



UTAH STATE BOARD OF EDUCATION

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MEMORANDUM

TO: Members, Utah State Board of Education

FROM: Martell Menlove, Ph.D.
Chief Executive Officer

DATE: June 6, 2014

**DISCUSSION/
ACTION:** Mathematics Standards

Background:

The Utah State Board of Education adopted the Common Core State Standards as Utah's Mathematics Standards in 2010, including the international course alignment model. Since then, the Board has studied the implementation of the mathematics standards in three separate meetings. Parents and teachers have responded to the implementation of the new core by sharing both anticipated and unanticipated challenges and successes.

Key Points:

- The Mathematics Standards are integrated in nature and coursework and instructional processes reflect this change.
- The Mathematics Standards focus on conceptual development along with procedural skill, and are thus more rigorous than the 2007 standards.
- Implementation of the Standards has happened at a time of rapid change in education (e.g. adoption of online texts) and alongside other initiatives (e.g. teacher evaluation).
- Implementation of the Standards has revealed areas that could be improved in the mathematics standards.

Anticipated Action:

USOE staff will present an overview of the Utah Mathematics Standards and the international course alignment model for discussion by the Board during the Board Study Session. Board members may take action in its regular meeting on the alignment model used for math courses.

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Math Standards Considerations

What is the Goal? The current goal is to have 66% of Utah students college/career ready by 2020 without remediation.

	Goal for % of students ready for college/career w/o remediation*	Ready to implement	Projected date to reach goal*	Textbooks Available	Most parents able to help. (Easy) Algebra, Geometry & Algebra 2 optional.	Some parents able to help in Secondary (2007 core) Moderate: About 1 and ½ years less difficulty	Some parents able to help K-8. (2010 core) Difficult/ Mapped to 1050/ World Class	No Federal Entanglement
Common Core Secondary International Model	66%	Now	2020	Yes TG difficult for parents			X	Under current waiver with addendum, No.
Common Core Secondary Traditional Model	66%	2016-17	2022	Yes TG difficult for parents			X	Under current waiver with addendum, No.
Common Core LEA choose your model	66%	2016-17	2022	Yes TG difficult for parents			X	Under current waiver with addendum, No.
New redesigned 2016 Standards A	66%	2018-19	2024	No			X	Yes
Old 2007 Standards	44%	Now	Now	No. Could use unaligned		X		Yes
New redesigned 2016 Standards B	15%	2016-17	Now	No	X			Yes

*If funds are allocated for On-going Professional Development, Resources, Remediation, Leadership, Communication.

Core Standards Consequences Comparison

Keep Current Core with Minor Adjustments	Adopt CCSS Algebra-Geometry Sequence	Return to 2007 Core	Completely Rewrite Core	Grant control of Standards to LEAs
Timeline for current implementation has been completed. 2014 will be the first year of state-wide alignment.	Requires phase-out of current standards for students already in International Pathway. Implementation target 2016-2017	Requires parent review committee and one year delay per HB 342 2 nd Sub. Requires overlapping years for phase-out of current standards.	Requires parent review committee and one year delay per HB 342 2 nd Sub. Also requires full core-revision process. Implementation target 2018-2019 with overlapping years for phase-out of current standards.	This would be a major departure from Standards adoption and implementation. It is unknown how HB 342 2 nd Sub. would pertain to this action.
No change in graduation rule needed.	Requires change in graduation rule and a phase-in period for students who have completed Secondary I.	Requires change in graduation rule and a phase-in period for students who have completed Secondary I.	Requires change in graduation rule and a phase-in period for students who have completed Secondary I.	Requires change in graduation rule to clarify parameters of local control and a phase-in period for students who have completed Secondary I.
Internationally-benchmarked, “world-class” standards designed for college – readiness with NCTM recommended pathway (Principles to Actions, 2014) Goal: 66%	Internationally-benchmarked, “world-class” standards designed for college-readiness. Goal: 66%	Not internationally benchmarked. Students would be college-ready at rates comparable to the past 44%, ACT 2013	May be internationally benchmarked. Standards might be designed for college-readiness, given enough time and resources to develop them.	Some would be internationally benchmarked, some would not. There would be no common standards for college-readiness, nor a common metric for college-readiness at a state level.

Keep Current Core with Minor Adjustments	Adopt CCSS Algebra-Geometry Sequence	Return to 2007 Core	Completely Rewrite Core	Grant control of Standards to LEAs
<p>LEAs and teachers who have complied with state policy have already committed time and resources to developing programs to support these standards.</p> <p style="text-align: right;">Ongoing Time</p>	<p>LEAs and teachers would need to completely rework resources to realign them to new sequence. Some lessons will no longer be appropriate and new lessons will need to be created.</p> <p style="text-align: right;">Additional Time</p>	<p>Although teachers with more than four years' experience in Utah will have resources to draw on (if they have maintained them), teachers with less than 4 years' experience (the majority of teachers) will need to develop completely new resources.</p> <p style="text-align: right;">Additional Time</p>	<p>Teachers would need to develop new lessons and find resources to support new standards when available. Impact depends on how closely new standards match either 2007 or 2010 standards.</p> <p style="text-align: right;">Extensive Time</p>	<p>Teachers would need to develop new resources and would not be able to share across the state or with educators in other states.</p> <p style="text-align: right;">Very Extensive Time</p>
<p>Core is familiar to teachers who have been working on it since 2010 and to teachers new to the field. Professional learning can shift to improvement of pedagogy and content knowledge.</p>	<p>Standards may be familiar but reorganization requires familiarization. Professional learning would need to focus on realignment of standards.</p>	<p>Core is only familiar to teachers who were teaching prior to 2010.</p>	<p>Core would be new to all. Professional learning impact is unknown.</p>	<p>Core may or may not be familiar depending on LEA choice. Statewide professional development would focus on pedagogy and content knowledge while districts would need to support other learning needs.</p>

Keep Current Core with Minor Adjustments	Adopt CCSS Algebra-Geometry Sequence	Return to 2007 Core	Completely Rewrite Core	Grant control of Standards to LEAs
Curriculum maps and pacing are currently in place.	Curriculum maps and pacing would need to be developed LEA cost	Curriculum maps and pacing may be available in archives.	Curriculum maps and pacing would not be available until after the core was written. LEA cost	Curriculum maps and pacing would be available for the international model but would need to be developed for any other adopted standards. Possible LEA cost
Many LEAs have purchased materials that align. RIMS database contains many recommended curricula and many more are available for fall review.	Recently adopted materials do not align. Alignment studies for RIMS would be required. LEA cost	Aligned materials were not available in 2007 and are unlikely to be available now. LEA cost	Availability of suitable materials could not be determined until completion of standards LEA cost	LEAs could adopt standards based on locally available materials.
State-created materials support these standards and are in place.	State-created materials would no longer align (MVP) \$315,000	State-created materials would no longer align (7 th & 8 th Grade, MVP) \$615,000	State-created materials would no longer align (7 th & 8 th Grade, MVP) \$615,000	State-created materials may or may not align.

Keep Current Core with Minor Adjustments	Adopt CCSS Algebra-Geometry Sequence	Return to 2007 Core	Completely Rewrite Core	Grant control of Standards to LEAs
Assessments are in place and only ongoing maintenance and regularly scheduled item development are required.	Items from existing bank would need to be realigned to match pathways, possibly negating pilot data and requiring re-pilot. Would require a change in the current contract. Cost	Historical items may be available, but would not include technology-enhanced items. Would require a change in the current contract. High Cost	A new assessment would need to be fully developed. Would most likely require a completely new contract. High Cost	There would not be a common state-wide assessment. OR An end of high school exam would need to be developed, requiring a new contract. OR ACT or other nationally available assessment could be used for high school assessment. High Cost
Ongoing Item Development Cost	Item Development Cost	Item Development Cost	Item Development Cost	Districts may have to develop individual assessments High Cost
SAGE formative is nearly ready for release	SAGE formative items would need to be realigned to match pathways. Cost	Formative Items may be available from UTIPS and would need to be uploaded into SAGE Cost	SAGE formative items would need to be developed for the new core. Some items may migrate. Cost	Districts would need to align whatever formative items are available. LEA Cost

Keep Current Core with Minor Adjustments	Adopt CCSS Algebra-Geometry Sequence	Return to 2007 Core	Completely Rewrite Core	Grant control of Standards to LEAs
National and International Results are unknown. Common standards have been proven to lead to higher overall results in international studies where professional development, resources, remediation, leadership and commitment are in place.	National and International Results are unknown. Common standards have been proven to lead to higher overall results in international studies where professional development, resources, remediation, leadership and commitment are in place.	Consistently mediocre performance on national and international assessments.	National and International Results are unknown	Common standards have been proven to lead to higher overall results in international studies.
Digital textbooks likely to be adopted at increasing rates.	Digital textbooks likely to be adopted at increasing rates.	Digital textbooks likely to be adopted at increasing rates.	Digital textbooks would not be available from publishers to support standards.	Digital textbooks may not be available to support individual LEA standards.
Open Education Resources are available from USOE, the U of U, and a variety of other sources, including resources outside of Utah.	Open Education Resources are available from a variety of resources outside of Utah.	Open Education Resources are not available, but could be developed. Resources from outside the state would not be available.	Open Education Resources could be developed to support a Utah specific core but resources from outside the state would not align.	There may or may not be Open Education Resources available, depending on choices made in LEAs.
NCAA approved	Would need to go through NCAA approval process with likely approval	Would need to go through individual school NCAA approval with likely approval	Would need to go through individual school NCAA approval.	Would need to go through individual school NCAA approval.
ACT is scheduled for revision and alignment.	ACT is scheduled for revision and alignment.	Does not align to current ACT and would not align to revised ACT.	May or may not align to ACT.	May or may not align to ACT.

5 Core Standards Consequences Comparison Chart

Keep Current Core with Minor Adjustments	Adopt CCSS Algebra-Geometry Sequence	Return to 2007 Core	Completely Rewrite Core	Grant control of Standards to LEAs
Aligns to SAT.	Aligns to SAT.	Does not align to SAT.	May or may not align to SAT.	May or may not align to SAT.
Some parents can help students with procedural skill but may be less equipped to help with developing conceptual knowledge	Some parents can help students with procedural skill but may be less equipped to help with developing conceptual knowledge	Some parents can help students with procedural skill	Impact would depend on the standards. High standards are less likely to be accessible to all parents.	Impact would depend on the pathway chosen. High standards are less likely to be accessible to all parents.
Core contains mathematical concepts and procedures unfamiliar to parents which are necessary for 21 st Century success.	Core contains mathematical concepts and procedures unfamiliar to parents which are necessary for 21 st Century success..	Some parents are familiar with mathematical procedures, but teachers may teach in unfamiliar ways.	Will most likely contain mathematical concepts and procedures unfamiliar to parents, especially if standards are designed for college- and career readiness.	Will most likely contain mathematical concepts and procedures unfamiliar to parents, especially if standards are designed for college- and career readiness.

Core Standards Implementation Update

Utah State Office of Education

June 5, 2014



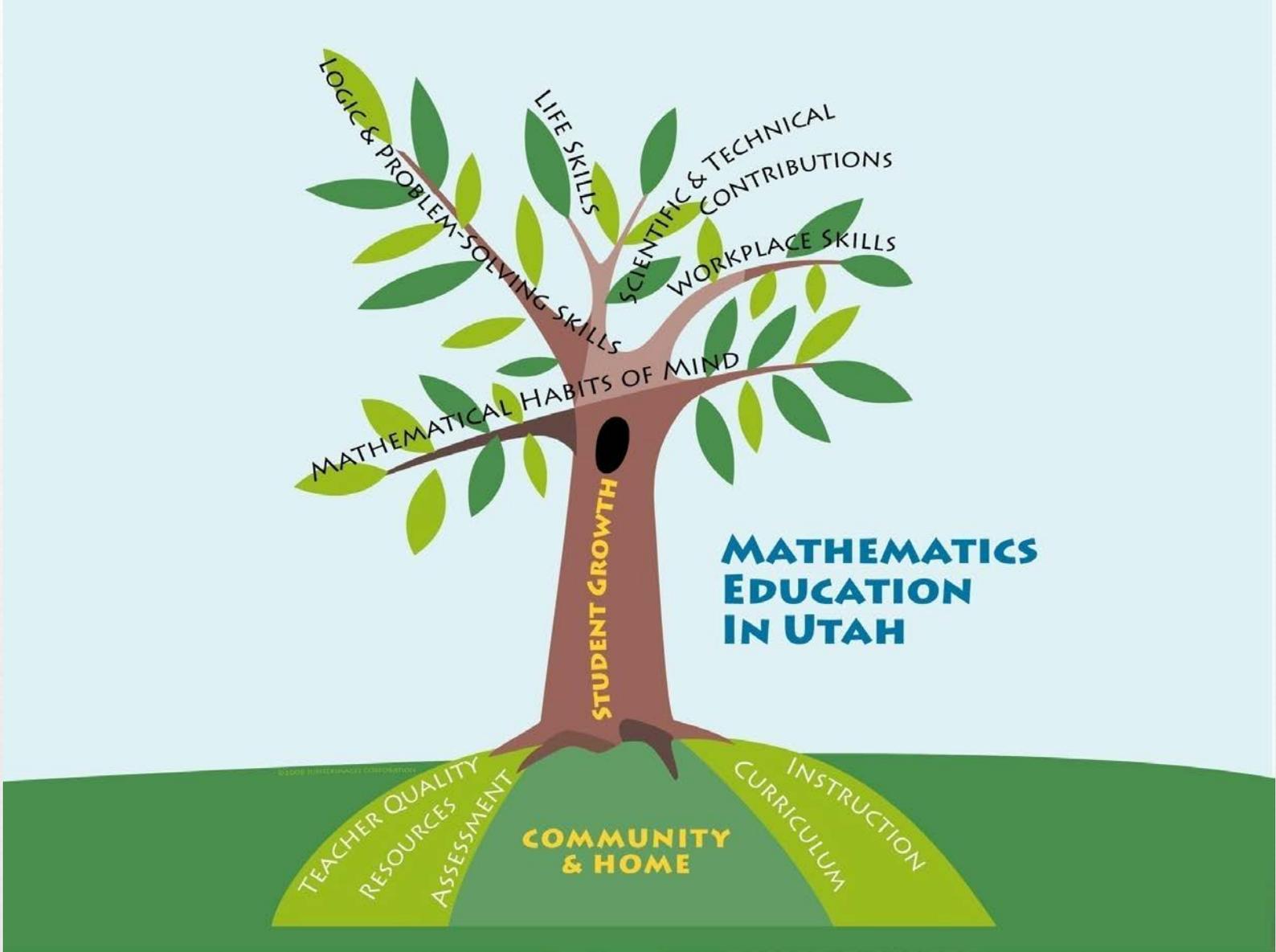
Today's Intended Outcomes

- At the end of the presentation/discussion Board members will have a better understanding of:
 - Process used to select high school mathematics pathways
 - International approach to new mathematics standards
 - Challenges and successes for students, teachers, and parents
 - Messages that have been given to teachers
 - USOE responses to findings from data
 - Options for moving forward

What are the issues with mathematics?



- New standards are integrated in nature and Utah selected new courses to reflect this change
- Instructional focus on both procedural knowledge and conceptual understanding is new for parents, students, and some teachers
- Materials and resources may not be in the form of one textbook. Utah has developed our own online materials in many cases.
- Published materials adopted by schools and districts are often not aligned to standards



What problem(s) is the Common Core trying to solve?

- American students are **middle-of-the-road** at best on academic skills when compared to other countries on **international tests**.
- Until now, each state set its own standards for what students should understand at each grade level, and each state had a **different definition for what it meant to be "proficient"** in math and reading.
- The US Education Department's statisticians **found a lot of variation** when they mapped state standards onto **scores on the National Assessment of Educational Progress**.
- So much variation makes it **difficult for states to collaborate** to improve education nationally. The Common Core is supposed to solve this by holding students in the majority of states to the **same, higher standards**.
- Policymakers and business leaders hope that **tougher standards will help the US catch up globally**.

Standards for Mathematical Practice

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Integrated Standards – Secondary Courses



International Model

Secondary I → Secondary II → Secondary III

- Fluency in linear and exponential relationships
- Fluency in linear data
- Congruence & Constructions
- Coordinate Geometry

- Quadratics
- Polynomial expressions and equations
- Probability
- Similarity, Proof & Trig
- Circles

- Polynomial, rational & radical functions & relationships
- Unit circle and trig functions
- Modeling
- Inferences with data

Algebra-Geometry-Alg. II Model

Algebra → Geometry → Algebra 2

- Fluency in linear algebra and data in linear models
- Exponentials
- Quadratics

- Coordinate Geometry
- Congruence & Proof
- Constructions
- Similarity & Trig
- Probability
- Circles

- Polynomial, rational & radical functions
- Unit circle and trig functions
- Modeling
- Inferences with data

Math Committee Discussion on Benefits of Models

International

- Eliminates algebra gap between geometry & algebra 2
- Better treatment of geometry through integration
- Cuts ties with outdated practices, attitudes, and curriculum
- Forces change-no familiar classes
- Connections within mathematics topics
- Separates linear and quadratic mathematics
- Broadens definition of mathematics
- World Class

Traditional

- Easier to double enroll (algebra and geometry)
- Better treatment of geometry through focused curriculum
- More comfortable for teachers and parents
- Parents understand names

Shifts required by new standards

- Focus
- Coherence
- Rigor
 - Fluency
 - Understanding
 - Application



What's the same?

- Procedures
- Correct answers
- Memorization of math facts
- Homework should be independent practice
- Textbooks and other materials are still important
- Technology and Manipulatives
- It's difficult for parents to help beyond arithmetic

What are the changes needed with instruction to support the development of mathematical practices?

- Interactive classroom experiences
- Authentic and engaging mathematical tasks
- Mathematical discourse
- Developing, solidifying, and practicing understanding
- Use of a variety of materials and curricular supports

What does this mean for **students**?

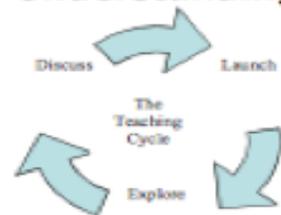
- Effective instruction leads to high levels of engagement and learning for students.
- Where practice standards are emphasized students are demonstrating deeper knowledge and practical use of mathematics.
- Students must get correct answers and justify why.
- Perseverance means taking ownership of learning and not just relying on the teacher or parent to give them the answer.
- Higher achievement for all students comes from students working together to solve real world problems.

What should this look like in classrooms?

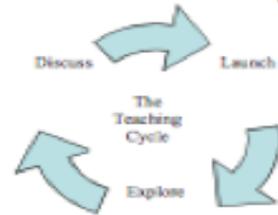
- Balance of skill, understanding and application
- Doing, learning, and understanding
- High quality questions
- Variety of learning experiences
- Using multiple class periods to achieve mastery
- Mathematics is made explicit (appearance of answers is not by “magic”)



Practice Understanding

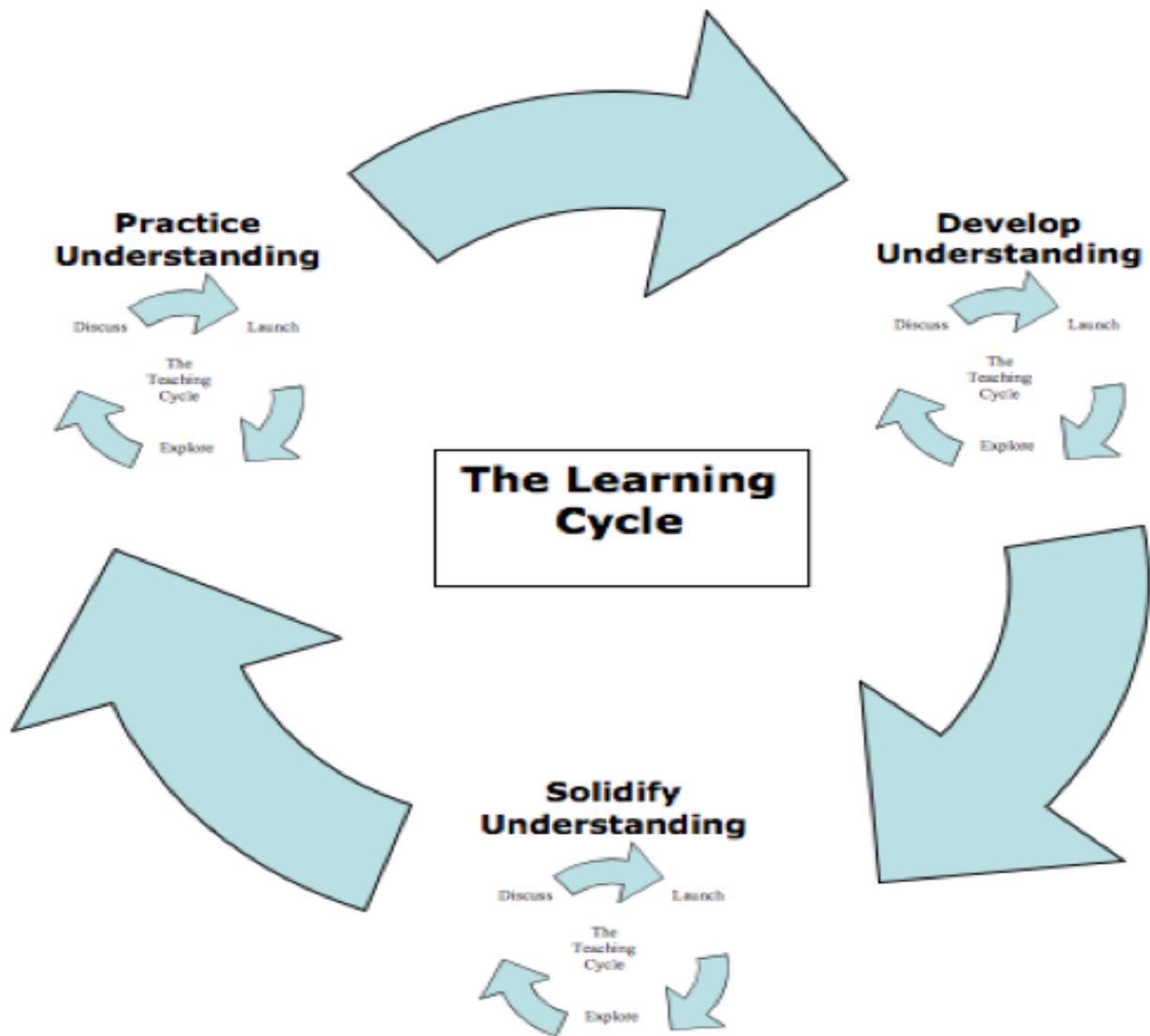
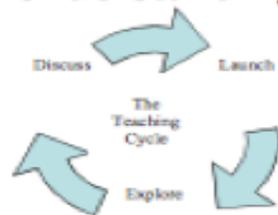


Develop Understanding

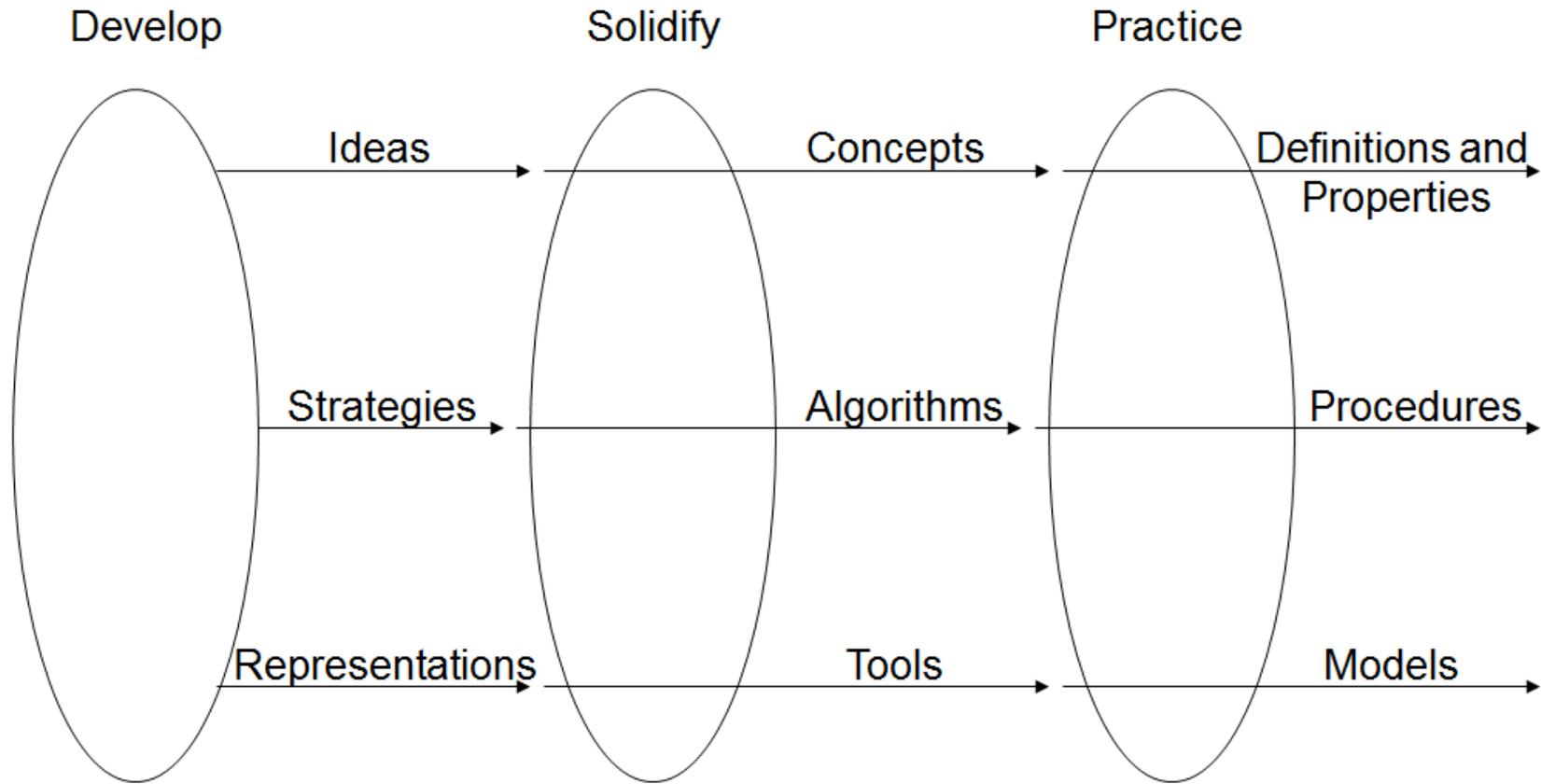


The Learning Cycle

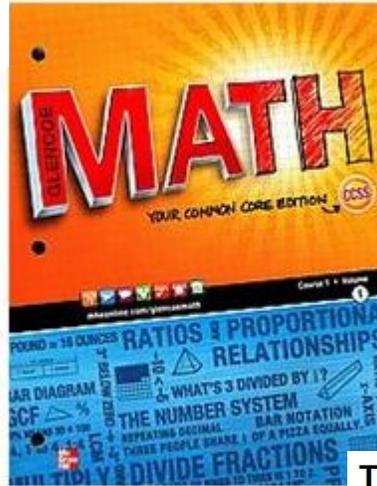
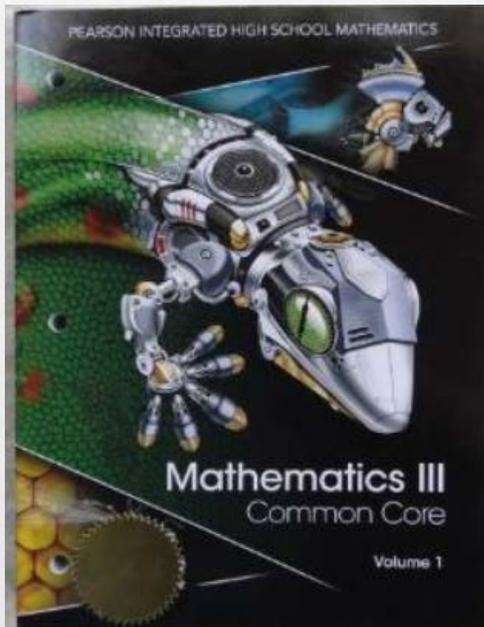
Solidify Understanding



Continuum of Mathematical Understanding



Textbooks



The Utah Middle School Math Project

*A University of Utah Partnership Project
for 7th and 8th Grade Math*



- Published Titles Available in RIMS
- Digital Textbooks
- OER Resources Developed by Utah
- OER Resources Developed by Consortia
- Teacher Developed Materials

Options for Advanced Students

- Honors Pathway
 - 5,511 students currently enrolled in Secondary III H
- Compacted Coursework
 - 1,675 8th graders currently enrolled in
Secondary I or Secondary IH
 - 42 LEAs currently offer Secondary Math to 8th graders
- Double-Blocked Courses
- Credit or Advancement by Examination



Options for At-Risk Students

- Double Blocks or Double Periods
- Supplementary Mathematics
- USTAR
 - In-year tutoring
 - Pre-coursework and summer recovery
- Online recovery



What does this mean for teachers?

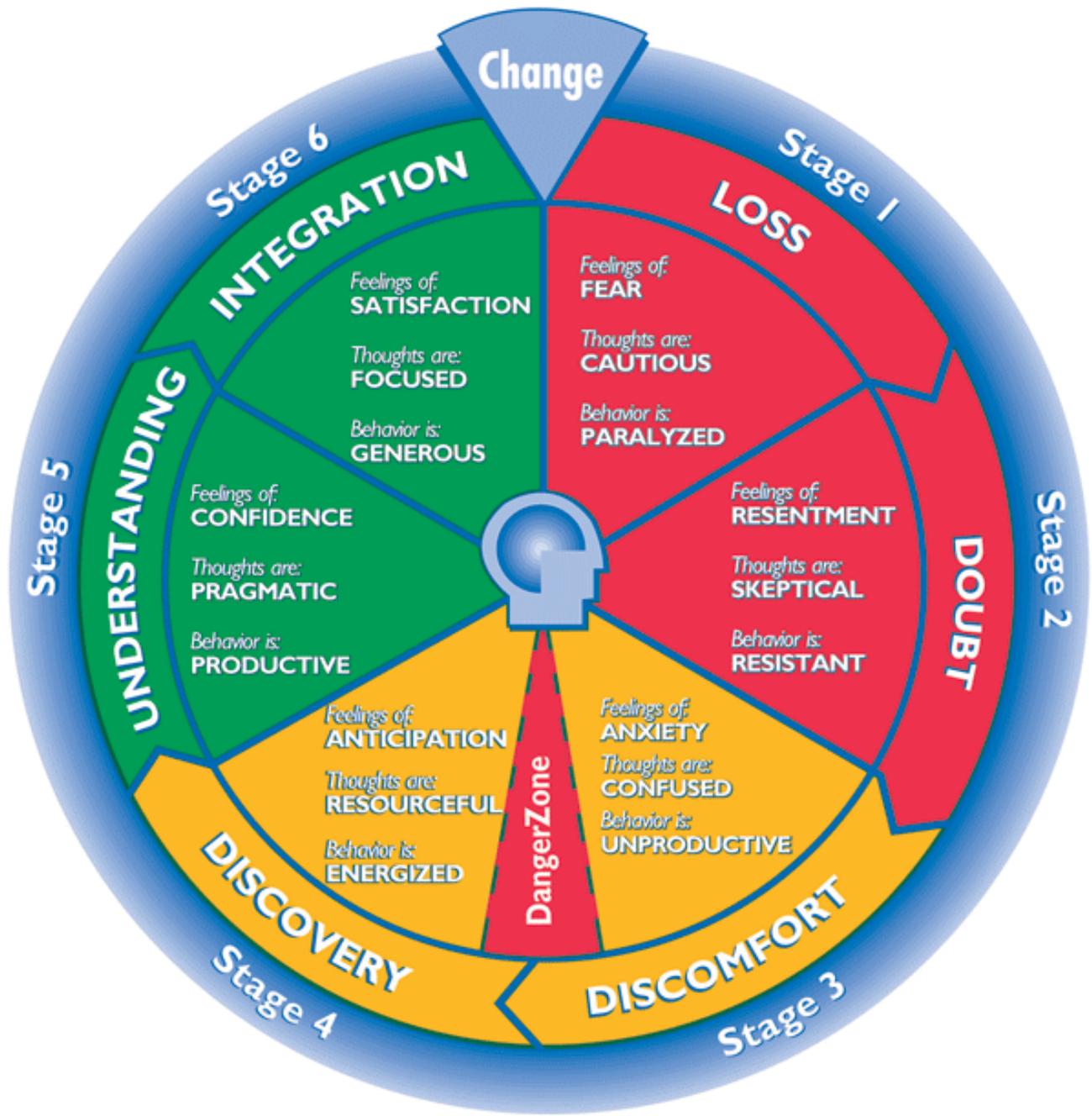


- Analysis, evaluation, critical thinking embedded in all instruction
- Increased knowledge of mathematical properties
- Application of what students learn to real world
- Emphasis on student performance instead of just knowing content

Professional Learning for Educators

- Summer Utah Standards Academy
- State Sponsored Professional Development
- District Sponsored Professional Development
- School-Level Learning Communities
- Individual Teacher Efforts
 - Online Professional Development
 - Attendance at conferences
 - Professional Reading





Mathematics Implementation Survey

- 4,426 respondents
 - 29% participation rate overall
 - 3,447/13,539 elementary teachers
 - 225 identify as special education teachers
 - 993/1,826 secondary math teachers
 - 91 identify as special education teachers
 - 3% of 6th grade teacher respondents are in middle school setting

Overall Findings from Surveys

- No significant differences in responses between rural and urban/suburban settings or between charters and districts.
- Most respondents are in their second year of implementation while a quarter are in their third or first year of implementation.
- 92% have implemented all or most of the standards outlined in the Utah Mathematics Core.
- Teachers are moderately confident (3.2 on a scale of 1-4) about teaching the standards. (Slight differentiation between elementary and secondary)
- Elementary were more positive overall about their experience with implementation than secondary math teachers.

- Materials and resources seem to be the greatest concern to a smooth transition during implementation. However, many express needing time with the materials they have and want more time to develop lesson plans with peers.
- Teachers have identified holes in instruction and gaps in student knowledge. They express confidence in these gaps closing over time. Many still need help with interventions for students who struggle.
- Teachers are savvy about district/school adopted materials not being aligned and are frustrated when they are required to teach the adopted text with fidelity.

Classroom Materials Used by Teachers

Materials used by respondent	Elementary	Secondary
My district/school has adopted a required paper-based textbook	41.22%	20.72%
My district/school has adopted a required digital textbook	5.88%	9.43%
I use a variety of materials including textbook, self-created, online	49.54%	59.80%
I mostly use materials that I have always used	1.53%	1.86%
I am still struggling with finding appropriate materials to use in class	1.82%	8.19%

General Commentary from Teachers

- Teachers who are positive about the standards and confident about student learning talk about higher levels of engagement, deeper understanding, more fun teaching mathematics, have plenty of resources to draw from, and speak of district/school support. Negative opinions about implementation express just the opposite.
- School and district leadership appears to be a significant factor in attitudes and successful implementation.

Commentary (cont.)

- Teachers working in schools serving high numbers of students living in poverty are finding success with higher standards. Of course, there were also quite a number of teachers in these same schools saying this is too hard for their students. Effective instruction is happening in many settings and teachers are finding that their students are capable of more rigor than they thought possible.
- Teacher attitudes and beliefs about student capacity is very telling in how they responded to all questions

Commentary (cont.)

- Teachers are confident that the standards are the right move and want to stay the course. Many specifically said, “Stay the course...it will take time...give us time to practice and get better”.
- Only a handful of teachers expressed a desire to go back to the 2007 standards.

What does this mean for parents?

- Parents need help understanding instructional shifts and expectations.
- Teacher manuals and traditional textbooks are available but are difficult for parents to use because they contain concepts they never used
- Standards for mathematical practice including making sense of problems and perseverance in solving them is a student and parent challenge.



Standards for Mathematical Practice

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- Look for and express regularity in repeated reasoning.

Implications for USOE

- **Communication gap** exists with classroom teachers, parents
 - School leaders need help with coherent messaging to deescalate stress on teachers, students, and parents.
 - Websites and social media must be clear, concise, and organized in order to provide easier access and accurate information.

Implications for USOE

- **Secondary mathematics courses** need some revision
 - Informed by stakeholder groups including parent review committee and teachers who have been implementing these courses
 - Further analysis of teacher resources with plans to address needs
 - Digital exemplars of effective classroom instruction so teachers can see the standards in practice (in progress).

Options for the Board

What is the
goal?

