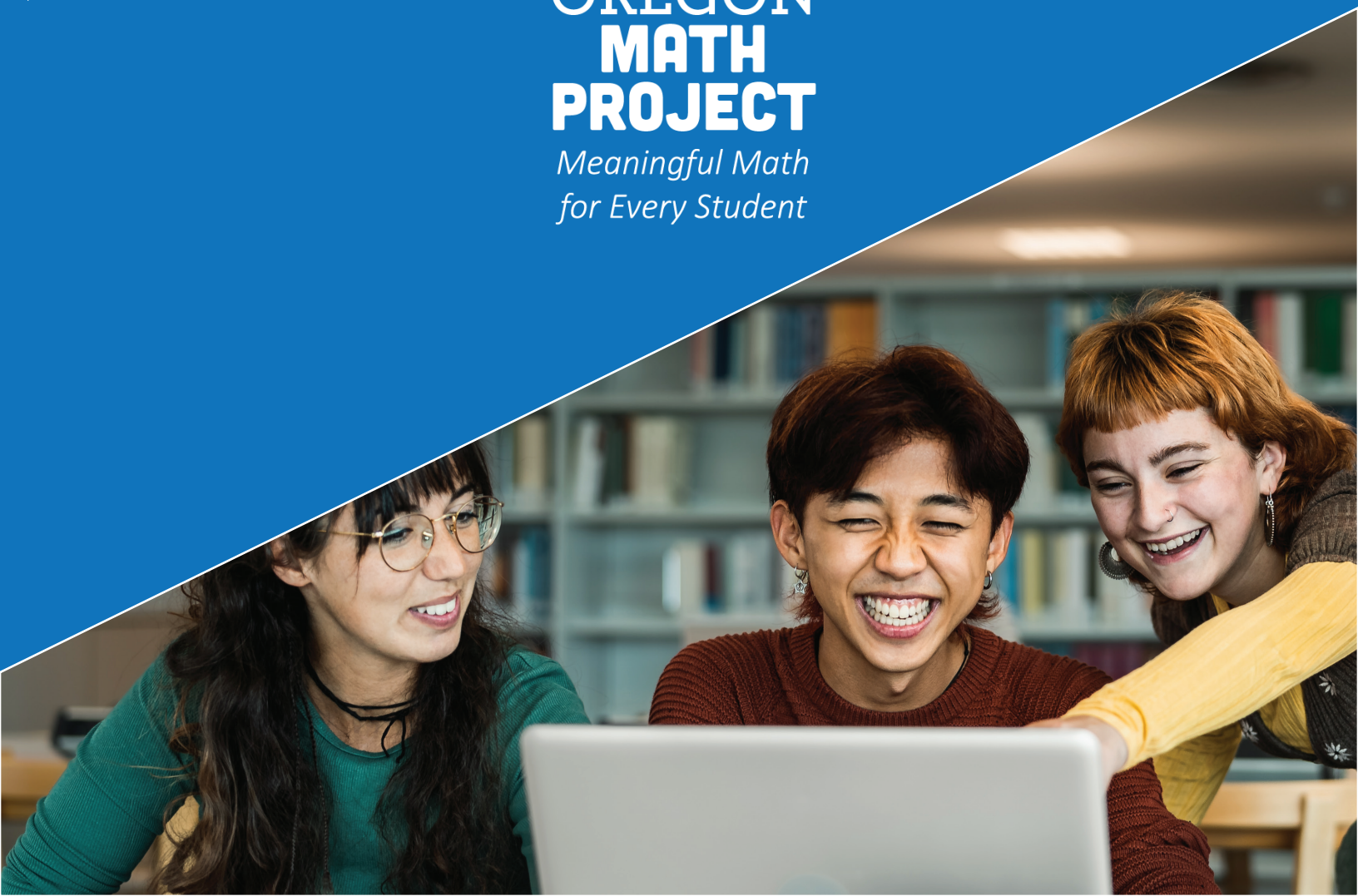
# High School Math Pathways Project

## *Communication Toolkit*

OREGON MATH PROJECT

*Meaningful Math for Every Student*



# Meaningful Math for All

OREGON MATH PROJECT
*Meaningful Math for Every Student*

Realizing the vision of math education in Oregon includes ensuring that all students attain mathematics proficiency. This vision is realized through access to high-quality instruction that includes both challenging and relevant content in a learning environment where each student receives the support they need to succeed in mathematics. This is the work of the Oregon Math Project.

The Oregon Math Project (OMP) advances mathematics education in the state by cultivating a network of educators that promotes equitable math achievements for all students through guidance and the support of policies, standards, curricula, assessments, and instructional best practices.

This document is the full communication toolkit for Administrators, School Counselors, and Math Educators & Specialists. This is a guide and resource for implementing Oregon High School Math Pathways.

*This Communication Toolkit provides the full work and list of resources. For a brief introduction and summary of this project, see the High School Math Pathways Executive Summary on the* ***Oregon Math Project webpage****.*

***NOTE:***

*This Communication Toolkit contains multiple pages and has been designed with screens in mind. At any time, if you wish to go back to the table of contents of this document, click the title of the project in any footer.*



Disclaimer: The Communication Toolkit was funded by a 2021 Oregon Mathways Grant. Linked resources in this document draw upon both internal and external sources for informational purposes. Inclusion of external materials does not necessarily indicate Oregon Department of Education endorsement.

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# Introduction to the Toolkit

## Why are high school math course sequences changing?

Math education must evolve to meet the educational and career needs and aspirations of all students. We need to prepare Oregon students for 21st century careers and to be informed and engaged citizens in a world with changing technology that requires data literacy. Math instruction must support all students and offer options to help them reach their educational goals and career aspirations.

### PURPOSE

The purpose of this toolkit is to support Oregon school district administrators, school counselors, and math educators and specialists to communicate about the changes to high school mathematics defined as the Oregon Math Project.

### STRUCTURE

The toolkit is structured to provide overview information about the changes to high school mathematics followed by tools aligned to each cornerstone that administrators, counselors, and math leaders and specialists can use to communicate and enact the Oregon Math Project.

**The vision of mathematics education in Oregon is to provide all students with a mathematical foundation that supports them to make sense of the world around us, to communicate effectively, and to discover innovative solutions.**

# Oregon is Part of a National Movement

## Aligning K-12 with Higher Education and Career Readiness

Oregon seeks to align the two systems of K-12 and higher education in order to change the trajectory for the future generations of students, providing them with the tools they need to achieve their full potential. This includes meeting the demands of the ever-changing workforce and ensuring students have the skills to meet those needs.

The Oregon Department of Education (ODE), Higher Education Coordinating Commission (HECC) and Oregon Community College Association (OCCA) are in partnership to align the math requirements for high school graduation and college admission. Representatives from a wide range of institutions collaborated to design an equitable admissions process[1] rather than limiting students to a few specific math course titles. The work continues with aligning dual-credit high school College Now math courses with the Common Course Numbering[2] completed by higher education. The common course numbering system, initiated through Oregon Senate Bill 233, aims to identify and articulate course learning outcomes implemented by all 24 public higher education institutions in Oregon.

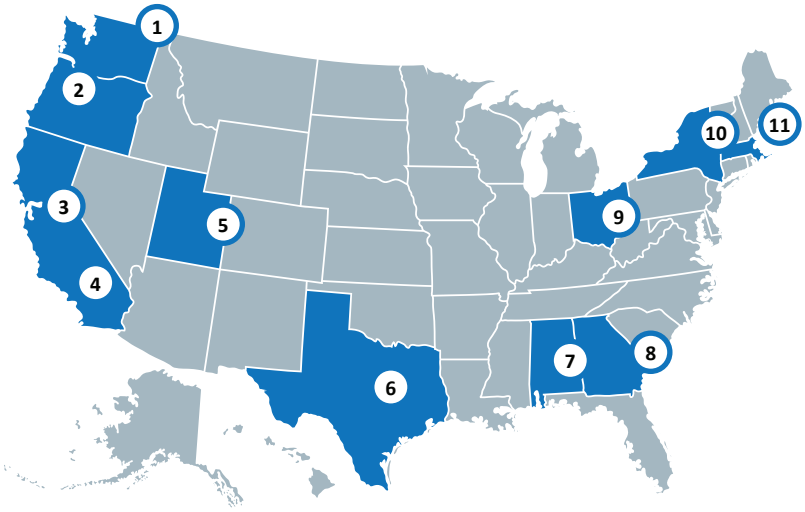
This work is not just occurring in the state. Oregon has joined a national movement through the Launch Years Initiative[3] in modernized systems aimed at modernizing math systems. In modernized systems, math equips all students with the mathematical tools that will help them pursue their future goals.

**Oregon has joined 25+ other states in a nationwide effort to improve K-16 math pathways and outcomes.**



(1) *Admissions Process*
(2) *Common Course Numbering*
(3) *Launch Years Initiative*

# Modernized Math Initiatives Across the Nation




This map includes a sample of other states' initiatives to build alternatives to the traditional math sequence:

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Algebra → Geometry → Advanced Algebra

**1 Washington**
Legislated student choice in their 3rd year high school math class.
- *New Pathway Policies*

**2 Oregon**
Updated admissions requirements at public colleges and universities. Algebra 2 is no longer a requirement for admission starting Fall 2024.
- OR Admissions : [EOU] [OIT] [OSU] [PSU] [SOU] [UO] [WOU]

**3 San Francisco Unified School District, CA**
Removed tracks in K-12 mathematics courses and create a compacted Algebra 2 + Precalculus course.
- *Detracked Mathematics Progress*
- *Alg2+Precalc*

**4 California**
Updated admission policy at Stanford.
*Note: The UC System policy was being reviewed in the 2023-24 SY. Please refer to UC System webpages for the latest information.*
- *UC System*
- *Stanford's New Math Admissions*

**5 Utah**
Engaged in high school math pathways work that supports students' informed course-taking decisions.
- *Graduation Pathways*
- *Informed Decisions*

**6 University of Texas at Austin, TX**
Started the Launch Years Initiative through the Charles Dana Center to support 20+ states and districts in implementing modern and open math pathways.
- *Dana Center Mathematics Pathways*
- *States Involved in Math Pathways Reform*

**7 Alabama**
Reworked their high school math standards to focus on essential concepts. High school students now select math courses that best align with their goals.
- *Alabama Course of Study Mathematics*

**8 Georgia**
Ended remedial mathematics course-taking in college and has seen dramatic increases in equitable outcomes.
- *Alternative To Remedial Education*

**9 Ohio**
Established multiple math pathways for high school students aligned to postsecondary careers.
- *Math Modeling and Reasoning*
- *Decision Tree*

**10 Ithaca City School District, NY**
Removed tracks in K-12 mathematics, centering equity and community voice throughout the process.
- *What's wrong with tracking students by math ability?*

**11 Harvard University, MA**
Updated admissions priorities that emphasize forms of service and deep learning over high status course-taking and test scores.
- *New Admissions Priorities*

# Re-Engineering Math Systems for Oregon Students

Uri Treisman of the University of Texas at Austin shared a metaphor of math education being designed as a ***filter***, one that sorts and labels students as "math" or "non-math" people. In place of the filter, the challenge before us is to reimagine an equitable system that, like a ***pump***, moves and lifts all students to their goals.

## FILTER: Engineered for Inequity

For generations, we have limited opportunities and access for students by promoting a one-size-fits-all approach to high school mathematics, marching all students on a path designed for success in Calculus. This approach has privileged some students and either left out or pushed out other students.

Currently, only about one third(1) of Oregon's high school students meet proficiency on statewide math test scores. Even fewer students of color, economically disadvantaged, and English learners demonstrate proficiency. Students report that they do not see relevance in mathematics courses and do not see themselves as "math people."

## PUMP: Re-Engineering for Equity

At the heart of this work is reimagining the math education system to stop it from acting as a filter in the system that sorts students into different educational tracks, and transform it into a pump that lifts a student to achieve whatever educational and career goals they have for themselves.

The Oregon Math Project encompasses multiple initiatives designed to increase the number of students who are on track to graduate. These initiatives also have a goal of increasing opportunities for students to learn and apply mathematics that will prepare them for the next phase of their mathematical journey.

## What are Oregon students saying?

*"Give more open-ended assignments that make me think and research real-world problems and ways we could solve them."*

**Student in Corvallis School District**

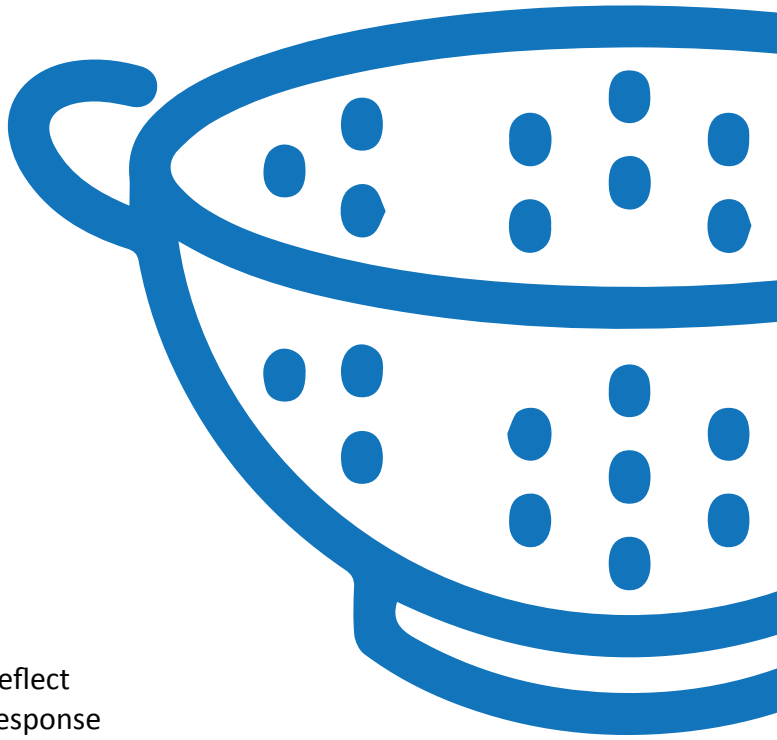
*"In regular Algebra you took notes and did problems. In this class we do projects. I'm learning more math and it sticks."*

**Student in Salem-Keizer School District**



(1) *ODE Assessment Group Reports*

# Engineered for ***Inequity***



## *Where we are now*

### Simple starting actions to help understand the filters happening in your communities:

#### Start with Stories

Use this protocol to support your staff and community to reflect on their own math stories and how this may inform their response to efforts to transform the mathematics education system.

**Resource Tool:** *Starting with Story*

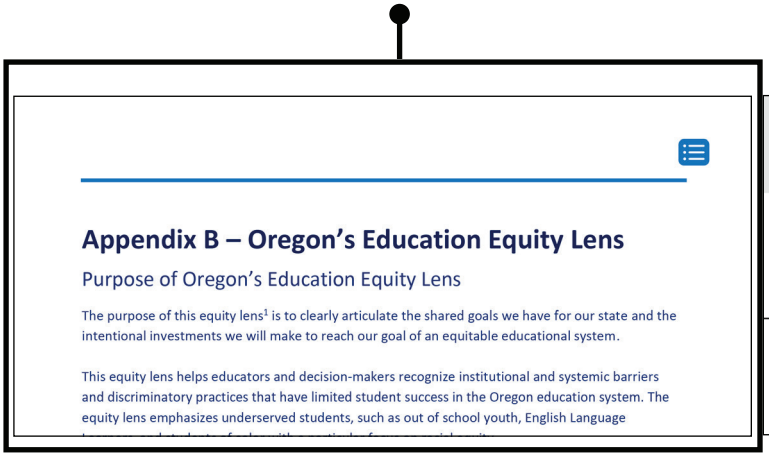
#### Understand how math may be functioning a filter in your system

Use this Oregon Department of Education equity lens to assess how your math program is designed and who is filtered out of your mathematics education program.

**Resource Tool:** *Oregon Department of Education Equity Lens*

***NOTE:***
Throughout this document, you will find ***internally linked resources***. If selected, you will be taken to the bottom of this document in the Attached Resources & External Links section.

Click on the blue icon in the top right corner to go back to the main page (shown below)

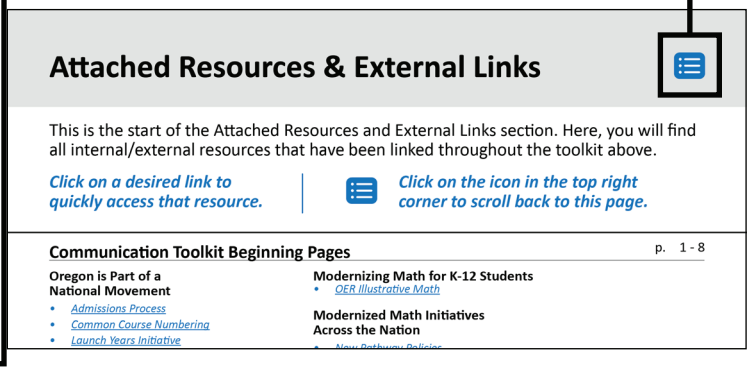


**Appendix B – Oregon's Education Equity Lens**

Purpose of Oregon's Education Equity Lens

The purpose of this equity lens[1] is to clearly articulate the shared goals we have for our state and the intentional investments we will make to reach our goal of an equitable educational system.

This equity lens helps educators and decision-makers recognize institutional and systemic barriers and discriminatory practices that have limited student success in the Oregon education system. The equity lens emphasizes underserved students, such as out of school youth, English Language



**Attached Resources & External Links**

This is the start of the Attached Resources and External Links section. Here, you will find all internal/external resources that have been linked throughout the toolkit above.

*Click on a desired link to quickly access that resource.* | *Click on the icon in the top right corner to scroll back to this page.*

**Communication Toolkit Beginning Pages** p. 1 - 8

**Oregon is Part of a National Movement**
- *Admissions Process*
- *Common Course Numbering*
- *Launch Years Initiative*

**Modernizing Math for K-12 Students**
- *OER Illustrative Math*

**Modernized Math Initiatives Across the Nation**

# Re-engineered for ***Equity***

*Where we want to be*

## Simple starting actions to help understand how to make math more like the pump:

### Communicate the vision of modern mathematics

The critical work outlined in this toolkit can raise questions and concerns. Here you will find advice about how to respond and resources that offer additional support.

**Resource Tool:** *High School Math Pathways FAQ*

Clear messaging around national and state efforts tied to your district's vision, plan, and readiness will help build stakeholder support.

**Resource Tool:** *Key Talking Points*

# The Four Cornerstones

The Oregon Math Project has identified cornerstones that come together to create a **more modern and equitable system of mathematics within the state.**


## Four Cornerstones Principles of the Oregon Math Project

**Craft a vision for shifting your mathematics program from a filter to a pump.**

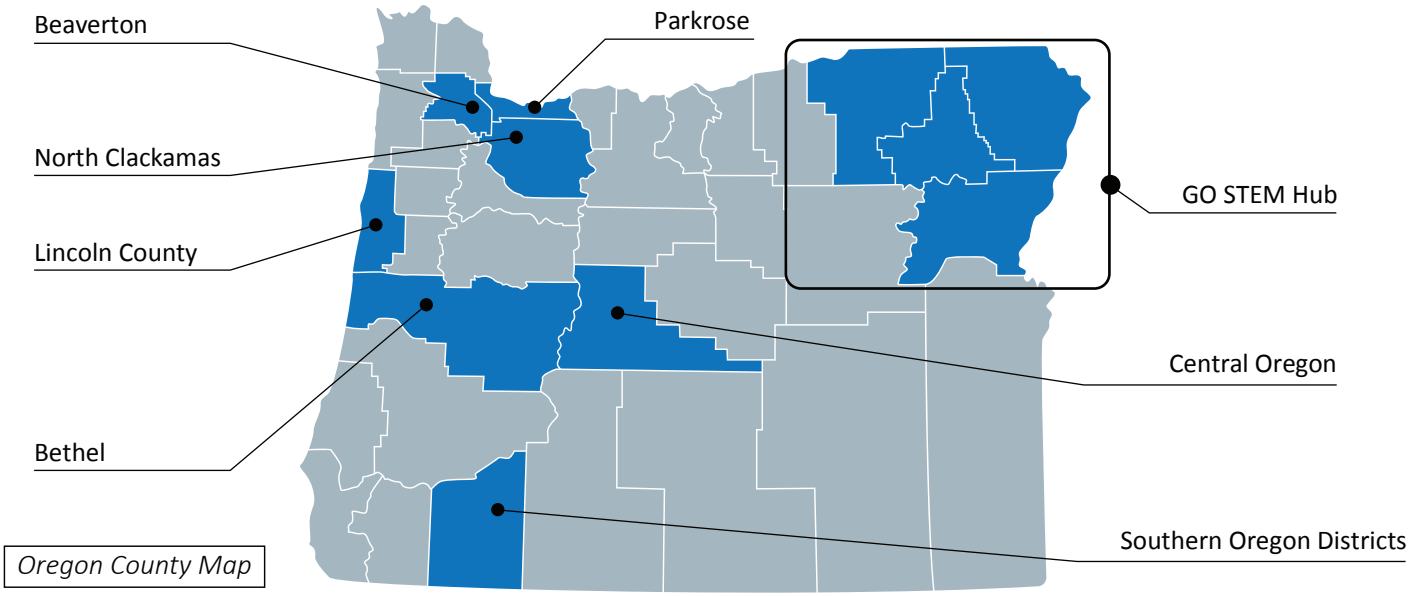
Use these resources to engage multiple stakeholders in a process to craft a unique vision for your context to that aligns to the cornerstones of the Oregon Math Project: Focus, Engagement, Belonging and Pathways

**Resource Tool:** *Where Are You Now?*

**Case Study:** *Gresham Barlow Visioning Work*

# Modernizing Math for K-12 Students

Using the **Oregon Math Project Cornerstones**, Oregon districts are reshaping their high school math programs to better help students reach their college and career goals. These efforts include: innovating math program data collection and use, adopting curriculum and classroom practices that center student agency, providing modern and aligned course options, and opening math pathways to all students. This map highlights some of the Oregon Math Project-aligned initiatives happening across Oregon.




*Oregon County Map*

**Beaverton School District**
Offering a new modernized math pathway: data science & statistics, and evaluating the four cornerstones (focus, engagement, pathways, belonging in their K-12 math program.

**Bethel School District**
Using student data to drive pathways decisions, which led to detracking their K-12 math program.

**Central Oregon Districts**
Piloting a new third credit math course: Data Science.

**GO STEM Hub**
Supporting six school districts in piloting a third credit course in the quantitative reasoning pathway.

- *Wallowa County: Joseph SD, Enterprise SD*
- *Baker County: Pine Eagle SD*
- *Umatilla County: Ukiah SD*
- *Union County: Union SD, North Powder Union SD*

**Lincoln County School District**
Piloting a new third credit course, Financial Algebra, offered in the quantitative reasoning pathway.

**North Clackamas School District**
Increasing engagement and belonging by using complex instruction practices in their detracked middle school math courses.

**Parkrose School District**
Using student-centered data to drive their belonging work to detrack their K-12 math program.

**Southern Oregon Districts**
Aligning their new high school math pathways with their CTE(1) programs.

**Umatilla School District**
Bringing better focus and engagement to their math courses by using Illustrative Mathematics (OER).



**(1) CTE:** Career and Technical Education

# Navigating the Cornerstones & Resources

This toolkit has been designed for digital use and is an interactive PDF where icons and links can be selected. his page describes how to navigate the Cornerstones portions of this toolkit.


## The Four Cornerstones

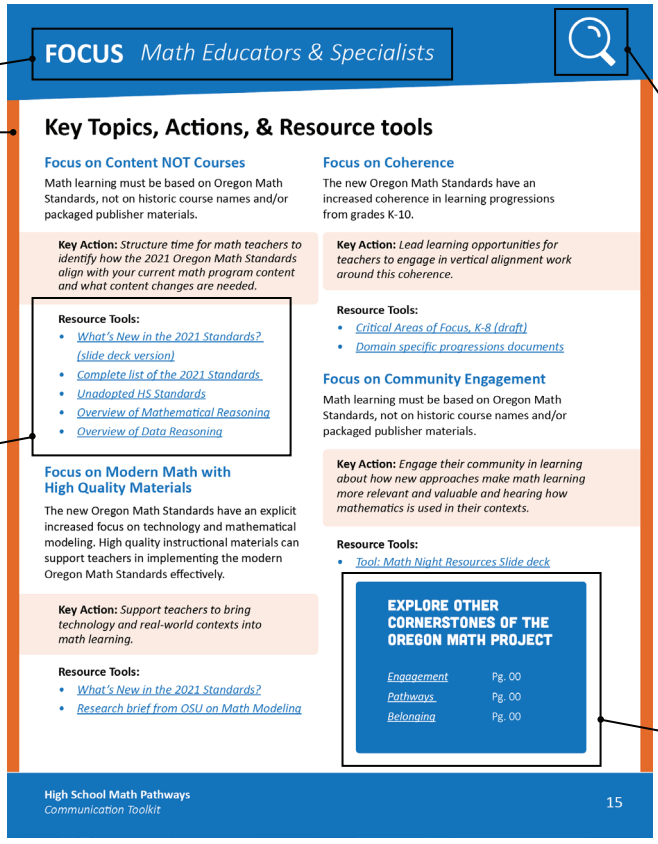
Each Cornerstone portion is divided into four sections and color-coded for easy reference. The introduction (blue) is a basic overview of some key topics and definitions of each cornerstone. The following three sections (purple, green, orange) are for specific audiences.

- **Introduction**
- **Administrators**
- **School Counselors**
- **Math Educators & Specialists**

Cornerstone, & Audience

Throughout the cornerstone pages, you will find external and internal resources/tools.

**NOTE**: Clicking on an internal resource will bring you to the *Attached Resources & External Links* section at the end of the document.



**FOCUS** *Math Educators & Specialists*

**Key Topics, Actions, & Resource tools**

**Focus on Content NOT Courses**

Math learning must be based on Oregon Math Standards, not on historic course names and/or packaged publisher materials.

**Key Action:** *Structure time for math teachers to identify how the 2021 Oregon Math Standards align with your current math program content and what content changes are needed.*

**Resource Tools:**

- *What's New in the 2021 Standards? (slide deck version)*
- *Complete list of the 2021 Standards*
- *Unadopted HS Standards*
- *Overview of Mathematical Reasoning*
- *Overview of Data Reasoning*

**Focus on Modern Math with High Quality Materials**

The new Oregon Math Standards have an explicit increased focus on technology and mathematical modeling. High quality instructional materials can support teachers in implementing the modern Oregon Math Standards effectively.

**Key Action:** *Support teachers to bring technology and real-world contexts into math learning.*

**Resource Tools:**

- *What's New in the 2021 Standards?*
- *Research brief from OSU on Math Modeling*

**Focus on Coherence**

The new Oregon Math Standards have an increased coherence in learning progressions from grades K-10.

**Key Action:** *Lead learning opportunities for teachers to engage in vertical alignment work around this coherence.*

**Resource Tools:**

- *Critical Areas of Focus, K-8 (draft)*
- *Domain specific progressions documents*

**Focus on Community Engagement**

Math learning must be based on Oregon Math Standards, not on historic course names and/or packaged publisher materials.

**Key Action:** *Engage their community in learning about how new approaches make math learning more relevant and valuable and hearing how mathematics is used in their contexts.*

**Resource Tools:**

- *Tool: Math Night Resources Slide deck*

**EXPLORE OTHER CORNERSTONES OF THE OREGON MATH PROJECT**

| | |
|---|---|
| *Engagement* | Pg. 00 |
| *Pathways* | Pg. 00 |
| *Belonging* | Pg. 00 |

High School Math Pathways
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Each icon in the top right of the cornerstone pages will link you back to the introduction section.

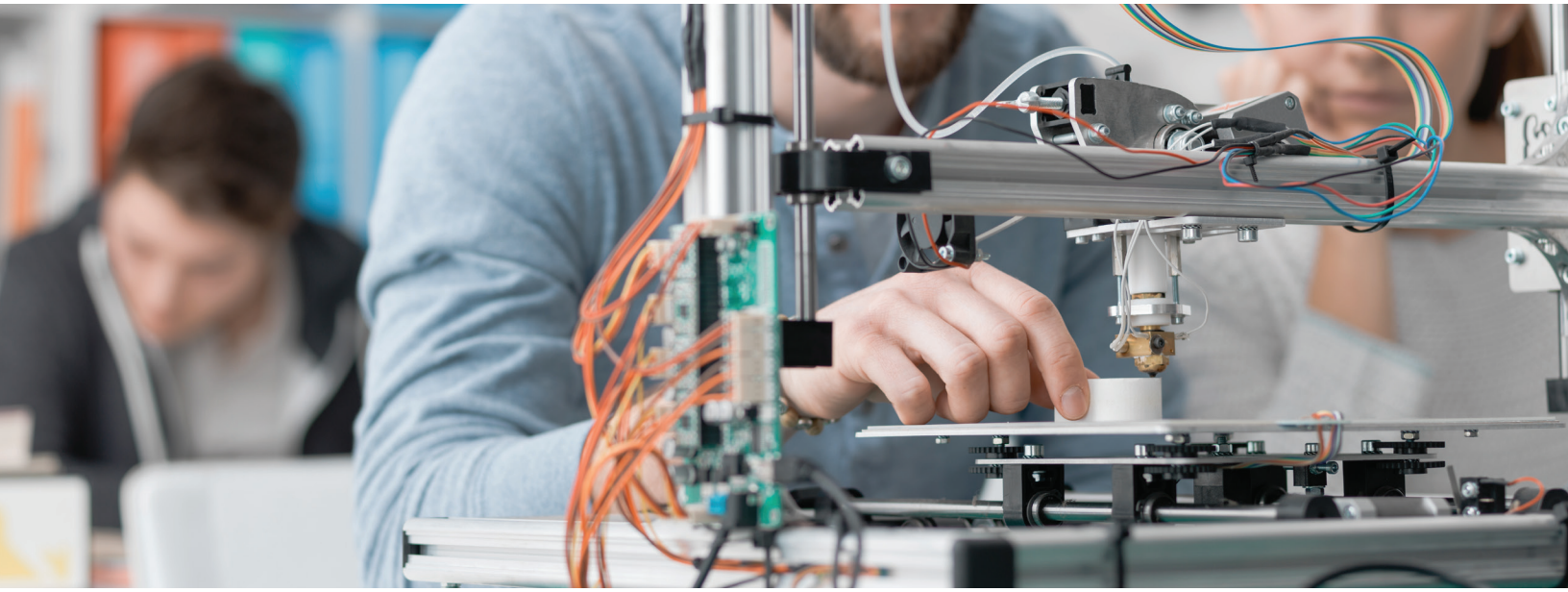
When you reach the end of a cornerstone section, you have the option to pick a new cornerstone to directly skip to that topic.

If you wish to go back to the table of contents of this document, click the title of the document here.

# FOCUS

# What do we mean by focus?

Equitable, modern and meaningful math programs ensure that learning experiences in every grade and course are ***focused*** on core mathematical content and practices that lead to mathematical understanding as the content and practices progress purposefully across grade levels.



## What's new in the 2021 Oregon Math Standards?

### Focus on Content, *not* Courses

- Modern mathematics courses need to focus on *2021 Oregon Math Standards*.
- Don't make assumptions about what is called "Algebra 1." Much content has shifted between traditionally named courses.

### Major Shifts in the New Standards:

- **Brand new standards about data reasoning.**
  This means a new K-12 progression of standards that support students to reason about data.
- **Emphasize *reasoning* about all domains of mathematics**
  This means students shouldn't be following procedures without understanding why they work and where they came from.
- **Emphasize *authentic* math modeling experiences**
  This means students make sense of the world around them with grade level appropriate mathematics.
- **Emphasize modern *technology***
  This means using technology for calculating, graphing and computing in service of reasoning and authentic problem solving.

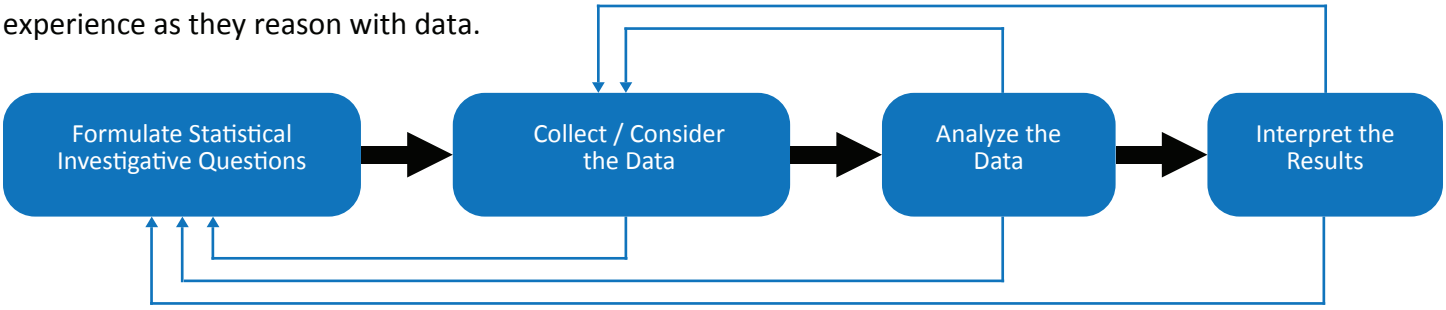
# An Introduction to FOCUS

## Data Reasoning: *A New Domain in the 2021 Oregon Math Standards*

All students in Oregon will now experience Data Reasoning as part of their K-12 math learning.

***What is Data Reasoning?***

The *GAISE II Data Reasoning Framework* shows the statistical problem-solving process Oregon students will experience as they reason with data.




***Why is this new domain important?***

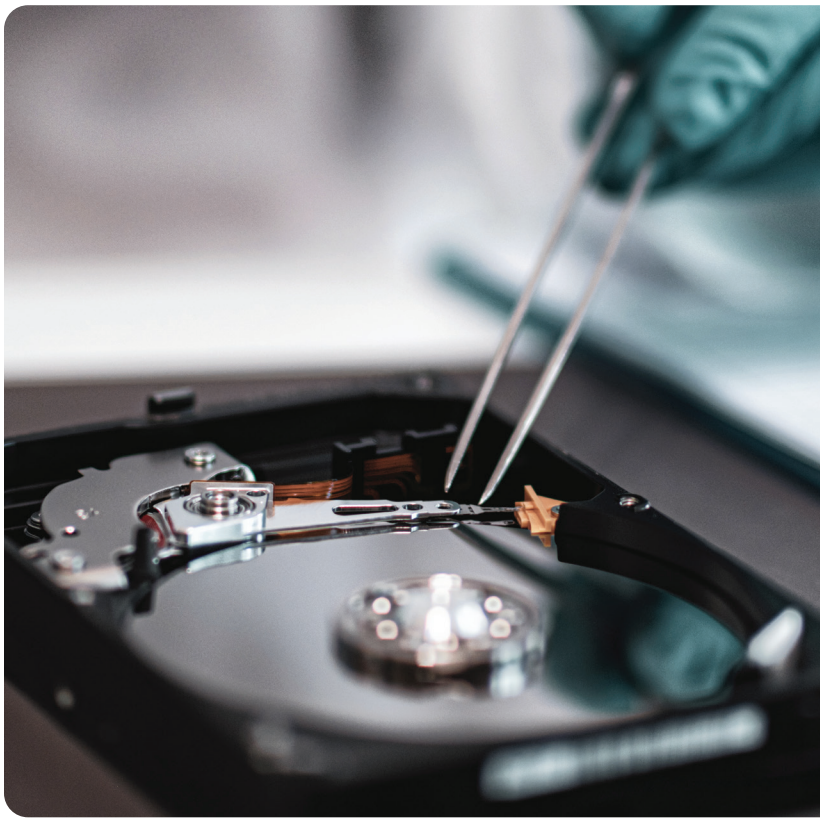
Modern math programs equip every K-12 student with the data literacy skills needed in our modern world. These skills open doors to higher education, high-paying careers, and align with many students' goals.

## Data Science: *An Exciting New Option for +1 Math Courses in Oregon*

As students complete their learning of the K-12 Data Reasoning Standards, they are well positioned to go deeper with data in a +1 math course.

***What is Data Science?***

Data Science is a *rapidly growing field and very popular college major*. Data Science courses for high school students are *rolling out at many US high schools*; many Oregon high schools are planning to, piloting, or already offering Data Science as a +1 math course.



***Find more detailed information and resources about Data Reasoning and Data Science here.***

# Key Topics, Actions, & Resource tools

## Focus on Content, Not Courses

K–12 instructional programs in Oregon must be planned in alignment with the adopted math content standards, not on historic course names and/or packaged publisher materials.

**Key Action:** *Structure time for math teachers to identify how the 2021 Oregon Math Standards align with your current math program content and what content changes are needed to modernize their math courses.*

**Resource Tools:**

- *Full List of 2021 Oregon Math Standards*

## Focus on Modern Math with High-Quality Materials

The new Oregon Math Standards have an explicit increased focus on technology and mathematical modeling. High-quality instructional materials can support teachers in implementing the modern Oregon Math Standards effectively.

**Key Action:** *Support teachers to anchor math learning with modern technology, real-world contexts through the use of high-quality materials.*

**Resource Tools:**

- *Research brief from OSU on Math Modeling*
- *Oregon Department of Education Instructional Materials Adoption Toolkit*
- *Instructional Materials Adoption Support - Example from Lane ESD*

## Focus on Coherence

The new Oregon Math Standards have an increased coherence in learning progressions from grades K-10.

**Key Action:** *Lead learning opportunities for teachers to engage in vertical alignment work around this coherence.*

**Resource Tools:**

- *Domain specific progressions documents*

## Focus on Community Engagement

The Oregon Math Project offers the opportunity to bolster existing community engagement efforts by integrating the topic of mathematics.

**Key Action:** *Engage community members by listening to how mathematics is used in local and relevant contexts and learning about how modern approaches to mathematics can incorporate and connect to the community.*

**Resource Tools:**

- *Community Engagement Toolkit* (from Aligning for Student Success: Integrated Guidance for Six ODE Initiatives)
- *Tool: Math Night Resources Slide deck*

# Key Topics, Actions, & Resource tools

## Focus on Content, Not Courses

Math learning must be based on Oregon Math Standards, not on historic course names and/or packaged publisher materials.

**Key Action:** *Understand these content changes at a high level so they can emphasize that historic course titles (i.e. "Algebra") have updated content associated with them.*

## Focus on Community Engagement

The Oregon Math Project offers the opportunity to bolster existing community engagement efforts by integrating the topic of mathematics.

**Key Action:** *Engage their community to ensure families understand the vision of the Oregon Math Project and how they can be involved in the process.*

**Resource Tools:**

- *Community Engagement Toolkit* (from Aligning for Student Success: Integrated Guidance for Six ODE Initiatives)
- *Tool: Math Night Resources Slide deck*

## Focus on Coherence

School counselors serve the critical role of supporting students in planning for their post-secondary futures.

**Key Action:** *Support their school in staying aligned with national changes so students have all doors open to them upon graduation.*

**Resource Tools:**

- *New Admissions Requirements for Oregon*
- *A New Calculus for College Admissions*
- *Link to SCED codes*
- *Link to NCAA guidance*
- *Link to Dana Center resources*

# Key Topics, Actions, & Resource tools

## Focus on Content, Not Courses

K–12 instructional programs in Oregon must be planned in alignment with the adopted math content standards, not on historic course names and/or packaged publisher materials.

**Key Action:** *Structure time for math teachers to identify how the 2021 Oregon Math Standards align with your current math program content and what content changes are needed.*

**Resource Tools:**

- *Overview of New Standards - Presentation*
- *Unadopted HS Standards*
- *Modernizing Math Classes with Data*

## Focus on Modern Math with High-Quality Materials

The new Oregon Math Standards have an explicit increased focus on technology and mathematical modeling. High-quality instructional materials can support teachers in implementing the modern Oregon Math Standards effectively.

**Key Action:** *Support teachers to bring technology and real-world contexts into math learning.*

**Resource Tools:**

- *Research brief from OSU on Math Modeling*

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**Resource Tools:**

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### EXPLORE OTHER CORNERSTONES OF THE OREGON MATH PROJECT

# ENGAGEMENT

# What do we mean by engagement?

Mathematical learning happens in environments that motivate all students to ***engage*** with relevant and meaningful issues in the world around them.

***Modern pedagogical moves need to be implemented to shift from a system that filters to a system that pumps.***

## Ambitious Math Teaching: Engagement & Belonging

Ambitious math teaching describes inclusive moves that promote students of all abilities, racial, ethnic, and class backgrounds in understanding mathematical ideas, participating in discourse, and solving authentic problems. Based in the framework of *Complex Instruction*, Ambitious Math Teaching goes further to explicitly center marginalized students.

**Learn More:**

- *Asynchronous course*
- *Principles to Action*

## Focus on Standards

- Modern mathematics courses need to focus on the 2021 Oregon Math standards.
- Don't make assumptions about what is called "Algebra 1." Much content has shifted between traditionally named courses.
- Ensure teachers are reading the new standards carefully and check:
    - What is the evidence that students are ***REASONING*** about mathematics?
    - Which standards require ***AUTHENTIC*** math modeling experiences?
    - Where can ***TECHNOLOGY*** take the place of rote procedural calculations?

## Equity-Based Mathematics Principles

*Aguirre, Mayfield-Ingram and Martin (2013)*

### Going Deep with Mathematics

Lessons include high cognitive demand tasks that support and strengthen student development of the strands of mathematical proficiency, including conceptual understanding, procedural fluency, and problem solving and reasoning.

### Leveraging Multiple Mathematical Competencies

Recognizing and positioning students' various mathematical backgrounds and competencies is a key equity-based practice.

### Affirming Mathematics Learners' Identities

Instruction that values multiple mathematical contributions, provides multiple entry points, and promotes student participation in various ways (teams, groups, and so on) can aid the development of a student's mathematical learning identity.

### Challenging Spaces of Marginality

Practices that embrace student competencies, diminish status, and value multiple mathematical contributions are essential to cultivate.

### Drawing on Multiple Resources of Knowledge

Equity-based teaching includes helping students bridge everyday experiences to learn mathematics, capitalizing on linguistic resources to support mathematics learning, recognizing family or community mathematical practices to support mathematics learning, and finding ways to help students learn and use mathematics to solve authentic problems that affect their lives.

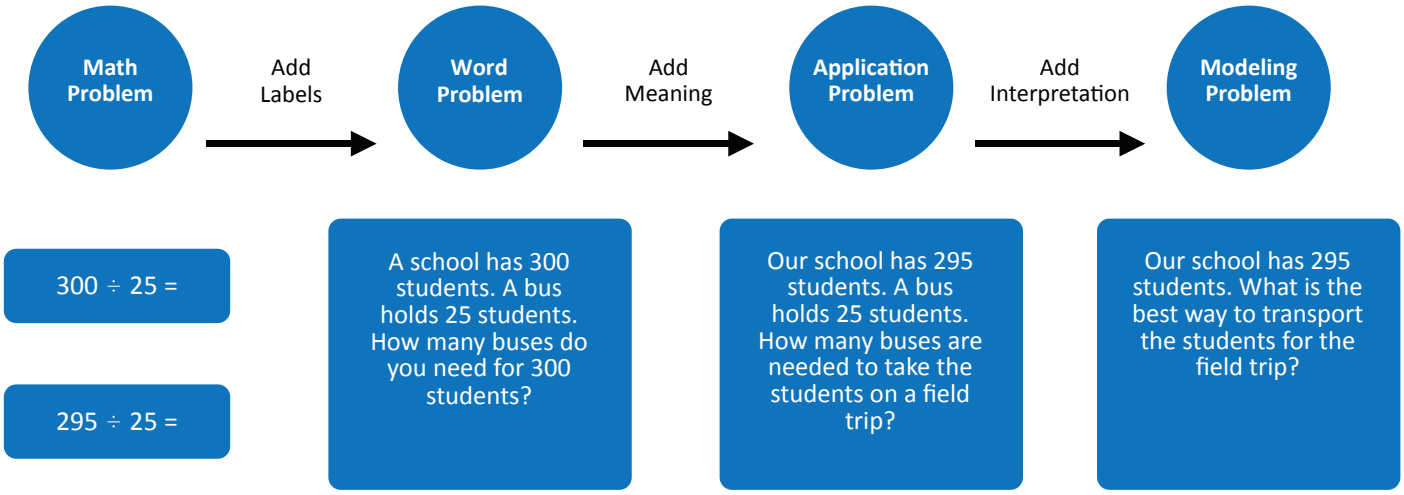
# An Introduction to ENGAGEMENT

## Engage in Relevant Tasks Through Mathematical Modeling

During math modeling tasks, students apply mathematical thinking and concepts to real world scenarios. Mathematical modeling tasks can draw from students' funds of knowledge and have them address problems they care about, while helping them learn how to apply math flexibly and beyond the classroom.

**Resource Tool:** *Research brief from OSU on Math Modeling*

## How are Math Modeling Problems Different from Traditional Math Problems?




## Integrate Technology

2021 Oregon Math Standards explicitly call for the use of technology, particularly at the high school level. According to the *National Council of Teachers of Mathematics*, "an excellent mathematics program integrates the use of mathematical tools and technology as essential resources to help students learn and make sense of mathematical ideas, reason mathematically, and communicate their mathematical thinking" (2014). Ultimately, we need to position our students as the thinkers, designers and creators of the next generation of technology that they will become.

**Examples in Action:**

- *Desmos*
- *GeoGebra*
- *Mathigon*
- *CODAP*

## Helpful Verbs

- **Conceptual Understanding**: connect, represent, compare/contrast, critique
- **Procedural Fluency**: find the error, estimate, generalize, find efficiencies
- **Strategic competence**: represent a situation, use a model, identify relationships
- **Adaptive reasoning**: defend, critique, choose, justify, prove
- **Productive disposition**: reflect, notice growth, set goals, apply math to areas of interest

*National Research Council. (2001). Adding it up: Helping children learn mathematics. J Kilpatrick, J. Swafford, and B. Findell (Eds.). Mathematics Learning Study Committee, Center for Education, Division of Behavioral and Social Sciences and Education. Washington, DC: National Academy Press.*

# Key Topics, Actions, & Resource tools

## Engage All Students with Ambitious Math Teaching

The Oregon Math Project applies the ideas of Ambitious Math Teaching in which students of all abilities, racial, ethnic, and class backgrounds, engage with authentic math tasks through discourse and collective problem solving.

**Key Action:** *Ensure teachers have access to professional development aligned to the principles of Ambitious Math Teaching.*

**Resource Tools:**

- *Complex Instruction - Stanford University*
- *Research Brief from OSU on Classroom Discourse*

## Engage All Students with Modern Mathematics

The new Oregon Math Standards have an explicit increased focus on technology, mathematical modeling, and data reasoning standards. Integrating these three elements authentically takes training and support.

**Key Action:** *Ensure teachers have access to professional development on integrating technology, mathematical modeling, and data reasoning.*

**Resource Tools:**

- *Research Brief from OSU on Math Modeling*
- *Modernizing Math Classes with Data*

# Key Topics, Actions, & Resource tools

## Engage All Students with Ambitious Math Teaching

Mathematical learning happens in environments that motivate all students to engage with relevant and meaningful issues in the world around them. ***Graduation requirements can, at times, place undue pressure on counselors to emphasize credit attainment over engaging learning experiences.***

**Key Action:** *Communicate the values of engaging mathematical learning experiences and work with administrators and math educators to ensure any alternative credit attainment methods offer high quality learning experiences.*

**Resource Tools:**

- *Evaluation Tool for Alternative Math Credit Bearing Courses*

## Engage All Students with Modern Mathematics

Mathematical learning happens in environments that motivate all students to engage with relevant and meaningful issues in the world around them. ***What is relevant and meaningful is unique to individual students and counselors play a critical role in learning about individual students.***

**Key Action:** *Share the values, aspirations and desires of individual students - particularly those who are marginalized in traditional mathematics programs - so that the reformed mathematics program can embrace content and pedagogies that will engage students.*

**Resource Tools:**

- *Letter to Teacher*

# Key Topics, Actions, & Resource tools

## Engage All Students with Ambitious Math Teaching

The Oregon Math Project applies the ideas of Ambitious Math Teaching in which students of all abilities, racial, ethnic, and class backgrounds, engage with authentic math tasks through discourse and collective problem solving.

**Key Action:** *Engage in or provide professional development aligned to the principles of Ambitious Math Teaching.*

**Resource Tools:**

- *Complex Instruction - Stanford University*
- *Research Brief from OSU on Classroom Discourse*

## Engage All Students with Modern Mathematics

The new Oregon Math Standards have an explicit increased focus on technology, mathematical modeling, and data reasoning standards. Integrating these three elements authentically takes training and support.

**Key Action:** *Engage in or provide professional development on integrating technology, mathematical modeling, and data reasoning. Further, educators and specialists .evaluate math tasks with the cornerstones and identify improvement priorities.*

**Resource Tools:**

- *Research brief from OSU on Math Modeling*
- *Modernizing Math Classes with Data*
- *OMP Math Task Improvement Tool*

**EXPLORE OTHER CORNERSTONES OF THE OREGON MATH PROJECT**


| | |
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| *Focus* | Pg. 10 |
| *Pathways* | Pg. 22 |
| *Belonging* | Pg. 27 |

# PATHWAYS

# What do we mean by pathways?

All students are equipped with the mathematical knowledge and skills necessary to identify and productively pursue any postsecondary ***paths*** in their future. Students have agency to choose from a variety of courses, contexts, and applications they find relevant.

The 2+1 course pathway model provides the structure for this innovation. It begins with two credits of **core content** for all students, and **third credit pathway options** that align to student interests and goals.

**Ensuring students have access to modern and relevant high school mathematics will take innovation and creativity to re-imagine what course experiences could look like for Oregon students.**

## Centering Equity when Designing High School Math Pathways:

- Who has been successful in mathematics in your district? How do you measure that?
- Who is accessing advanced math courses? Does this reflect the diversity of your student population?
- How do students gain access to math courses? Are there barriers to access such as prerequisites?
- What assumptions are you making in your course placement processes? What marginalizing practices are being upheld by these assumptions?

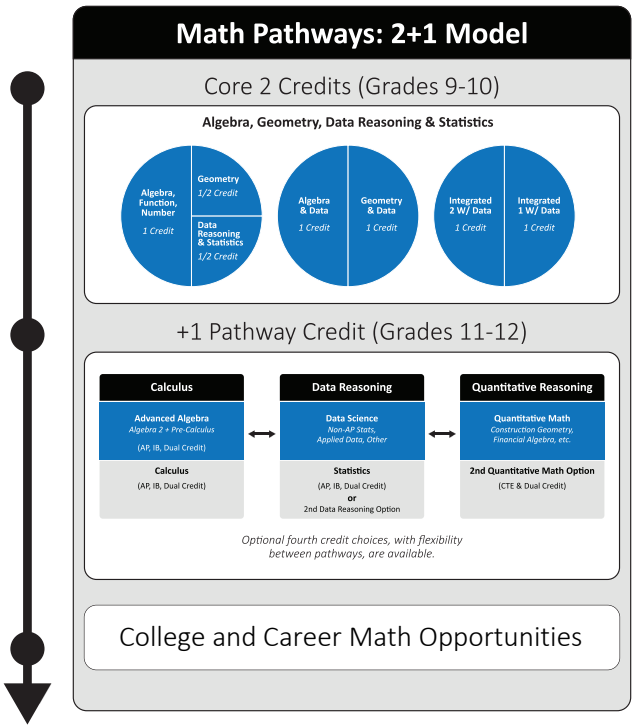
## Core Content

- Core content is balanced between approximately one credit of algebra, ½ credit of geometry, and ½ credit of data science and statistics. Core 2 courses focus on the *2021 Oregon Math Standards*.

## Third Credit Options

- For third credit options, Oregon high school staff are invited to innovate by offering new specialized courses within three general paths:
  - (1) a pathway to calculus;
  - (2) a pathway to data science;
  - (3) and a pathway to quantitative mathematics.

Third credit content prepares students for (or already is) college-level math courses at the 100 level.



# Key Topics, Actions, & Resource tools

## Student Voice Drives Paths

For +1 math course options (third and fourth credit) to function as a "pump," where math learning prepares students for modern college and career success, student voice must be at the center for pathways design efforts.

**Key Action:** *Integrate the selection of a student's +1 math course with their existing college and career planning process so that students and families are well-informed about their choices.*

**Resource Tools:**

- *Pathways Overview for Parents - Presentation*
- *High School Math Pathways FAQ*

## Design Paths for Equity

+1 math courses are key for launching students into college and career success. The 2 +1 model recognizes and designs for the many branches of mathematics relevant to a student's postsecondary plans, rather than limiting them to one based on historical practices.

**Key Action:** *Ensure that districts (and schools) offer well-designed +1 courses that center the Oregon Math Project cornerstones, align with student goals, prepare students for workforce needs, and position students for college admissions success.*

**Resource Tools:**

- *Designing +1 Math Courses*
- *Dana Center's Launch Years Recommendations*

## Assess Equity of Pathways

The dominant math pathway aimed at Calculus currently sorts students in predictable demographic patterns. The 2 + 1 model empowers students to choose their third and fourth credit courses based on their interests – not on their demographic information.

**Key Action:** *Check that district (and school) math pathways are operating with equity at the center by analyzing course-taking patterns and outcomes with an equity lens.*

**Resource Tools:**

- *Oregon Department of Education Equity Lens*

# Key Topics, Actions, & Resource tools

## Student Voice Drives Paths

For +1 math course options (third and fourth credit) to function as a "pump," where math learning prepares students for modern college and career success, student voice must be at the center for pathways design efforts.

**Key Action:** *Integrate the selection of a student's +1 math course with their existing college and career planning process so that students and families are well-informed about their choices, including updated language in university admissions policies in Oregon and beyond.*

**Resource Tools:**

- *How is Higher Education Changing in Oregon?*
- *Just Equations Report*
- *Harvard Admissions*

# Key Topics, Actions, & Resource tools

## Student Voice Drives Paths

For +1 math course options (third and fourth credit) to function as a "pump," where math learning prepares students for modern college and career success, student voice must be at the center for pathways design efforts.

**Key Action:** *Provide structured and ongoing ways for student voice to inform the creation and iteration of +1 math courses.*

**Resource Tools:**

- *Pathways Overview for Parents - Presentation*
- *High School Math Pathways FAQ*

## Design Paths for Equity

+1 math courses are key for launching students into college and career success. The 2 +1 model recognizes and designs for the many branches of mathematics relevant to a student's postsecondary plans, rather than limiting them to one based on historical practices.

**Key Action:** *Design +1 courses that center the Oregon Math Project cornerstones, align with student goals, prepare students for workforce needs, and position students for college admissions success.*

**Resource Tools:**

- *Designing +1 Math Courses*
- *Dana Center's Launch Years Recommendations*

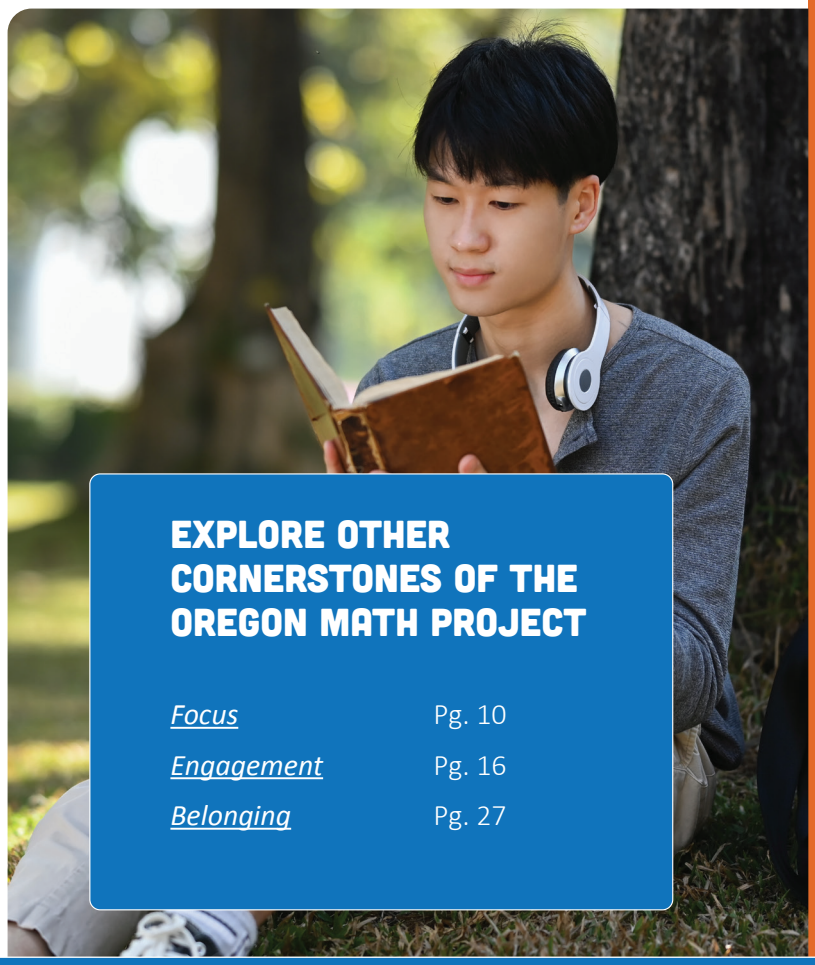
## Assess Equity of Pathways

The dominant math pathway aimed at Calculus currently sorts students in predictable demographic patterns. The 2 + 1 model empowers students to choose their third and fourth credit courses based on their interests – not on their demographic information.

**Key Action:** *Reflect on the enrollment and outcomes of their +1 courses and be responsive if these new courses are reproducing inequities of traditional math courses.*

**Resource Tools:**

- Data collection towards representative enrollment and outcomes on paths



**EXPLORE OTHER CORNERSTONES OF THE OREGON MATH PROJECT**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| *Focus* | Pg. 10 |
| *Engagement* | Pg. 16 |
| *Belonging* | Pg. 27 |

# BELONGING

# What do we mean by belonging?

Participation in mathematical learning builds students' identities as capable math learners and fosters a positive self-concept. Students' culture and linguistic assets are valued in ways that contribute to a sense of ***belonging*** to a community of learners. Students need not shed their individuality and conform to dominant culture norms in order to be successful.

## Myths that Drive Filtering

Deeply problematic myths are at the root of our inequitable mathematics education system. As we work to re-engineer this system, these myths must be recognized, uprooted, and replaced with research-based knowledge about teaching and learning.

**Myth 1**

Students learn more/better in homogeneous groups.

**What the Research Says**

A meta-analysis demonstrated that students in detracked groups performed better academically than tracked peers (Rui, 2009).

A multi-level modeling study found that students in "lower" tracks are 60% more likely to dropout of high school (controlling for other factors) (Werblow et al, 2013).

Boaler & Foster (2021) found 65% of students who were enrolled in accelerated classes were required to repeat the classes when they went to high school.

**Myth 2**

Students, especially those tracked into low skilled groups, feel more positive about themselves when they are in homogeneous groups.

**What the Research Says**

Tracking creates a self-fulfilling prophecy of behavior in students and plays an important role in defining the type of person that they believe themselves to be (Ansalone, 2009).

Tracking has a negative impact on the overall attitude and self-concept of students in lower tracks (Sukhnandan & Lee, 1999).

Student self-concept is healthier in untracked schools (Ireson and Hallam, 1999).

**Myth 3**

Placement processes accurately and fairly reflect past achievement and future potential.

**What the Research Says**

The result of tracking is a reproduction of social class and unequal access to resources (Battey, 2013).

Domina (2014) used multi-level modeling to discover that even when students have similar skills, characteristics such as race and class can influence middle school math course placement.

With a rank-based regression discontinuity design, Card & Giuliano (2016) found that putting non-gifted students in gifted courses led to significant gains in achievement.

**Myth 4**

Teaching is easier when students are in homogeneous groups.

**What the Research Says**

Tracking creates a self-fulfilling prophecy of behavior in students and plays an important role in defining the type of person that they believe themselves to be (Ansalone, 2009).

Instead, complex instruction and other heterogeneous grouping instructional strategies can promote teacher success and satisfaction (Horn, 2006).

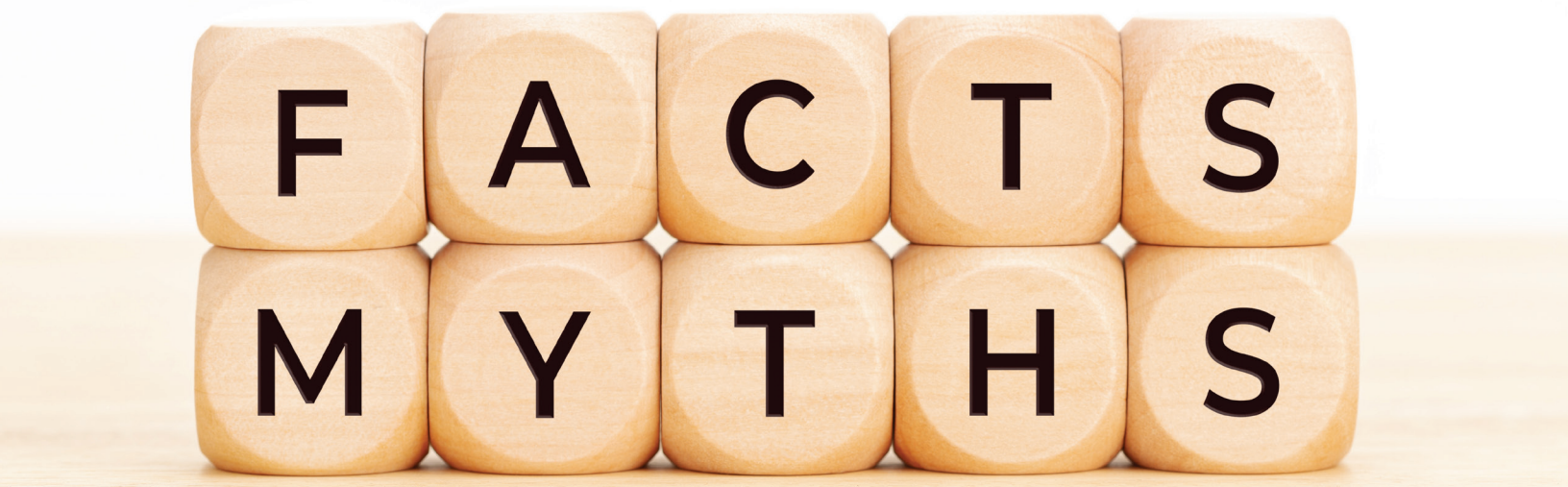
**Read more about these myths in Jeannie Oaks book**
***Keeping Track: How Schools Structure Inequality***

**"Shifting deficit beliefs is often challenging as people generally do not recognize the deficit perspectives they hold; instead they view these perspectives as normal rather than developed over time through stereotypical, and then institutionalized, cultural narratives"**

*Catalyzing Change in Middle School, NCTM*

## How do we uproot these myths?

- Call out these myths when you hear them: they are challenged by *40+ years of education research*. Get familiar with tracking research and share it whenever these myths are used to rationalize inequities in our math systems.
- Invite educators to consider how these myths negatively impact our students. Ask them to share experiences that challenge these myths.
- Practice responding to statements that promote these myths: *High School Math Pathways FAQ.*



# Key Topics, Actions, & Resource tools

## Students Belong in Heterogeneous Classrooms:

Tracking is the practice of segregating students by perceived ability into separate mathematics courses or fixed-groups. This practice is common in most math programs despite a lack of evidence for its effectiveness and ample evidence for its production of inequitable outcomes.

**Key Action:** *Interrogate tracking practices with an equity lens and dismantle these systems to ensure all students develop a sense of belonging in richly diverse and heterogeneous classrooms. This process should involve diverse voices including students, families, educators and community-members in equity-based, research informed decision making.*

**Resource Tools:**

- *Introduction to Detracking Mathematics - Presentation for Teachers*
- *Introduction to Detracking Mathematics - Presentation for Parents*
- *OSU Research Brief on Tracking*
- *Detracking Math in Oregon series, hosted by the Math Coaching and Leadership Network*

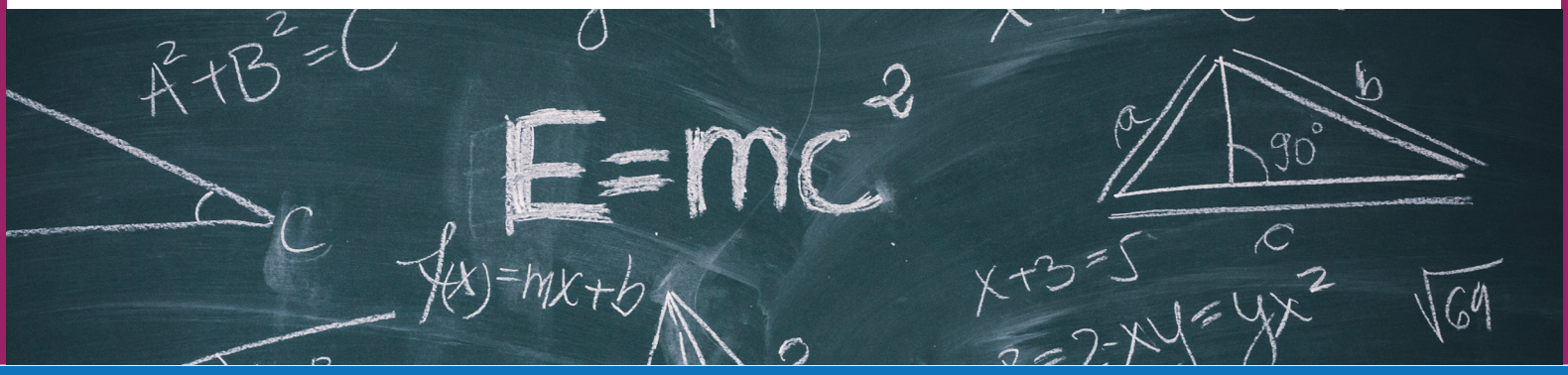
## Math Belongs to Everyone

To develop positive math identities in all students, education personnel must critically examine how cultural norms and classroom structures reinforce ideas about who is a "math person." Mindful design, with asset-based framing, can create truly equitable environments where all students learn how to apply math with purpose and power.

**Key Action:** *Integrate mathematics educators into their efforts for supporting students' social emotional learning.*

**Resource Tools:**

- *ODE Social Emotional Learning Toolkit*
- *How Do We Ensure Access for All?*
- *What is Math Identity?*
- *OSU Research Brief on Equity*
- *High School Math Pathways FAQ*






**Heterogeneous Classrooms:**
*Classrooms in which students have a wide range of previous academic achievement and varying levels of oral and written proficiency in the language of instruction. (Bunch, Gainsburg, & Lotan, 2022)*

# Key Topics, Actions, & Resource tools

## Students Belong in Heterogeneous Classrooms:

Tracking is the practice of segregating students by perceived ability into separate mathematics courses or fixed-groups. This practice is common in most math programs despite a lack of evidence for its effectiveness and ample evidence for its production of inequitable outcomes.

**Key Action:** *Interrogate outcomes of current mathematics course-taking patterns with an equity lens and offer their perspective to the process of reevaluating course offerings.*

## Math Belongs to Everyone

To develop positive math identities in all students, education personnel must critically examine how cultural norms and classroom structures reinforce ideas about who is a "math person."

**Key Action:** *Communicate with students and families about the diverse mathematics-rich opportunities that are available to ensure all students see how mathematics plays a role in their future.*

**Resource Tools:**

- *High School Math Pathways FAQ*
- *A New Calculus for College Admissions*
- *Oregon's Adopted Transformative SEL Framework and Standards*



**Heterogeneous Classrooms:**
*Classrooms in which students have a wide range of previous academic achievement and varying levels of oral and written proficiency in the language of instruction. (Bunch, Gainsburg, & Lotan, 2022)*

# Key Topics, Actions, & Resource tools

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- *OSU Research Brief on Equity*
- *Detracking Math in Oregon series, hosted by the Math Coaching and Leadership Network*

## Math Belongs to Everyone

To develop positive math identities in all students, education personnel must critically examine how cultural norms and classroom structures reinforce ideas about who is a "math person."

**Key Action:** *Learn about the impact of identity in mathematics. Educators and specialists must go beyond the quip "we are all math people" and reflect on curriculum, instructional, assessment or structural decisions that implicitly communicate to students that they are or are not a "math person."*

**Resource Tools:**

- *How do we Ensure Access for All?*
- *What is Math Identity?*
- *Oregon's Education Equity Lens*
- *High School Math Pathways FAQ*

**EXPLORE OTHER CORNERSTONES OF THE OREGON MATH PROJECT**





**Heterogeneous Classrooms:**
*Classrooms in which students have a wide range of previous academic achievement and varying levels of oral and written proficiency in the language of instruction. (Bunch, Gainsburg, & Lotan, 2022)*

# High School Math Pathways FAQ

***The critical work outlined in this toolkit can raise questions and concerns. Here you will find advice about how to respond, as well as resources that offer additional support.***

**Someone Says . . .**
"Students with IEPs and 'low' math learners can't handle being with other students. They can't keep up and need to learn math that their peers already know. They need their own math classes."

**You Might Say . . .**
"Isolating students and labeling them as 'low' prevents students from developing a positive math identities, which we know is a key part of student success in math. Students deserve to learn in heterogeneous classrooms with all of their peers and work on grade level math. It is very unlikely that students exit low math tracks once they are in them. We have inherited systems that make math a barrier for many of our students; we want to remove those barriers and open math pathways to all of our students. We are redesigning our math classes to be supportive, engaging, and full of rich, relevant learning for all of our students."

**Key Resources:** *The Opportunity Myth* *The Trouble with "High" and "Low"*

**Someone Says . . .**
"How are advanced students supposed to get to Calculus on time? This is messing up their ability to get into good colleges."

**You Might Say . . .**
"It's still important for us to offer a Calculus pathway and are making it accessible by [name your approach: doubling up 9-10th grade, compacting Algebra 2 and Pre-Calculus, etc]. That said, the push to take Calculus in high school puts a lot of pressure on K-12 math programs to accelerate students. When this happens, students miss opportunities to build a deeper and more relevant and mathematical foundation. While Calculus is relevant for a small percentage of majors (e.g., engineering), it is rarely a college admission requirement. All students will have access to Calculus in college. Students should research the university admission requirements for the program(s) they're interested in and take the courses that best align with those requirements."

**Key Resources:** *A New Calculus for College Admissions* *Example of a compacted Algebra 2 + Precalculus course* *Re-Envisioning Mathematics Pathways to Expand Opportunities*

**Someone Says . . .**
"I can't teach a class with students at so many levels, it's not possible."

**You Might Say . . .**
"Research from the last 40+ years has shown how classroom strategies like Complex Instruction can offer the differentiated, deep learning that our students need. It can also help our students build their SEL skills, construct positive math identities, and engage with more relevant and open-ended math learning. No matter what, we are always teaching students with diverse needs and interests; let's stop replicating systems that harm students and limit their options."

**Key Resources:** *40+ Years of Tracking Research* *The Truth About Tracking* *OSU Research Brief on Tracking*

# High School Math Pathways FAQ

**Someone Says . . .**
"TAG and 'advanced' students need courses that challenge them. Otherwise they will be bored and not living up to their potential."

**You Might Say . . .**
"Yes, our students deserve math classes that are exciting and engaging. We know that a strong, foundational experience in middle school math leads to increased student success in high school, including more students opting to take an optional 4th year of math. We also know students who take Algebra in middle school are much more likely to repeat the course in high school. We are redesigning our middle school and high school math experiences so that our math classes are engaging and supportive, and full of rich and modern math learning. These changes benefit all of our students, including students who are designated TAG. Research shows that students learn best in heterogeneous groups, including our 'advanced' math learners."

**Key Resources:** *Predictors of Algebra 1 Repetition* *The Trouble with "High" and "Low"* *Rethinking Giftedness*

**Someone Says . . .**
"These new math courses sound nice, but they won't be accepted by colleges."

**You Might Say . . .**
"Starting in the fall of 2024, Algebra 2 will no longer be an admissions requirement at public colleges and universities in Oregon; at this point, alternatives to the Algebra 2 → Calculus pathway are expected to have equal weight in Oregon admissions. Many other higher ed institutions in the US, including elite private colleges like Harvard and Stanford, have made strong admissions statements that they will not privilege Calculus over courses like Statistics and Data Science. The higher ed admissions landscape is shifting, and we believe it is critical that we offer math pathways that better match many of our students' interests and goals."

**Key Resources:** *A New Calculus for College Admissions* *The Multiplier Effect: Dual Enrollment x Math*

**Someone Says . . .**
"Why are you making all these changes? It hasn't been working in other places that have tried this."

**You Might Say . . .**
"Oregon is one of 25+ states committed to improving and modernizing math pathways. In our current system, math creates significant barriers that prevent many students from reaching their goals. Our district is building a math program that aligns with our students' goals, reflects how math is used in our local workforce, and prepares students for college admissions and college success. Colleges and universities in our state and around the US are making similar changes. Data in our district and across the country supports these reforms."

"I'm curious, could you share any examples you're referencing? Any links or research is very appreciated; we want to understand what you're seeing and hearing so we can be more informed when we respond to any concerns."

**Key Resources:** *Dana Center Launch Years Initiative*
*San Francisco Unified School District Work to End Tracking and Offer Four Years of Meaningful Math Instruction*

# Glossary (P.1)

| | |
|---|---|
| **2 + 1 Model** | • The "2+1 Model" refers to reformed pathways for our three-credit minimum high school math course sequences.<br>• The "2" refers to common math courses taken by all 9th and 10th grade students (sometimes these courses are called "Core 2" or "Core 9-10").<br>• The +1 represents courses that students can complete as their third math credit requirement, typically taken during 11th and 12th grade. You may see many mentions of "new +1 courses"; this is because many districts are working to offer multiple, robust, and relevant pathways beyond the traditional Calculus pathway. Common 2+1 sequences are shown in the 2+1 HS Math Pathways diagram.<br>• A sign of math program improvement is when students, especially focal group students, are successfully earning credit at least two +1 courses before they graduate. Student +1 course taking can include multiple math pathways (example: a student taking CTE-Aligned Data Science in 11th grade and then Dual Credit Math in Society 105z in 12th grade). |
| **Authentic** | Authentic math tasks ask students to use math as they consider and address real-world, unresolved problems and questions that professionals, citizens, community-members, etc. grapple with. |
| **Career-Ready** | Career-Ready means that students have obtained math skills and credits that will help them apply relevant mathematics aligned with their career goals |
| **College Ready** | College-Ready means that students have the math skills and credits they need to succeed in college level (100+) math courses and earn the credits they need for their major or program. |
| **Cornerstones** | The work of engineering a more equitable math system is centered on four cornerstone principles of the Oregon Math Project: **Focus, Engagement, Pathways, and Belonging.** |
| **Complex Instruction** | In Complex Instruction, students learn in productive, heterogeneous teams. In this pedagogical framework, developed by educational researchers at Stanford University in the 1990s and used in many classrooms in the US and beyond, students engage with math tasks that are open-ended and rich, use norms and roles as they work together, and experience both individual and group level accountability for their learning. Teachers guide this work, intervening with "just-in-time" scaffolding, making needed status-interventions, leading cross-team learning, and collecting data on individual and team growth. |
| **Data Reasoning vs. Data Science** | Data reasoning refers to the process of formulating questions that can be answered with data. Data collection, analysis, and interpretation follow. In any given data reasoning math lesson, students may engage in parts or all of this process. Across K-12 grade levels, the process can be adjusted for differing levels of complexity and use of technological tools.<br><br>Data science is a specific field that analyzes large data sets; writing programming code and use of statistics is common. Data science is a quickly growing field and a popular college major. High school data science courses are increasingly offered throughout the US. |
| **Detracking** | The process of restructuring mathematics courses to place students in mixed-ability, heterogeneous classes. Curricular and pedagogical changes must accompany any detracking effort to ensure that all students have access to high-quality mathematics instruction. |

# Glossary (P.2)

| | |
|---|---|
| **Filter** | **The "Filter" metaphor, used throughout the Oregon Math Project refers to the predictable barriers students face in their math programs.** Filtering is present when our math programs sort and label students as "math" or "non-math" people. Students can experience filtering in many ways:<br>• *Uncertainty about the goals, importance and progressions of math learning (problems with Focus);*<br>• *Lack of agency, excitement or appropriate challenge (problems with Engagement);*<br>• *Unsure how their math courses help them reach their college/career goals (problems with Pathways);*<br>• *And/or when math learning lacks cultural relevance or needed learning supports (problems with Belonging).* |
| **Focal Group Students** | In alignment with the Student Success Act, the Oregon Math Project elevates the needs of students populations typically underserved and marginalized in K-12 systems. This includes, but is not limited to:<br>• *Students of color,*<br>• *Students with disabilities,*<br>• *Emerging multilingual students, and*<br>• *Students navigating poverty, homelessness, and foster care* |
| **Math Modeling** | In math modeling tasks, students apply mathematical skills and habits of mind to a real world problem. Mathematical modeling questions are richly complex, ambiguous, and benefit from multiple approaches and perspectives. The process of mathematical modeling requires students to revise their work and report their findings, based on an appropriate audience. |
| **Modern Math** | In modern or modernized math, students learn and apply math skills that support current-day applications where technology is a regularly used tool. Modern math emphasizes the use of data and math modeling, where students apply math in complex, real-world settings. |
| **Pump** | In the "Pump" metaphor, used throughout the Oregon Math Project, districts reimagine their math programs as deeply equitable in design and impact, in which math learning lifts all students to the goals they want to achieve. Cornerstone-focused improvements, described throughout this toolkit, will help districts actualize the "Pump" metaphor in their math programs. |
| **Relevance** | When math learning has relevance, students understand how math connects with their lived experiences, offers valuable tools and frameworks, and prepares them for their post-secondary goals. |
| **Rigor** | "Rigor" is a debated term in math education. For many years, "rigor" has often meant "difficult." Students may report that math is challenging or difficult for many reasons that have little to do with meaningful learning or growth. For example, students may find a math lesson difficult if it is poorly organized, confusingly worded, or lacks relevance. The National Council of Math Teachers (NCTM) asks that we be mindful when we think and talk about mathematical rigor. |
| **The Core** | "The Core" refers to common 9th and 10th grade math courses. These math courses engage students with the 2021 Oregon HS Math Standards which include roughly 1 credit of Algebra standards, ½ credit of Geometry Standards, and ½ credit of Data Reasoning standards. "The Core" is the "2" in "2+1" high school math pathways and can be structured in many ways (see the 2+1 HS Math Pathways diagram). |
| **Tracking** | The tracking of students for instruction in mathematics is a long-standing practice of schooling that segregates students of different backgrounds into separate experiences, based on perceived ability and prior performance, on pathways leading to different outcomes. |

# Attached Resources & External Links

This is the start of the Attached Resources and External Links section. Here, you will find all internal/external resources that have been linked throughout the toolkit above.

***Click on a desired link to quickly access that resource.***

***Click on the icon in the top right corner to scroll back to this page.***

## Communication Toolkit Beginning Pages



### Oregon is Part of a National Movement

- *Admissions Process*
- *Common Course Numbering*
- *Launch Years Initiative*

### Re-Engineering Math Systems for Oregon Students

- *ODE Assessment Group Reports*

### Math as a Filter

- *Starting with Story*
- *Oregon Department of Education Equity Lens*

### Math as a Pump

- *Advice for How to Talk About OMP*
- *Key Talking Points*

### The Four Cornerstones

- *Where are You Now?*
- *Gresham-Barlow Visioning Work*

### Modernized Math Initiatives Across the Nation

- *WA - New Pathway Policies*
- *OR Admissions - [EOU] [OIT] [OSU] [PSU] [SOU] [UO] [WOU]*
- *CA - Detracked Mathematics Progress*
- *CA - Alg2+Precalc*
- *UC System*
- *Stanford's New Math Admissions*
- *UT - Pathways Work*
- *UT - Informed Decisions*
- *Dana Center Mathematics Pathways*
- *States Involved in Math Pathways Reform*
- *Alabama Course of Study Mathematics*
- *GA - Alternative to Remedial Education*
- *OH - Math Modeling and Reasoning*
- *OH - Decision Tree*
- *What's Wrong With Tracking Students by Math Ability?*
- *Harvard's New Admissions Priorities*

## Focus Cornerstone



### Introduction

- *2021 Oregon Math Standards*
- *GAISE II: Pre-K-12 Guidelines for Assessment and Instruction in Statistics Education II (A Framework for Statistics and Data Science Education)*
- *Data Science - Rapidly Growing Field and Very Popular College Major*
- *Data Science is the Future. Let's Start Teaching It*

### Administrators

- *Complete List of the 2021 Standards*
- *Research Brief from OSU on Math Modeling*
- *Oregon Department of Education Instructional Materials Adoption Toolkit*
- *Instructional Materials Adoption Support - Example from Lane ESD*
- *Domain-Specific Progressions Documents*
- *Community Engagement Toolkit*
- *Tool: Math Night Resources Slide Deck*

***REMINDER:***

If you wish to go back to the table of contents of this document, click the title of the document here.

# Attached Resources & External Links

### School Counselors

- *Community Engagement Toolkit*
- *Tool: Math Night Resources Slide Deck*
- *New Admissions Requirements for Oregon*
- *A New Calculus for College Admissions*
- *Link to NCAA Guidance*
- *Link to Dana Center Resources*

### Math Educators & Specialists

- *Overview of New Standards - Presentation*
- *Unadopted HS Standards*
- *Modernizing Math Classes with Data*
- *Research Brief From OSU on Math Modeling*
- *Domain Specific Progressions Documents*
- *Tool: Math Night Resources Slide Deck*

## Engagement Cornerstone

p. 16 - 21

### Introduction

- *Complex Instruction*
- *Asynchronous Course*
- *Principles to Action*
- *Aguire, Mayfield-Ingram and Martin (2013)*
- *Research Brief from OSU on Math Modeling*
- *Technology is a Tool - National Council of Teachers of Mathematics*
- *Desmos*
- *GeoGebra*
- *Mathigon*
- *CODAP*

### Administrators

- *Complex Instruction - Stanford University*
- *Research Brief From OSU on Classroom Discourse*
- *Research Brief from OSU on Math Modeling*
- *Modern Math Classes with Data*

### School Counselors

- *Evaluation Tool for Alternative Math Credit Bearing Courses*
- *Letter to Teacher*

### Math Educators & Specialists

- *Complex Instruction - Stanford University*
- *Research Brief from OSU on Classroom Discourse*
- *Research Brief from OSU on Math Modeling*
- *Modernizing Math Classes with Data*
- *OMP Math Task Improvement Tool*

# Attached Resources & External Links

## Pathways Cornerstone

p. 22 - 26

### Introduction (No Links)

### Administrators

- *Pathways Overview for Parents - Presentation*
- *High School Math Pathways FAQ*
- *Designing +1 Math Courses*
- *Dana Center's Launch Years Recommendations*
- *Oregon Department of Education Equity Lens*

### School Counselors

- *How is Higher Education Changing in Oregon?*
- *Just Equations Report*
- *Harvard Admissions*

### Math Educators and Specialists

- *Pathways Overview for Parents - Presentation*
- *High School Math Pathways FAQ*
- *Designing +1 Math Courses*
- *Dana Center's Launch Years Recommendations*

## Belonging Cornerstone

p. 27 - 32

### Introduction

- *Detracking Research - Boaler & Foster (2021)*
- *Lessons Learned from Detracked Math Departments - Horn, 2006*
- *Keeping Track: How School Structure Inequality*
- *40+ Years of Education Research*
- *High School Math Pathways FAQ*

### Administrators

- *Introduction to Detracking Mathematics - Presentation for Teachers*
- *Introduction to Detracking Mathematics - Presentation for Parents*
- *OSU Research Brief on Tracking*
- *Detracking Math in Oregon Series, Hosted by the Math Coaching and Leadership Network*
- *ODE Social Emotional Learning Toolkit*
- *How Do We Ensure Access for All?*
- *What is Math Identity?*
- *OSU Research Brief on Equity*
- *High School Math Pathways FAQ*

### School Counselors

- *High School Math Pathways FAQ*
- *A New Calculus for College Admissions*
- *ODE Social Emotional Learning Toolkit*

### Math Educators & Specalists

- *Introduction to Detracking Mathematics - Presentation for Teachers*
- *Introduction to Detracking Mathematics - Presentation for Parents*
- *OSU Research Brief on Tracking*
- *OSU Research Brief on Equity*
- *Detracking Math in Oregon Series, Hosted by the Math Coaching and Leadership Network*
- *ODE Social Emotional Learning Toolkit*

# Key Talking Points about the Oregon Math Project

## Key Communication

***We are not alone in this work.*** We are a part of national movement focused on aligning K-12 math programs with college mathematics, with student goals and needs, and with the ways math is used in our society.

## Why is this Important?

Many people are fearful of making changes from their own understanding of how math programs are "supposed to" operate. However, we have ample research and personal experiences demonstrating K-12 mathematics does not align with the modern ways math is applied in postsecondary learning and careers. Change is needed.

"Tell me about your high school math courses and how you experienced mathematics." [Listen and relate the changes to their own experience remembering to center historically and currently marginalized students.]

"We have heard from our post-secondary partners that our pathway focused on getting students ready for college is not preparing the majority of our students. In fact many colleges have deemphasized Calculus because courses like Statistics/Data Science are more relevant to the 21st century workforce. Our +1 courses like [name them here] are much more relevant for [name postsecondary majors & careers they align to]."

"Another district [name the district] in Oregon, similar in [size, demographics: share the ways it is similar], is also engaged in this work. When they changed [name the equity-centered reform], their students [name the positive impact]. We believe this is worth trying in our district and think it will benefit our students in similar ways."

## Key Communication

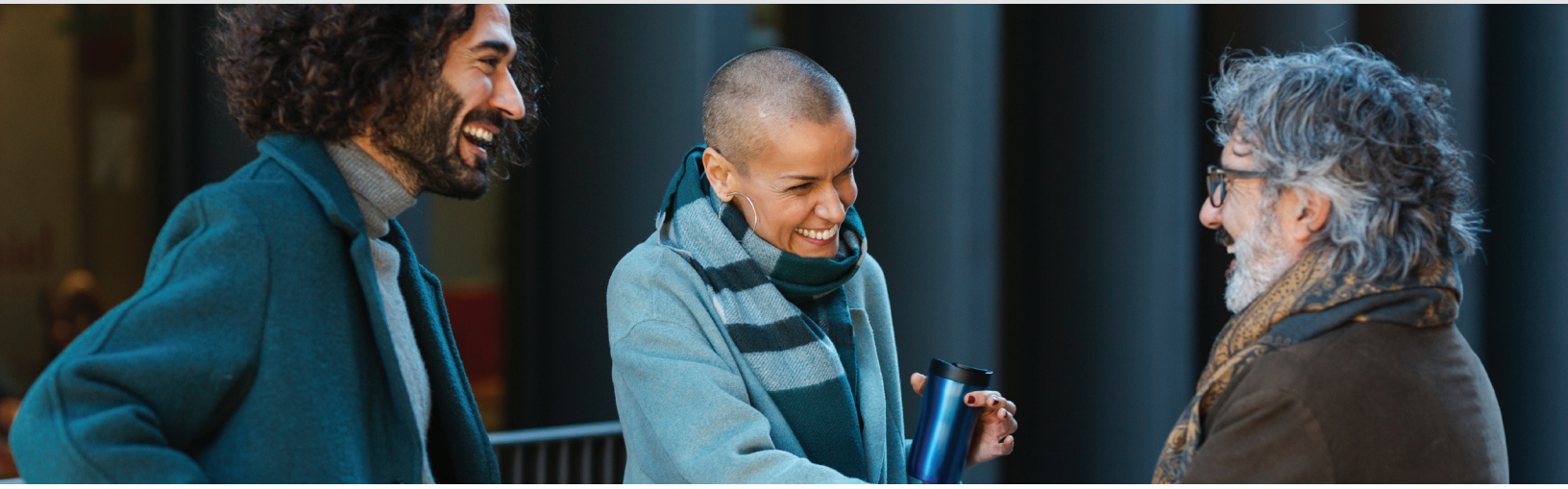
***We have a vision*** for how we will make math meaningful for every student. Our stakeholders and student data are guiding our work.

## Why is this Important?

Engaging your community early and often is critical. From this work you must be able to clearly state what is working and not working in your math program - and for whom.

"As a part of our community engagement events, we heard that mathematics courses are a major barrier for students. We know that our math program has been working well in some ways, like [name assets in your program]. Through work with our students, district families, and larger community, we have identified ways our program needs to change, like [name prioritized areas of reform work]. At the heart of this work, our vision is to make our math programs meaningful for every student in our district."

# Key Talking Points about the Oregon Math Project



## Key Communication

***We have a plan*** for this work, and it is something we are excited to iterate over time, based on student data and community engagement.

## Why is this Important?

Sharing plans, timelines and evaluation criteria will build trust that this ambitious work is possible and in good hands. Making it clear that plans are always adjustable guided by stakeholder input and data, will take away the "top down" feel of your work.

"Our plan is always a work in progress based on what we see in student impact data. We are tracking how [name reform, example: Core 2 heterogeneous grouping paired with new curriculum and classroom practices] is impacting our students [share data focus, example: high school students taking an optional 4th math credit]. We see that [name pattern/impact] and this tells us our next step is [share how you are adjusting/finding success in your plan]."

## Key Communication

***We are ready*** to do the on-going, complicated work of building a math program that helps every student reach their goals and continuously engages stakeholders.

## Why is this Important?

Doing truly transformative work means that you are ready to dig into complexity and will shift systems in multiple ways. Showing that you understand this complexity and are focused on action will build confidence and buy-in in your stakeholders.

"We know that it isn't enough to change our course offerings and pathways. We need to make sure our courses work well for all of our students when they are heterogeneously enrolled [Share the professional development you have and will be providing for teachers]. We will collect data on [share your plan] and will use this data to decide our next step [name when this will happen and how stakeholders will be engaged]."

# Where Are You Now?

To begin this work, district leaders must engage multiple stakeholders in a visioning process to understand if and how a filter is operating in your system.

**District Tool for Planning and Implementing Equity-Centered Math Reforms**

**Document Template:** *Math Visioning Process*

**Slide Template:** *Making Math Meaningful for Every Student*

## If you believe that your district is ready to start taking on this work, make sure you can agree to the following assumptions.

- We are committed to doing the hard work of reflecting on our math program, and how it must be improved to fully meet the needs of students who are marginalized and racialized in our societal and educational structures.
- We will be asset-based as we interrogate our math program.
- We will center asset-based views of learners, their experiences, and outcomes in this work.
- We will continuously recognize and dismantle ways that our math programs and systems have marginalized students.
- This tool will be used to drive on-going collaboration with our math program stakeholders.

# Visioning Process Case Study

## Gresham-Barlow School District

In the 2021-2022 school year, Gresham-Barlow SD, guided by research and work done by the National Council of Teachers of Mathematics (NCTM), ODE, and other districts, engaged with stakeholder groups to define their district's "math vision." Their visioning team interviewed teachers and community members, and also conducted empathy interviews with elementary, middle, and secondary students.

**Based on stakeholder input and student interviews, they developed this draft math vision statement:**

**"Math Students of GBSD . . .**

- Believe they are capable doers of math and have a positive self concept in our community of mathematicians.
- Make sense of mathematics in ways that are creative, interactive, authentic and relevant.
- Engage in discourse to problem solve and think critically about rigorous mathematics.
- Demonstrate academic success not predictable by race, ethnicity, gender, socioeconomic status, language, religion, sexual orientation, cultural affiliation, or special needs.
- Graduate from high school college and career ready with the math skills that will allow them to contribute to a global society."

In addition the their guiding vision statement, this stakeholder engagement work also supported updates to *Gresham-Barlow's Draft K-12 Universal Math Framework*.

## Putting Your Vision Into Action

Gresham-Barlow's math adoption teams will consider ways to apply this vision and framework as they review, pilot, and select math materials. Other applications (example: redesigning math pathways) and next steps are currently being considered.

# Modernizing Math Classes with Data

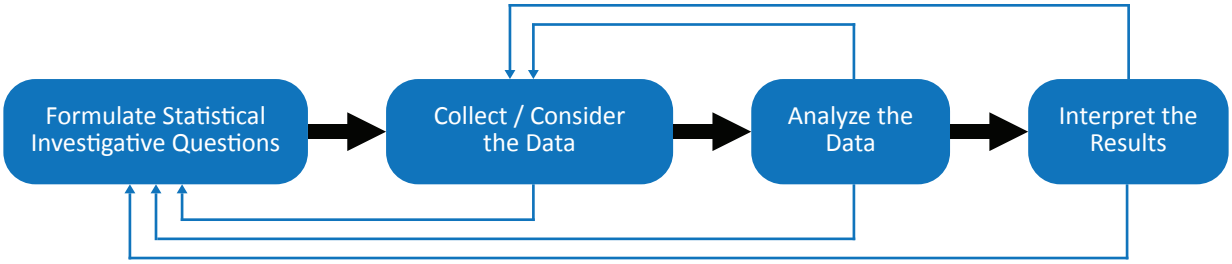
The 2021 Oregon Math Standards include a new K-12 Data Reasoning domain. This emphasis on data will help modernize and build engagement in our math programs. Additionally, many Oregon high schools are considering or already offering +1 Data Science courses. "Data reasoning" and "data science" are often conflated; read this page to understand the similarities and differences, and how both can help transform your math program.

## Data Reasoning: *A new Domain in the 2021 Oregon Math Standards*

All students in Oregon will now experience Data Reasoning, K-12, as part of their math learning.
**See Link to Learn More:** *2021 Oregon Math Standards for Data Reasoning*

***What is Data Reasoning?***

The *Pre-K-12 Guidelines for Assessment and Instruction in Statistics Education II* (GAISE II) details the statistical problem-solving process Oregon students will experience as they reason with data. A key component of this process is starting with a relevant question to drive the investigation.




***Why is this new domain important?***

Modern mathematics programs equip every K-12 student with the data literacy skills needed to make informed decisions in our modern world. Students engaging in data reasoning will have abundant opportunities to integrate technology into their data collection, analysis, and data interpretation. These skills open doors to higher education, high-paying careers, and align with many students' goals.

## Data Science: *An Exciting New Option for +1 Math Courses in Oregon*

As students complete their learning of the K-12 Data Reasoning standards, they are well-positioned to go deeper with data in a +1 (third credit) math course.

***What is Data Science?***

Data Science is a rapidly growing field and very popular college major that primarily focuses on deep knowledge discovery through data exploration and inference. A good data scientist must possess both the statistical knowledge and computer skills that are needed for solving complex problems (*Discover Data Science*). Data Science courses for high school students are *rolling out at many US high schools*; many Oregon high schools are planning to, piloting, or already offering Data Science as a +1 math course.

***Consider offering this high interest and relevant course in your district! Check out available high school data science curricula and lessons (some are free to use):***

*Youcubed* *Bootstrap* *IDS* *CourseKata* *DataScience for Everyone*

# Modernizing Math Classes with Data

*How Do We Talk About It?*

### Someone Says . . .

"What if my child chooses the Data Science +1 and then changes their mind about their pathway. Can they do that?"

### You Might Say . . .

"Yes! The intentional design of math pathways allows students the agency to choose their third and fourth year courses. A student could complete a Data Science course during 11th grade and then take Advanced Algebra or Pre-Calculus during 12th grade. A student who pursues advanced courses in multiple pathways will be well-positioned for additional mathematics courses in postsecondary education, regardless of their program of study."

### Someone Says . . .

"Can you learn Data Science without Calculus?"

### You Might Say . . .

"According to the *University of Chicago Initiative* supporting K-12 Data Science integration, "if you're drawing insights from data, that's Data Science" and we don't need Calculus for that. Start by reading the *Data Reasoning Standards for Oregon* which lay the foundation from K-10th grade for an engagement with Data Science. These standards were based on recommendations from the *American Statistical Association*."

### Someone Says . . .

"What is the benefit of splitting Calculus and Data Science tracks vs. offering a higher-level familiarity with both?"

### You Might Say . . .

"To be honest, we are WELL overdue offering students ANY experience with Data Science in K-12 education. To "make-up" for this, Data Science is now a requirement for all high school students via the *2021 Grade 9/10 standards* (equivalent to at least 0.5 credits). The *pathways* that follow do offer students a choice between a deeper dive into data science, quantitative reasoning or a pathway to Calculus. These ideas are grounded in research out of the *Charles Dana Center* and their experience working in other states to create meaningful career & college aligned pathways.

In short, the benefit is there are no bad options; just modern mathematics relevant for a career pathway that will help them develop an identity as a mathematician that sticks with them when they inevitably change their minds about that pathway."

# How is Higher Education Changing in Oregon?

## Academic leadership at all seven of Oregon's public universities have agreed to adopt the following admissions policies:

Students interested in attending a State of Oregon Public Higher Education Institution should take at least three years of high school math. The third year could be satisfied by any math course with a primary focus on concepts in algebra, calculus, data science, discrete mathematics, geometry, mathematical analysis, probability, or statistics.

Prospective students are encouraged to take a fourth math course in their senior year of high school. Those intending to study a STEM (Science Technology Engineering and Mathematics) major or another field for which calculus is required are strongly encouraged to take pre-calculus and, if possible, calculus in high school.

**Oregon Public University Admission Requirements: [EOU] [OIT] [OSU] [PSU] [SOU] [UO] [WOU]**

### Strong Start Oregon

Students with remedial math needs take college-level math courses with appropriate supports, such as co-requisite math classes rather than pre-requisite or "developmental" classes, reducing time to complete a credential.

### Guided Pathways

Colleges implement comprehensive, "student-focused" redesign to streamline college offerings and increase student success.

### Common Course Numbering

Common Course Numbering, or CCN, has been adopted by 20 states as of July 2022. CCN focuses on the creation of a uniform numbering convention for lower-division courses to ensure course equivalency and to facilitate transfer of course credit. Ultimately, CCN seeks to reduce the number of credits lost (sometimes referred to as "fallthrough" credits) when transferring institutions. For students, this means real savings in time and money.

**See Link:** *Common Course Numbering*

# **Designing + 1 Courses** *Administrators & Math Educators*

Junior and senior year + 1 math courses are key for launching students into college and career success. Well-designed +1 courses center the Oregon Math Project cornerstones, align with student goals, prepare students for workforce needs, and position students for college admissions success.

## Course Design Guidelines

+1 math courses need to attend to all four of the Oregon Math Project's Cornerstones:
**See a Cornerstone-Focused Syllabus:** *Example Syllabus*

- **Focus**: Course content prepares students for (or already is) college-level math courses at the 100 level.
- **Engagement**: Course content centers mathematical modeling and is anchored in relevant and career-related contexts.
- **Pathway**: Student choice determines placement - no gatekeeping, no prerequisites - and aligns with post-secondary goals.
- **Belonging**: Student enrollment is not predictable by student demographics. Social Emotional Learning skill development is embedded and lessons are culturally relevant.

**2+1 Slide Deck for Parent Night:** *Making Math Meaningful for Every Student*

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## Tips for Designing +1 Courses

- **Survey your students:** design +1 options around your students' interests, goals, and post-secondary plans
- **Integrate with CTE:** align +1 courses with your *CTE programs of study* and your region's workforce goals
- **Partner with Higher Ed:** ensure all of your +1 pathways prepare students for *college-level mathematics*
- **Clearly communicate student options:** clearly communicate student options: help students and families understand how your +1 courses prepare students for their future plans (examples from Ohio: *course descriptions*, *pathways diagrams*, and *student profiles*)

## Key Readings

- *Calculating the Odds Fact Sheet*
- *Calculating the Odds Report*
- *More university systems are moving away from using standardized tests, such as the ACT/SAT, in admissions*

# Designing + 1 Courses *School Counselors*

## Messaging for Students and Families

- Pick a +1 math course that:
  - Is best aligned with your goals.
  - Fits admission requirements at the higher education institutions where you will likely apply
  - Will expand and/or deepen your interest in math.
- Dual credit and CTE aligned math courses are excellent options!
- Every student should consider taking an optional fourth year of math; this is a great opportunity to experience other math pathways and earn college credit in high school.

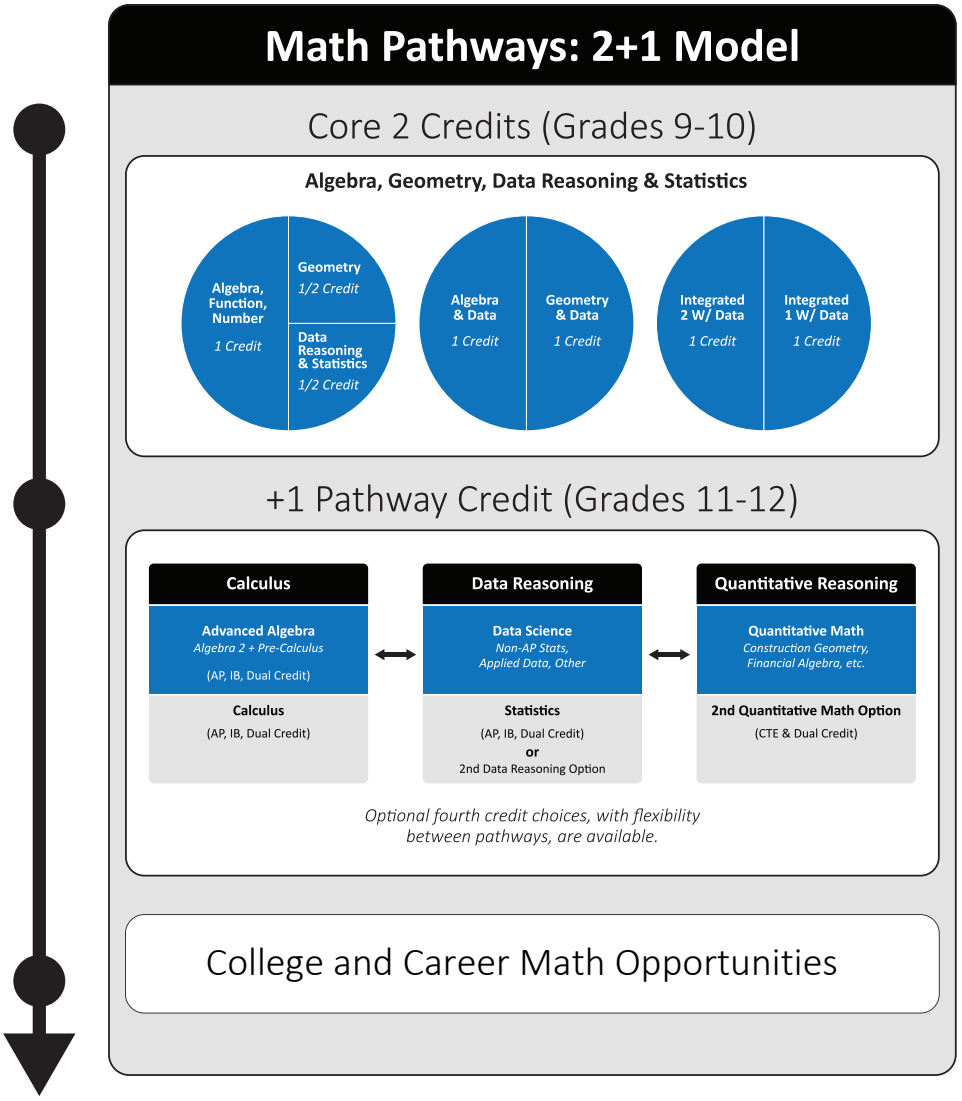
## Myth Busting

- Algebra 2 is no longer an admissions requirement at Oregon public colleges and universities (starting Fall '24).
- Colleges and universities admissions departments are increasingly encouraging non-calculus math courses like data science and statistics: check current math admissions requirements at any colleges/universities you might attend.

## Work Toward School-Wide Equity

- Pay attention to enrollment patterns in +1 courses. Do they reflect your school's demographics? If not, it's time for action. Track enrollment data and promote classes to students who might not otherwise take them.
- Invite students back after they graduate. Ask them how they are using the math they learned in high school and how your +1 offerings are helping them reach their goals. Make sure school staff and your current students learn from their experiences.

# Designing + 1 Courses

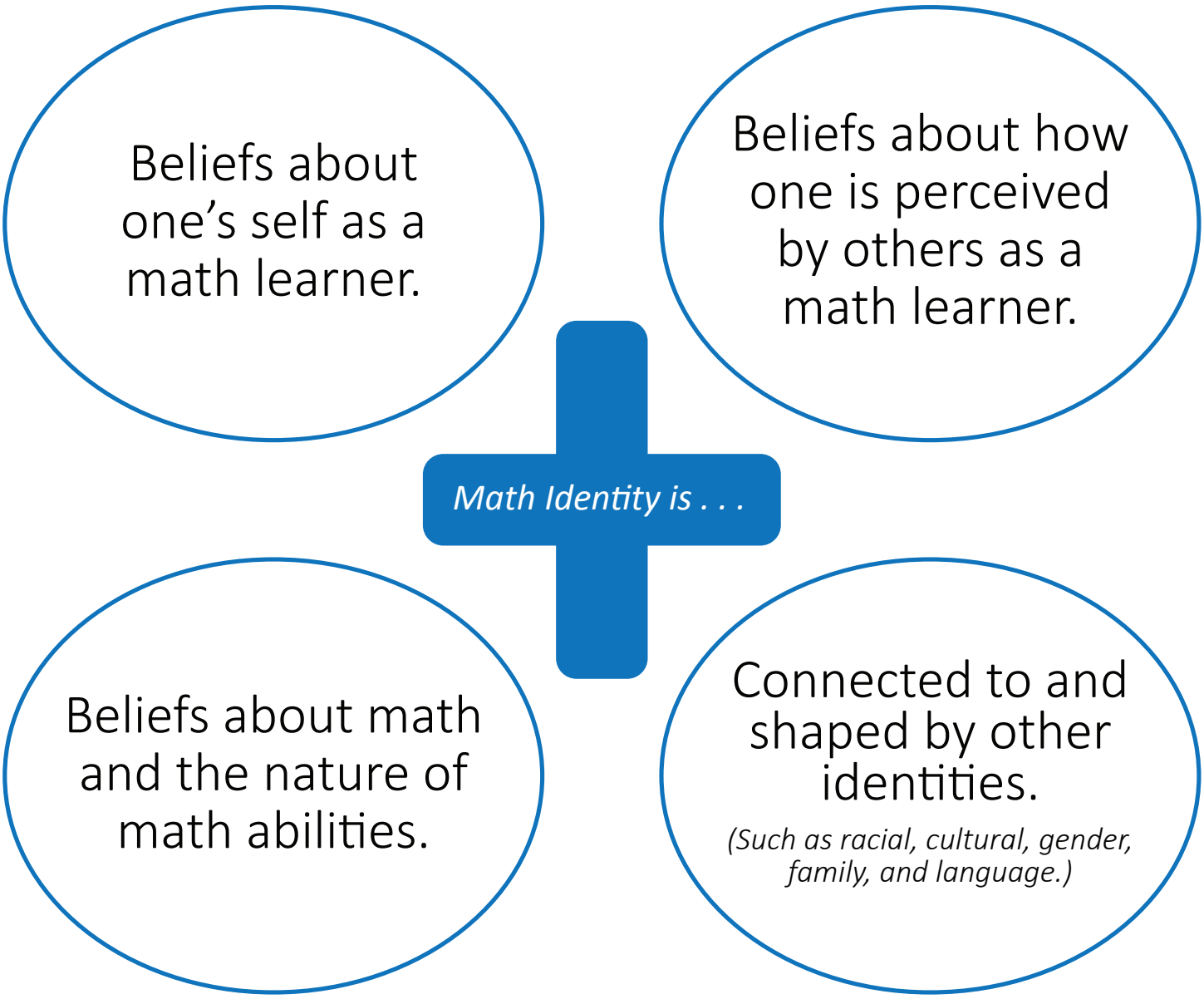



| Tracking sounds / looks like . . . | | Pathways sound / look like . . . |
|---|---|---|
| "We have a + 1 math course for college-bound kids." | → | "All our +1 math courses lead to or earn college-level math credit." |
| "We have applied options for our CTE kids." | → | "All our +1 math courses use relevant and career-related context." |
| Classes are homogeneous by one or more demographic group. | → | Course enrollment can not be predicted by demographics. |
| Teachers recommendation process for +1 enrollment. | → | Student choice is the only factor for placement into +1. |



**Tracking**
*"The tracking of students for instruction in mathematics is a long-standing practice of schooling that segregates students of different backgrounds into separate experiences, [based on perceived ability and prior performance] on pathways leading to different outcomes." - Robert Q. Berry, III - NCTM 2008*

# What is Math Identity?




*Solomon, Y. (2008). Mathematical literacy: Developing identities of inclusion. Routledge.*

# How Do We Ensure Access for All?

**Historic practices of tracking and acceleration have caused some student populations to expect particular sequences of courses. Here are helpful resources to use when you are communicating about changes to course sequences.**

### In Our Curriculum . . .

Our current high school sequence of courses (Algebra course followed by Geometry and then another course in Algebra) dates back to at least 1890 as evidenced in documents from the *Committee of Ten* who were charged with documenting current high school practices at the turn of the 20th century.

### In Our Structures and Procedures . . .

We can trace the roots of our math sequencing practices to the early 20th century. At this time the American school system underwent a substantial shift. The rise of manufacturing, immigration, and intelligence testing were among the leading causes of these shifts. "Tracking students to situate them for specific roles in the economic hierarchy helped to replicate existing social and racial hierarchy, and to provide 'scientific' justification for doing so" (Feldman, pp. 21-22).

*These discriminatory practices of sorting students based on perceived ability and perceived potential are very much ingrained in our mathematics education system today.*

**Dive Into Your Data with an Equity Lens**

- Who is successful in mathematics in your district? How do you measure that?
- Who is accessing advanced math courses? Does this reflect the diversity of your student population?
- How do students gain access to math courses? Are there barriers to access such as prerequisites?
- What assumptions are you making in our course placement processes? What assumptions are you making in your course placement process?

**Learn More**

- *Dr. Jo Boaler on Ability Grouping*
- *Excerpt from Catalyzing Change*
- *San Francisco USD Overview*
- *Article about SFUSD and Oakland SD pathway reforms*
- *Quick Facts about Math and Tracking*
- *Video Overview of North Clackamas*
- *Q&A from North Clackamas*
- *IB programs in support of detracking*

**Supporting Gifted Learners**

- Schools are encouraged to *Rethink Giftedness.*
- Gifted learners deserve individualized supports through multi-tiered systems of support (MTSS) planning.

**Read More:** *Branching Out: Designing High School Math Pathways for Equity*

**"Positive academic identity and agency cannot happen without deliberate work on the part of educators to address implicit bias, assumptions about student capabilities, and the ways that math traditionally reinforces privilege."**

# How Do We Ensure Access for All?

***Engineering for equity means designing at the margins – centering students who math education is currently not serving. In Oregon, students receiving special education services and multilingual learners have been particularly marginalized and underserved by our mathematics education system.***

## Designing with Special Education Students at the Center

### At the District Level

- Establish a culture of "our kids" - sending the message that everyone is a teacher of special education.

### At the School Level

- Choose curriculum that authentically integrates *Universal Design Principles for Learning.*
- Design your schedule for co-teaching models that allow for collaboration between classroom teachers and special education teachers.

### At the Lesson Level

- Plan lessons using strategies from *Universal Design for Learning*
- Increase access for students:
  - by being flexible about the physical environment, tools, means of expression, etc.
  - by allowing ample processing time - never emphasize speed in a math class.
  - with the use of assistive technology, manipulatives, visual aids, graphic organizers, and intentional brain breaks.

## Designing with Multilingual Learners at the Center

### At the District Level

- Establish a culture of "our kids" - sending the message that everyone is a teacher of multilingual learner.

### At the School Level

- Choose curriculum that authentically integrates *SIOP Strategies.*
- Design your schedule for co-teaching models that allow for collaboration between classroom teachers and English language development (ELD) teachers.

### At the Lesson Level

- Language-rich mathematics instruction is necessary to support multilingual learners. Rather than removing text, use these strategies to support access.
  - *Teaching Academic Vocabulary*
  - *Reading and Understanding Written Math Problems*
  - *Building Background Knowledge*
  - *Increasing Student Language Production in the Content Area*
  - *Using Technology*

## Rethinking Intervention

*Intervention curriculum, double-dosing math, and math support classes are common practices in math education systems. The following guidance can support your district in ensuring that interventions have a positive impact:*

1. **Focus on conceptual development**: "Efficiency is the issue though. In our rush to 'catch our students up' we are jumping to the efficient language too early" (Dixon, 2022). Intervention time is the time to ensure students understand WHY. It is not the "shortcut" or "trick" time.
2. **Provide a clear connection between concepts and procedures**: When you move to the HOW during intervention time, make frequent call backs and explicit connections the WHY.
3. **Prioritize a strategic selection of content**: All math instruction should be focused on the "big ideas," but intervention time should be even more focused on the "biggest" of these ideas and then make explicit connection to what is being studied in their grade level math course.

# Appendix B – Oregon's Education Equity Lens

## Purpose of Oregon's Education Equity Lens

The purpose of this equity lens[1] is to clearly articulate the shared goals we have for our state and the intentional investments we will make to reach our goal of an equitable educational system.

This equity lens helps educators and decision-makers recognize institutional and systemic barriers and discriminatory practices that have limited student success in the Oregon education system. The equity lens emphasizes underserved students, such as out of school youth, English Language Learners, and students of color with a particular focus on racial equity.

The focus of this equity lens is on race and ethnicity. This is based on an understanding that when we focus on racial disparities as a lens to consider investments for each and every student and community, we can and will generate opportunity and improvement in every area of educational practice and performance. Centering racial equity is rooted in the historical context of Oregon and is the path through which we can heal while targeting areas of action, intervention and investment.

The questions offered below can and should be adapted to ask questions regarding each of the focal groups named in the Student Success Act as being farthest away from opportunity and deserving our collective attention.

The passage of the Student Success Act directly calls upon educators and leaders across the state to act together, with a shared sense of purpose and possibility.

[1] This equity lens was first generated by the Oregon Education Investment Board in 2011 and then was adopted by the Oregon Department of Education and the State Board of Education. It is lightly adapted here to provide an equity lens that SIA applicants can apply in their planning and decision-making processes. SIA applicants can utilize a different equity lens which they are asked to provide and describe how they've utilized it within the SIA application.

## Questions to Support Ongoing Equity Work

The following questions should be used to examine investments and priorities:

1. Who are the racial/ethnic and underserved groups affected? What is the potential impact of the resource allocation and strategic investment to these groups?

2. Does the decision being made ignore or worsen existing disparities or produce other unintended consequences? What is the impact on eliminating the opportunity gap?

3. How does the investment or resource allocation advance student mental or behavioral health and well-being and/or increase academic achievement and address gaps in opportunity?

4. What are the barriers to more equitable outcomes? (e.g. mandated, political, emotional, financial, programmatic or managerial)

5. How have you intentionally involved stakeholders who are also members of the communities affected by the strategic investment or resource allocation? How do you validate your assessment in (1), (2) and (3)?

6. How will you modify or enhance your strategies to ensure each learner and communities' individual and cultural needs are met?

7. How are you collecting data on race, ethnicity and native language?

8. What is your commitment to professional learning for equity? What resources are you allocating for training in culturally responsive and sustaining instruction?

## Beliefs

**We believe** that everyone has the ability to learn and that we have an ethical and moral responsibility to ensure an education system providing optimal learning environments that lead students to be prepared for their individual futures.

**We believe** that speaking a language other than English is an asset and that our education system must celebrate and enhance this ability alongside appropriate and culturally responsive support for English as a second language.

**We believe** students receiving special education services are an integral part of our educational responsibility and we must welcome the opportunity to be inclusive, make appropriate accommodations and celebrate their assets. We must directly address the over-representation of children of color in special education and the under-representation in “talented and gifted.”

**We believe** that the students who have previously been described as “at risk,” “underperforming,” “under-represented” or minority actually represent Oregon’s best opportunity to improve overall educational outcomes. We have many counties in rural and urban communities that already have populations of color that make up the majority. Our ability to meet the needs of this increasingly diverse population is a critical strategy for us to successfully reach our collective goals.

**We believe** that intentional and proven practices must be implemented to return out of school youth to the appropriate educational setting. We recognize that this will require us to challenge and change our current educational setting to be more culturally responsive, safe and attending to the significant number of elementary, middle and high school students who are currently out of school. We must make our schools places where every learner feels welcomed and a sense of belonging.

**We believe** that ending disparities and gaps in achievement begins in the delivery of quality early learning programs and through family and community engagement and support. This is not simply an expansion of services -- it is a recognition that we need to provide services in ways that best meet the needs of our most diverse segment of the population, 0-5 year olds and their families.

**We believe** that resource allocation demonstrates our priorities and values and that we demonstrate our commitment to rural communities, communities of color, English language learners and out of school youth in the ways we allocate resources and make educational investments.

**We believe** that communities, families, teachers and community-based organizations have unique and important solutions to improving outcomes for our students and educational systems. Our work

will only be successful if we are able to truly partner with the community, engage with respect, authentically listen -- and have the courage to share decision making, control and resources.

**We believe** every learner should have access to information about a broad array of career/job opportunities and apprenticeships that will show them multiple paths to employment yielding family-wage incomes, without diminishing the responsibility to ensure that each learner is prepared with the requisite skills to make choices for their future.

**We believe** that our community colleges and university systems have a critical role in serving our diverse populations, rural communities, English language learners and students with disabilities. Our institutions of higher education, and the P-20 system, will truly offer the best educational experience when their campus faculty, staff and students reflect this state, its growing diversity and the ability for all of these populations to be educationally successful and ultimately employed.

**We believe** the rich history and culture of learners is a source of pride and an asset to embrace and celebrate.

**And, we believe** in the importance of supporting great teaching. Research is clear that "teachers are among the most powerful influences in (student) learning."[2] An equitable education system requires providing teachers with the tools and support to meet the needs of each student.

[2] Hattie, J. (2009), Visible learning: A synthesis of over 800 meta-analyses relating to student achievement. P. 238.

# Oregon Math Project

# Practice Brief: Mathematical Modeling

Megan Brunner, Elyssa Stoddard & Rebekah Elliott, Oregon State University

## What is the Issue?

A primary task of mathematics educators is to support students in understanding the usefulness of mathematics outside of the classroom setting. Mathematical modeling is one way we can utilize math to analyze situations, create and test solutions, and make decisions based on sound reasoning. Researchers have explored how students at all grade levels can successfully engage in mathematical modeling. However, they are still exploring how teachers can engage students in authentic modeling tasks. This practice brief shares ideas in support of mathematical modeling, opportunities for students to see the usefulness of mathematics connected to their communities and lives, and emerging ideas for modeling instruction.

## Why it Matters:

- **Bringing the classroom into the community**: Mathematical modeling asks students to engage with rich, complex problems. Incorporating tasks and scenarios that are directly relevant to students' lives and communities are opportunities for students to see themselves echoed in the curriculum. They are able to draw upon their varied expertise and funds of knowledge to solve problems which can lead to richer mathematical discourse. Authentic modeling tasks can also help students learn to analyze current issues using mathematics and to determine and communicate solutions to stakeholders.[1] Modeling can be a space for learning mathematics and learning about the world.
- **Opportunities to develop student agency and mathematical identities**: Modeling tasks align well with recommendations for increasing agency and identity in mathematics.[2] When students are actively engaged in the lesson they deepen their understanding and see themselves as mathematically capable.[3] Teachers can increase opportunities for student agency and voice in the learning process by providing choice in tasks and centering modeling on contexts in which students have experience and interest. Building mathematical identities can occur through the use of relevant contexts and explicit recognition of the way students are engaged in their own and others' mathematical reasoning.
- **Building mathematical proficiency**: School mathematics is often experienced as memorization and carrying out procedures. Mathematics is more than this! It includes cultivating reasoning and justification, strategically examining problems, identifying reasonable solution paths, iterating solutions, and preserving through problems. Mathematical modeling directly connects to these elements of mathematical proficiency and asks students to experience mathematics as a cycle of initiating a problem, identifying assumptions and variables, using mathematical tools and representations, analyzing a model for given situations, and validating a model for the initial problem or refining the problem to begin the cycle again.[3] Students who engage in modeling tasks begin to see mathematics as a way of reasoning and doing mathematics that involves mistakes and revision, rather than only a focus on getting an answer. Mathematical modeling actively engages students to see the usefulness of math.[4]

## Big Questions:

1. How are we providing opportunities for students to engage in the cycle of mathematical modeling?
2. How is mathematical modeling different than using a mathematical representation?
3. How do we assess students' modeling process as opposed to focusing on just the model?

## In Oregon & Beyond:

- **Oregon's Pilot of High School 2+1 Math Pathways**: The '2' of '2+1' is the first two years of high school mathematics that integrates modeling across all mathematical domains. The '1' is a variety of advanced mathematics courses aligned to student interest and college and career aspirations that also may integrate mathematical modeling in authentic ways.
- ***Math in Real Life* (MiRL) & Pilots of the First Two Years:** Oregon teachers are exploring ways to incorporate math modeling in their classes. MiRL teachers have designed projects that allow students to engage in robust mathematics and explore their communities. Other MiRL teachers have designed *mathematical modeling routines* to use with a variety of math tasks across math curricula. These routines are being shared across districts.
- **GAIMME Report and Math Modeling HUB resources:** The GAIMME report provides an in-depth exploration of the modeling cycle and ways to assess math modeling available via COMAP.[3] The Math Modeling Hub is an online community with K-16 modeling tasks.

## Future Steps:

- **Incorporate routines and build norms for participation in each step of the modeling process**: The modeling cycle is complex and can be overwhelming to do immediately with students. Incorporate instructional routines that focus on specific elements of the modeling cycle can support both teachers and students to get started with modeling. Two routines for mathematics modeling developed by Oregon teachers ask students to (1) consider assumptions, variables, and parameters that lead to a model and (2) analyze a model and consider its validity by coordinating a justification with assumptions and parameters. Teachers have found that these routines can be used with content more familiar to teachers and students before launching an authentic modeling task. Preparing for each step of the modeling cycle by organizing resources, anticipating student methods, and developing discussion questions is essential to supporting students modeling.[2]
- **Modifying task to become modeling tasks***:* Typical mathematics tasks in textbooks can often be modified to become modeling tasks by removing scaffolds or steps in problems.[6] To support students' engagement in modeling ensure tasks involve communicating with others, developing strategies, asking good questions, and persevering when solutions are not obvious.
- **Connect to community and student interests**: Math is everywhere. Using the local newspaper and community issues, especially on topics of interests to students or where they spend their time outside of school, is a great source for modeling tasks.[1] Provide opportunities for students to do research into questions of interest. Use modeling as a way to develop, analyze, and justify solutions. Encourage and support students to bring those solutions to the appropriate stakeholders.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# Oregon Math Project

# Practice Brief: Classroom Discourse

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## What is the Issue?

Classroom research has established that all students learn by participating in meaningful discourse, and many teachers are changing the ways they teach to incorporate more student reasoning, ideas, and questions. Unfortunately, much of student talk in math classrooms is often limited to students providing short responses to teachers' questions. This practice brief explores how robust discourse can positively impact student learning and identity in math and it details steps educators can take to incorporate more meaningful discourse in their classrooms.

### Classroom Discourse

The gestures, speech and written text used by teachers and students to communicate. These depend on the social relationships and communication system cultivated by teachers and students.[1]

## Why it Matters:

- **Affords deeper understanding**: When classroom discourse asks students to justify their own thinking and make sense of the thinking of others, learning becomes a collaborative process in which students are able to make connections to mathematical concepts and gain insight into their own (mis)understandings.[2] Students develop the skills to support their thinking with examples, counterexamples, and logic, which are critical to mathematical proficiency. Constructing viable arguments and critiquing the reasoning of others (Math Practice #3, Common Core State Standards) is an essential part of mathematical discourse.[3]
- **Positions everyone as a knower and doer of math**: If the ideas and voices of only a select group of students are recognized as mathematically correct or useful, it may position other students as incapable or unworthy of learning mathematics. However, research demonstrates there are certain discourse moves which help to position students as knowers and doers of mathematics, particularly English Language Learners.[4] For example, when teachers "revoice" student ideas or ask another student to "repeat or rephrase" to highlight key mathematical thinking, students are recognized by their peers as having valuable ideas.[5] Using tasks that have multiple entry points and solution methods and that require students to work collaboratively provide opportunities for students to see themselves and each other as mathematically competent.[6] When students' identities are grounded in being mathematically capable, they are more comfortable sharing their own ideas, questioning others, and taking on the cognitive load of tasks and problem solving.
- **Provides opportunities for formative assessment**: By having students voice their thinking, rephrase peers' thinking, or add on with reasoning by agreeing or disagreeing to peers' thinking, teachers can assess understanding of concepts and gain insight into students' methods and reasoning.[5] Class discussions allow for frequent, formative, informal assessment, to gauge reasoning and comprehension. Activities where students capture their thinking through reflections can serve as both a check-in and an artifact of student progress.

## Big Questions:

1. Do students feel they have the authority and responsibility to ask questions and drive discussions?
2. How can all student ideas be seen as valuable contributions?
3. What instructional opportunities engage students in meaningful discourse that deepens their understanding of mathematics?

## Future Steps:

- **Rough draft talk**: Create a space where students share their initial ideas (i.e., rough drafts) without being evaluated. Instead, have students ask questions to help clarify ideas and give them time to revise their thinking before sharing ideas as a final draft. When students can share without the fear of being wrong and have the opportunity to revise their thinking, they develop the confidence to take intellectual risks and the understanding that learning/doing mathematics is an iterative process.[7]
- **Model the discourse you expect**: Since this type of discourse may be different from students' previous experiences, teachers must intentionally support the discourse practices expected from students.[1] This includes providing sentence stems, asking open-ended questions, using appropriate terminology, and providing enough time for students to think about and revise their responses.[8]
- **Act on opportunities**: In addition to incorporating high cognitive demand tasks which provide opportunities to leverage student thinking[9], teachers can also modify current tasks to incorporate more discourse by considering question that ask students to make their thinking visible.[10] Talk moves such as revoicing, restating, agree/disagree with reasoning, adding on, and wait time are discourse practices that can be used on a regular basis.[5] Additionally, look for ways to structure activities for students to work collaboratively and capture their in-process thinking using technology.
- **Trust the process**: Changing classroom discourse norms takes time for both teachers and students. Making explicit new discourse routines and behaviors helps to establish norms as does practice with authentic tasks that elicit reasoning.[9] Establishing and maintaining robust discourse norms requires persistence especially when students face challenging content or shifting norms across courses.[11]

## In Oregon & Beyond:

- **Curriculum for developing norms for discourse:** District that utilize curricula that embed opportunities to build routinized structures for classroom discourse are providing teachers with resources and opportunities to build math classroom discourse. Curricula such as CPM[16], New Visions[14], and Illustrative Math[15] emphasize communication and justification as students collaboratively solve tasks. They also embed instructional routines for regular use to build classroom discourse norms.
- **Bend La Pine School District**: Teachers are encouraged to regularly use classroom discourse practices as a part of their instruction. To work on math discourse department wide, teachers engage in Studio Cycles[12] where they lesson plan and make teaching public via observation multiple times a year.
- **Conferences:** Teacher professional development opportunities around building mathematical classroom discourse include:
  - **Teachers Development Group Leadership Seminar,**
  - **Oregon Math Leaders Conference**
- **Integrating Effective Teaching Practices**[13]: A brief report that explains three teacher moves to use in establishing mathematical discourse with students and provides tips for structuring class time effectively.


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[14]https://curriculum.newvisions.org/math/course/getting-started/instructional-routines/
[15]https://www.illustrativemathematics.org/curriculum/
[16] https://cpm.org/

# Oregon Math Project
# Practice Brief: Tracking

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## What is the Issue?

Tracking, also known as ability grouping students into particular courses, has been commonplace in K-12 schools and particularly in mathematics classrooms since the 1920s. While some argue that tracking allows for more targeted instruction based on student ability and need, research has demonstrated that tracking often results in inequitable teaching and learning for students. Certainly, students have different needs and abilities that need to be attended to, however tracking isn't the answer given the persistent inequalities that result from it. This practice brief discusses the impact tracking has on students and describes alternatives for teachers and schools.

## Why it Matters:

- **Tracking is inequitable**: Students minoritized in schools are placed in lower track courses at higher rates than their white peers.[1] This contributes to what opportunities students have to learn and how they see themselves as capable learners. This contributes to the inequalities documented in system level assessments.
- **Impact on student learning**: Lower track classes frequently focus on below grade-level content and over-reliance on procedures thus not preparing students to advance in mathematics. These courses are often taught by the least experienced teacher or by teachers with minimal certification or licensing. One study found that students who were given grade-appropriate assignments met the demands of those assignments the majority of the time regardless of the track where they were enrolled.[2] Additionally, students who began the year testing behind their peers demonstrated more than 7 months of academic gains when they had greater access to grade-appropriate assignments.
- **Labels send a message**: How courses are labeled (i.e. advanced, college preparatory, regular, foundational) can perpetuate status issues among students.[1] Status based on perceived academic, social, or other capabilities, when unattended to, can perpetuate biases and systemic inequality. Course labels often send a message that "advanced courses" are somehow more important than applied courses such as those in career and technical education departments.
- **Students see the inequity of tracking**: Research on detracking documents that students are aware of the inequity of being tracked in courses. Students in one study expressed how easy it was to be moved to a low track course yet widely experienced great difficultly to shift into a high track course.[3] They also recognized that some teachers give more attention and effort to higher track courses than to lower track courses and thus students received less attention and quality of instruction.[3]
- **Teacher tracking hinders system coherence:** Teachers are also tracked, meaning they teach a limited scope of courses or are assigned courses with particular course titles (regular, foundational, etc.). This limits teachers' professional growth and the school's or department's instructional coherence.[7]

## Big Questions:

1. What process does your school use to assign students to a course?
2. What is the impact of tracking on students' status, course taking, and access to grade level math in your school/district?
3. How can students' diverse needs and abilities be met and challenged in a heterogeneous setting?
4. Who needs to be a part of conversations on tracking?

## In Oregon & Beyond:

- **Oregon Schools**: Districts are exploring ways to grade level mathematics in every grade.[2] For example, for those entering a trimester system, teachers may offer first trimester courses so that all students, even those who were tracked to a "lower level" course, can enter into "grade level" mathematics in trimester two and three. First trimester content provides robust opportunities to work on procedural fluency and standards for math practice such as modeling.
- **San Francisco United School District:** Mathematics courses were de-tracked started in middle school with students completing the same core course sequence during grades 6 through 9, including Algebra I. Afterwards, course options allow for students to choose the path of rigorous mathematics they wish to pursue.[6]
- **Look to the National Council of Teachers of Mathematics:** Read their recent publication *Catalyzing Change.*[7]

## Future Steps:

- **Create supportive routines and structures that attend to grade level learning and status when detracking courses and schools**: When systems change from traditional ability grouping to detracked courses, teachers need routines and structures built within courses to support each and every student to learn grade level content and to establish norms for addressing status. Co-requisite courses that support student success with grade-level content must attend to problem solving and concepts, not just procedures.
- **Create multidimensional courses***:* Utilize mathematical tasks that have multiple entry points and solution paths. Often these tasks ask students to work together in groups.[4] This way all students can participate and find success, while also seeing that success in mathematics is not just getting an answer. Mathematics involves communicating with others, developing strategies, asking good questions, and persevering when solutions are not obvious.
- **Work to change community beliefs**: Teachers, students, and community members need to believe that all students are mathematically capable if detracking efforts are going to be sustainable and successful.[5] To change beliefs, teachers should be provided with supports such as common planning time, professional development, and curricular resources. Students previously in low track courses should be supported academically so they feel capable of taking on detracked courses. All students should feel supported and understand that they are capable of being successful in mathematics.

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# Oregon Math Project

# Practice Brief: Promoting Equity

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## What is the Issue?

In education, we often hear the word "equity" used in conversations about programs and in policy. Knowing what is meant by equity and attending to who is served and more importantly who is not served by our programs and policies is complex and not typically central in our discussions. The lack of a shared definition of equity and attention to who is served in policies and programs can result in perpetuating the status quo. This practice brief introduces a commonly used framing of equity in mathematics education and provides ideas for how teachers, administrators, and families can work together to improve instruction towards more equitable ends.

### Equity

The inability to predict mathematics achievement and participation based solely on student characteristics such as race, class, ethnicity, sex, beliefs, and proficiency in the dominant language.[1]

## Why it Matters:

- **Access**: The first step into making schooling more equitable focuses on students' access to grade level opportunities for learning. Without access to resources and opportunities, students can be positioned from a deficit perspective instead of acknowledging that students will have different needs in the classroom. When planning, enacting, and assessing a lesson, we need to provide equitable access to materials, people, content, and a community that supports the learning of all students. However, providing access to opportunities is not enough.[2]
- **Achievement**: The definition of equity presented above centers achievement as a key piece for measuring equitable schooling. That is, unless we teach our students in ways that support them to show what they know on assessments that determine their futures as well as empower them to use mathematics as a critical tool in their lives and communities, we have not prepared them to succeed in a society that values mathematics. We need to prepare students to "play the game" in order to "change the game." This means that we must support students from non-dominate communities' access to math *and* math achievement so they may pursue STEM and change STEM culture.[2]
- **Power**: Power dynamics shape teaching and learning mathematics. These dynamics can be seen through questions such as, "whose voice is heard in the classroom?", "who is able to author mathematical ideas?", "where is mathematical authority located?", and even regarding how mathematics is seen as useful by students. Students need to experience their power as mathematical thinkers and do-ers, thus requiring us to decenter our own thinking and center theirs.[2]
- **Identity**: Studies have shown that students who hold positive mathematical identities are more likely to succeed in math and continue in the field. A linchpin in the development of positive mathematical identities is the classroom learning environment. Supporting students' development of positive math identities is intentional work that comes through planning, enactment, and assessment of a learning segment. The learning environment must welcome and draw upon students' cultures, communities, and identities to learn content just as the design of curricular tasks must recognize the valid and valuable[3] mathematical activity students bring from their everyday lives.[2]

## Big Questions:

1. How are our expectations of students shaped by biases and perspectives on learning that we bring to the math classroom?

2. Is each and every student receiving a high-quality education with equitable opportunities to participate in learning?

3. How are math classes empowering students to meaningfully participate in their future and community and to see themselves as

## In Oregon & Beyond:

- **Escondido Union High School District**[11]**:** A common vision of equitable instruction was developed by EUHSD teachers and leaders to guide their work in creating an equitable math program.
- **Conferences:** Many conferences for teachers include sessions specific to equity in math education or are equity-focused as a whole. Opportunities for professional learning include:
  - **TODOS**
  - **Teachers Development Group Leadership Seminar**
- **Resources for reflecting on practice:** Teachers can use tools such as the TRU Framework[8] to critically reflect on their practice, or apps like EQUIP[10] to set goals and capture evidence of teaching.

## Future Steps:

- **Set norms for interaction that attend to status issues**: Regularly position students as competent, recognizing their participation in mathematical activity publicly. Ask students to engage in groupworthy tasks, where all members of a group are needed to contribute to the solution. Structuring peer discussions can support deeper connections to the math and build positive classroom relationships.[4]
- **Consider assessment policies used in class**: Provide opportunities for students to revise reasoning and demonstrate understanding in multiple forms over the course of a unit in order to reflect the iterative nature of mathematics.[5] Utilizing a variety of assessments that integrate student choice and self-assessment can build agency and connect mathematics with student interests.
- **Incorporating questioning into curriculum**: Fore-fronting student thinking and discourse provides a way to meet students where they are and allow *their* ideas to drive discussion. Asking questions that elicit mathematical reasoning allows students opportunities to explain their thinking, learn to question each other's reasoning, and build on each other's ideas.[6]
- **Connect classrooms with the community**: Our students live and interact in complex environments, and we do them a disservice when we expect them to leave their lives at the door. Pose problems around student or community interests and empower your students to analyze scenarios and propose solutions using mathematics as a critical tool.[7]
- **Engage in critical conversations**: Learning how our commitments to equity connect to our instruction is challenging. It requires hard work, critical reflection, and accountability to goals for improvement. It requires reflecting on our biases and the ways they shape instruction. Observing colleagues and reflecting on our instruction can support growth.[8] Collective, sustained focus across a system is needed to move toward equitable and inclusive mathematics education.[9]


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