

AERO Mathematics Standards Connection to Common Core SUMMARY

Several months ago, AERO released the K-8 Mathematics Curriculum Framework and recently the High School Mathematics Standards. Both documents were developed from the Common Core Mathematics Standards. It is important to note that AERO Standards are written to inform assessment. The Common Core was written to inform instruction.

Recently, there have been several questions regarding the source of the Common Core, its implications for students in the American Education System. I hope this informational tool helps to answer some of those questions.

RESEARCH

The Common Core Standards were Internationally benchmarked to mathematics standards of high-achieving countries and states. (Mathematics documents from: Alberta, Canada; Belgium; China; Chinese Taipei; Denmark; England; Finland; Hong Kong, India; Ireland; Japan; Korea; New Zealand; Singapore; Victoria (British Columbia). See <http://www.achieve.org/international-benchmarking>)

The Common Core Standards were designed to reverse the “mile-wide, inch-deep” analogy of US mathematics curricula.

BACKGROUND

Three years ago, governors and state commissioners of education from 48 states, 2 territories and the District of Columbia (D.C.) committed to developing a common core of state standards for proficiency in English-language arts and mathematics for grades K-12. The Common Core State Standards Initiative (CCSSI) was a state-led effort coordinated by the National Governors Association Center for Best Practices (NGA Center) and the Council of Chief State School Officers (CCSSO).

The standards were developed in collaboration with teachers, school administrators, and education experts, The NGA Center and CCSSO received feedback on the drafts from national organizations representing, but not limited to, teachers, postsecondary educators (including community colleges), civil rights groups, English language learners, and students with disabilities.

DESIGN

The Standards are designed to ensure that students graduating from high school are prepared to go to college or enter the workforce and that parents, teachers, and students have a clear understanding of what is expected of them.

The Standards are benchmarked to international standards to guarantee that our students are competitive in the emerging global marketplace.

The Standards create a rigorous definition of college and career-readiness for high school graduates.

The Standards of Mathematical Practice define the dispositions and habits of successful mathematical students to ensure College and Career Readiness.

The Standards of Mathematical Content define what students should understand and be able to do at each grade level to ensure College and Career Readiness.

The Standards are organized under large conceptual domains that span several grade levels. Standards are grouped in conceptual clusters under each domain.

The Standards: Include rigorous content and application of knowledge through high-order skills;

The Standards build upon strengths and lessons of current state standards;

The Standards are evidence-based.

It is important to note developing a set of common standards is far from looking for the lowest common denominator, these Standards are designed to ensure that all students, regardless of where they live, are learning what they need to know to graduate from high school ready for college or a career.

NATIONAL STANDARDS

The Standards are not national standards. The federal government was NOT involved in the development of the standards. This has been a state-led and driven initiative from the beginning. States will voluntarily adopt the standards based on the timelines and context in their state. The process of state standards adoption depends on the laws of each state. Some states are adopting the standards through their state boards of education, while others are adopting them through their state legislatures. Adoption means the state has agreed 85% of their standards in Math will be from the Common Core.

POINTS OF EMPHASIS

All Grades

- o Balance Conceptual Understanding and Procedural Fluency
- o Math fact fluency included
- o Modeling throughout grade levels

Elementary (Kindergarten – 5th Grade)

o K-5 standards develop a solid foundation in numbers and operations necessary to successfully apply more advanced math concepts and procedures in later grades.

o K-5 standards build a grade to grade progression of concepts (e.g. fractions, integers)

Middle School (6th to 8th Grade)

- o Aggressive progression towards preparation for Algebra I
- o Provide a rich and deep understanding of concepts and application of mathematics to prepare students for high school mathematics.

High School (9th to 12th Grade)

- o A rigorous definition of College and Career Readiness for all students.
Two years beyond traditional Algebra 1 curriculum.
- o Greater emphasis on functions than current Grade Expectations.
- o Great emphasis on mathematical modeling in all conceptual domains.
- o Advanced mathematical standards (+) are provided to help align curriculum up to pre-Calculus level.

CURRICULUM

The Standards are not a curriculum. They are a clear set of shared goals and expectations for what knowledge and skills will help students succeed. Local teachers, principals, superintendents and others will decide how the standards are to be met. Teachers will continue to develop their scope and sequence, develop units of instruction, devise lesson plans and tailor instruction to the individual needs of the students in their classrooms.

Instructional materials and curricula are key components to making standards usable and real in the classroom. The NGA Center and CCSSO convened internationally recognized experts to discuss the implications for curriculum and how the two organizations could best support districts and states in developing and implementing curricula aligned to the Standards.

instruction

The best understanding of what works in the classroom comes from the teachers who are in them. The Standards establish a clear set of shared goals and expectations for what knowledge and skills will help students succeed, but they do not dictate how teachers should teach. Teachers will continue to devise lesson plans and tailor instruction to the individual needs of the students in their classrooms. However, it is important to note that although the Standards do call for a change in content the biggest impact will be made by the way we change instruction. Local teachers, principals, superintendents and others will decide how the standards are to be met.

ASSESSMENT

Like adoption of the standards, assessment is up to the states: The states have formed two consortia – the Partnership for the Assessment of Readiness for College and Careers (PARCC) (www.parcconline.org) and the Smarter Balanced Assessment Consortium (SBAC) (<http://www.k12.wa.us/smarter/>) – to guide the development of new student assessments that are at once more rigorous and more flexible in how they measure learning growth in increasingly diverse student populations.

The goal is to create an assessment system and supporting tools that will help states dramatically increase the number of students who graduate high school ready for college and careers and provide students, parents, teachers and policymakers with the tools they need to help students - from grade three through high school - stay on track to graduate prepared. The Partnership will also develop formative tools for grades K-2.

The Consortia are grounded in the following principles allow for comparison across students, schools, districts, states and nations; create economies of scale; provide information and support more effective teaching and learning; and prepare students for college and careers. The first assessment is planned for 2014.

Why do we need AERO? Why not just adopt the Common Core Standards?

All states adopting the Common Core have agreed to adopt 100% of the Common Core in three years and each state can then decide on an additional 15% to add to the Common Core Standards. AERO, as did many states used the Common Core to write their standards. AERO differs from the Common Core in its presentation and intent. The AERO Standards presents a broad description of the (**learning progression) essential content and general **sequencing** for student learning and skill development at the level of detail of grade-specific curriculum K-8 and course specific 9-10. It is written to inform assessment and the AERO MAP assessment is aligned to these learning progressions. See Learning Progressions Frameworks Designed for Use with The Common Core State Standards in Mathematics K-12

<http://www.naacpartners.org/publications/MathLPF.pdf>

**Learning progressions characterize typical pathways (obstacles and landmarks) that students traverse as they develop proficient understandings of "big ideas" in science, math, and reading. Progressions are based on empirical study of student thinking and link to curriculum, instruction, tools, assessment, and professional development.

http://www.nciea.org/publications/CCSSO2_KH08.pdf

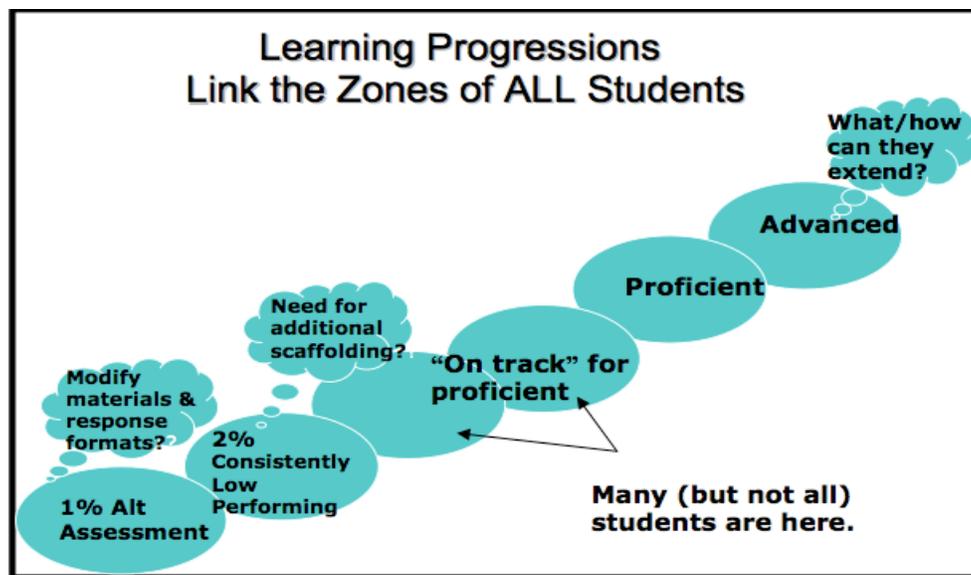


Figure 1: Learning progressions connect the “learning zones” of a range of learners within a classroom or grade level. Different instructional materials and strategies will be used by teachers at different points along the learning pathway, but progress is seen as a continuum of learning. (The Zone of Proximal Development/ZPD is the range of potential each person has for learning. Vygotsky (1978) maintained the child follows the adult’s example and gradually develops the ability to do certain tasks without help or assistance. He called the difference between what a child can do with help and what he or she can do without guidance the zone of proximal development.) "

Vygotsky, L.S. (1978). *Mind in Society: The Development of Higher Psychological Processes*. Cambridge, MA: Harvard University Press.

Karin Hess, National Center for the Improvement of Educational Assessment/NCIEA, Dover, NH
10/2007, updated 2/2008

AERO STANDARDS ALIGNED TO THE COMMON CORE EMPHASIS

The standards stress not only procedural skills, but also conceptual understanding, to make sure students are learning and absorbing the critical information they need to succeed at higher levels - rather than the current practices by which many students learn enough to get by on the next test, but forget it shortly thereafter, only to review again the following year.

The K-5 standards provide students with a solid foundation in whole numbers, addition, subtraction, multiplication, division, fractions and decimals--which help young students build the foundation to successfully apply more demanding math concepts and procedures, and move into applications.

In kindergarten, the standards follow successful international models and recommendations from the National Research Council's Early Math Panel report, by focusing kindergarten work on the number core: learning how numbers correspond to quantities, and learning how to put numbers together and take them apart (the beginnings of addition and subtraction).

The K-5 standards build on the best state standards to provide detailed guidance to teachers on how to navigate their way through knotty topics such as fractions, negative numbers, and geometry, and do so by maintaining a continuous progression from grade to grade.

Having built a strong foundation K-5, students can do hands on learning in geometry, algebra and probability and statistics. Students who have completed 7th grade and mastered the content and skills through the 7th grade will be well-prepared for algebra in grade 8.

The middle school standards are robust and provide a coherent and rich preparation for high school mathematics.

The high school standards call on students to practice applying mathematical ways of thinking to real world issues and challenges; they prepare students to think and reason mathematically.

The high school standards set a rigorous definition of college and career readiness, by helping students develop a depth of understanding and ability to apply mathematics to novel situations, as college students and employees regularly do.

The high school standards emphasize mathematical modeling, the use of mathematics and statistics to analyze empirical situations, understand them better, and improve decisions.

WHERE DO WE BEGIN

Become familiar with the following critical areas

1. The foundation for Mathematics understanding is developed in K-5
Adding It UP: How Children Learn Mathematics
(http://www.nap.edu/catalog.php?record_id=9822)
2. College Prep Begins in Middle School
(<http://www.act.org/research/policymakers/pdf/CollegeReadiness.pdf>)
3. All 9-12 students need rigorous mathematics courses.
Ready for College and Ready for Work Same or Different?
(<http://www.act.org/research/policymakers/pdf/ReadinessBrief.pdf>)

Do's and Don'ts

DO: use 2011-12 curriculum time to align curriculum and assessments with AERO K-12

See the AERO Alignment template

DO: reassure teachers that it isn't 'one more thing' that they have to do

DO: encourage K12- teachers to use the standards in planning assessments

Coming soon some examples of the new assessments

DO: make sure the Mathematical Practices are in place in all classrooms

Standards for Mathematical Practice

Mathematical dispositions and habits for all grade levels see AERO HS

www.projectaero.org

Do: inform parents of the importance of developing conceptual as well as procedural understanding of mathematics

DON'T: panic or rush to change everything!

Change takes time. We go slow to go fast!

DON'T: purchase new textbooks or materials if possible – they are still evolving

CCSSO is developing a Math curricular analysis tool to help educators analyze curricular materials as they implement the math standards. There will be three tools: one looking at the treatment of key content areas in each of four grade bands (K–2, 3–5, 6–8, 9–12); one analyzing how well the standards for mathematical practice are integrated into the materials; and one assessing pedagogical aspects of the materials.