

Math Workgroup Speakers: Separation of Notes from Speakers into Research Areas

Research Area: Curriculum: The Written Curriculum		
Dr. Skip Fennel May 7, 2009	Mr. Steve Leinwand June 4, 2009	Jim Hiebert June 25, 2009
<p>Priorities for K–12 Mathematics are:</p> <ul style="list-style-type: none"> • Curriculum • Equity • Linking Research and Practice • Professional Development • Advocacy <p>Curriculum—Common Curriculum:</p> <ul style="list-style-type: none"> • Increased efforts to focus and align the pre-K–8 curriculum to achieve coherence, stronger intervention programs and assessments, and emphasis on formative assessments. <p>?? What is the status of the reconciliation of the National Math Panel recommendation to streamline elementary curriculum with Principles and Standards?</p> <ul style="list-style-type: none"> • Development of Algebra curriculum topics • Second attempt of NCTM • Some overlap exists <p>?? What are suggestions for things to think about and consider as revisions to curriculum, textbook selection, etc. are made?</p> <ul style="list-style-type: none"> • Changes with VSC • Materials that best meet needs: outcomes, technology 	<p>Priorities for K–12 Mathematics are:</p> <ul style="list-style-type: none"> • Securing economic security and social well-being driven by innovation and productivity that produces human capital and equity of opportunity • Importance of high quality education (literacy, math, science) • Math is second to reading/language arts. Students must be able to read to be taught mathematics. Need balance of 2:1 with instruction. • Math focus should include number, symbol, spatial and data sense. • How do we serve students to build human capital? <p>Math Issues</p> <ul style="list-style-type: none"> • Typical mathematics curriculum is generally incoherent, skill-oriented, and accurately characterized as a mile wide and an inch deep. <p>Possible Solutions:</p> <ul style="list-style-type: none"> • Positive is that we will have recommended K-12 reading and mathematics standards by January 1, 2010. • High school workplace and college readiness standards currently being developed • Simply put: What is the math, how is it conveyed, and what support structures exist for teachers? 	<p>Priorities for K–12 Mathematics are:</p> <ul style="list-style-type: none"> • Emphasis on teaching as a key channel through which everything reaches kids. • What does research say are effective features of teaching? • How do we help teachers move in that direction? <p>TIMMS 1999 Video Study</p> <ul style="list-style-type: none"> ○ What features are absent from US math? <ul style="list-style-type: none"> - Not new findings - Had to change - Change meets resistance ○ There is no country that tests as often and tests procedures. ○ US reviews more than others (does things more quickly). ○ US has inefficient system for teaching math. Too many topics—not deep. <p>Q&A</p> <ul style="list-style-type: none"> • National standards could have huge impact on teaching and learning

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<p>?? What is the knowledge students must have a firm grasp on leaving ES and MS?</p> <ul style="list-style-type: none"> • ES: strong sense of numbers, numbers, operations <p>National Standards Movement and relation to ACHIEVE (Algebra II/Algebra I test)</p> <ul style="list-style-type: none"> • Using standards to develop • Algebra II data is not great • 13 states, 30+governors • Pilot stage, criticism, 26% pass rate • Will MD back map from exam? No. Center from America Diploma objectives <p>Pros and Cons of traditional sequencing: Algebra I, Geometry, Algebra II</p> <ul style="list-style-type: none"> • Fear is impact on test • States can purchase modules to go with test • Tailoring curriculum to marketed tests • Consider looking at districts with success in non-traditional sequencing. Why were they successful? How do you know? <p>Benefits and drawbacks of offering Algebra I over 2 years. What is common practice?</p> <ul style="list-style-type: none"> • Determining student readiness • HSA part algebra, part statistics impact on instruction, curricular sequence • Other states having same issue for high school assessment, and use of ACT (Ill/Mich./NE) 	<p>Critical Perspective:</p> <ul style="list-style-type: none"> • Need to ensure that curriculum is rational and attainable and teach it well. • New Chinese math standards are based on basic rationale of mathematics being meaningful, realistic, and challenging and part of daily living, work, and play. Transcend idea of skill to student understanding of concepts. • What is the mathematics that is appropriate for all kids and what do we layer on top of that for some kids! <p>Open Dialogue:</p> <ul style="list-style-type: none"> • Underperforming national curriculum that does not provide all students with opportunities to fully engage and be excited by learning. <p>What knowledge should all students have firmly in their grasp by the time they leave elementary school and enter middle school?</p> <ul style="list-style-type: none"> • Given a problem situation, what math must be performed and why? (i.e. operations, number sense) • Draw reasonable conclusions from graphical representations of data • Have comfort with alternative approaches, believe that they have the ability to understand mathematics, and given problems can preserve. 	

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<p>Can a district align with recommendations from NMP with Singapore? No.</p> <ul style="list-style-type: none"> Limited lens of content Published program would provide coverage Singapore math has been revised; has been Americanized All recommendations were not relative to curriculum 	<ul style="list-style-type: none"> Core mainstream math program needs to be designed for 60 percent of students. Variable becomes placement and differentiated instruction along a continuum. <p>Topic of Algebra (Algebra by grade 8, Algebra II, Defining Acceleration):</p> <ul style="list-style-type: none"> Provide opportunities for students to access critical content at appropriate time. <p>Instruction and Assessment</p> <ul style="list-style-type: none"> Effective instruction of number concepts to young children makes math meaningful and accessible. 	

Research Area: Classroom/Instructional Practices: The Implemented Curriculum		
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<p>Curriculum—Common Curriculum:</p> <ul style="list-style-type: none"> NMAP (Conceptual Knowledge) Foundations for Success: curriculum focus and coherence pre-k–8, closure with topics, proficiency with critical foundations (must haves in pre-algebra), algebra topics, access to algebra, and teacher background. Role of Algebra <p>?? Explain proportional reasoning (ratio and proportion) across grade levels.</p> <ul style="list-style-type: none"> Important to tie subset of skills to success in Algebra 	<p>Math Issues</p> <ul style="list-style-type: none"> Tracking and “one-way” instruction Isolated teachers <p>Possible Solutions:</p> <ul style="list-style-type: none"> Focus on high-quality instruction Effective implementation of existing programs Integration of technology to enhance learning and skills and concepts 	<p>Two facts about teaching and learning?</p> <ul style="list-style-type: none"> Teaching matters a whole lot <ul style="list-style-type: none"> How do we interact with students regarding math? Effective methods of teaching depend on what we want kids to learn. <p>What kinds of teaching helps students become mathematically proficient? Research findings</p> <ul style="list-style-type: none"> Attend explicitly to relationships among facts, procedures, representations, ideas, etc.

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<ul style="list-style-type: none"> • Fractions, ratio, and proportions are critical • Important to build context <p>?? Describe how mathematics teaching and learning might look 10 years from now</p> <ul style="list-style-type: none"> • Technology much more major role; delivery of instruction • Greater concern for who will be teaching. <p>Labeling strands and separating into courses at HS. Disadvantages and advantages.</p> <ul style="list-style-type: none"> • Internationally teach mathematics and take courses • Integrated curriculum; 3 NSF supported • How is it organized? Books that integrate...similar to ES model <p>Range of curricular materials:</p> <ul style="list-style-type: none"> • MS: CMP2, 1990's • ES: Investigations, Trailblazers, Everyday Mathematics • HS: Core+, IMP 	<p>Critical Perspective:</p> <ul style="list-style-type: none"> • Focusing instruction on predetermined calculus-based curriculum is not capable of achieving urgent national goals. • Students should utilize core critical understanding of mathematics concept to problem solve. <p>Open Dialogue:</p> <ul style="list-style-type: none"> • Real question is "Given data, students can postulate questions, not complete procedural questions to one correct answer". <p>Topic of Algebra (Algebra by grade 8, Algebra II, Defining Acceleration):</p> <ul style="list-style-type: none"> • Criteria: demonstrate proficiency on 7th and 8th grade math. It is important to clarify, What is Algebra? <p>Instruction and Assessment</p> <ul style="list-style-type: none"> • Fundamental shift from answer driven instruction to providing rationale for alternative problem solving strategies, such as graphic representation. • Proportional reasoning across the grade levels is based on number sense, place value. Middle school should take us from additive to proportional reasoning. It is the most critical concept. 	<ul style="list-style-type: none"> • Allow students to do some of important math work <ul style="list-style-type: none"> ○ Pose challenging problems and allow time for students to do work ○ Problems should engage more than one strand ○ Major threat is teachers—jumping in too quickly <p>TIMMS 1999 Video Study</p> <ul style="list-style-type: none"> • Examined 100 8th grade students in six higher achieving countries: Austria, Czech Republic, Hong Kong, Japan, Netherlands, Switzerland • Types of problems presented to students <ul style="list-style-type: none"> ○ Stating Concepts: recalling or applying definitions as conventions ○ Using Procedures: Applying learned procedures ○ Making Connections: constructing relationships among ideas, facts, procedures • Findings: <ul style="list-style-type: none"> - US presented very similar problems to other countries - The difference is what teachers do with problems. - Problems can be transformed - Problems can be solved procedurally - US doesn't have kids solve problems by working on corrections

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	<p>How might mathematics teaching and learning look 10 years from now?</p> <ul style="list-style-type: none"> • Technology in education becomes stronger as we tailor to students. • Focus on when and now, less on how • More visual, animated and conceptual • Focus more on performance rather than content standards 	<p>Why are two features absent from US math teaching?</p> <ul style="list-style-type: none"> • Not new finding • Teaching hard to change <ul style="list-style-type: none"> ○ Teaching is cultural activity ○ Changing teaching meets resistance • There are many factors that contribute to this, not just cultural aspects, but factors outside of school. <p>How can teaching change?</p> <ul style="list-style-type: none"> • Change assumptions about teaching <ul style="list-style-type: none"> ○ Effective teaching is learned not innate talent ○ ○ Changing teaching is hard, unrelenting work. ○ Schools must be places where teachers, not just students, learn. ○ Expertise in teaching, includes knowing how to prepare and evaluate lessons, not just how to perform <p>Q&A</p> <ul style="list-style-type: none"> • [It is important that) Pedagogy [is] coupled with content knowledge

Research Area: Curriculum: The Assessed Curriculum		
Dr. Skip Fennel May 7, 2009	Mr. Steve Leinwand June 4, 2009	Jim Hiebert June 25, 2009
<p>Curriculum—Common Curriculum:</p> <ul style="list-style-type: none"> Shared NCTM Curriculum Focal Point website: connection of expectations and instructional practice to attain fluency. Could impact where Maryland is going in “focus” on curricular topics. Implications for what is “dropped”, sequence of topics, state tests. <p>Advocacy-ARRA (stimulus package money as applied to education)</p> <ul style="list-style-type: none"> Coming soon: Race to the Top and Invest in What works and Innovation: competitive grants to States and LEAs and non-profits, respectively. Implication that voluntary state curriculum will be replaced. <p>Algebra doesn’t start with the course</p> <ul style="list-style-type: none"> Track pattern, variable 	<p>Math Issues</p> <ul style="list-style-type: none"> Numerous high-stakes testing of marginal quality <p>Possible Solutions:</p> <ul style="list-style-type: none"> Assessment of relevant information <p>Instruction and Assessment</p> <ul style="list-style-type: none"> Formative assessment should be called formative assessment processes, do I know that students know what has been taught and if not, what do I do? Reflection on assessment processes: What did you plan to determine student understanding? 	<p>TIMMS 1999 Video Study</p> <ul style="list-style-type: none"> There is no country that tests as often and tests procedures. US reviews more than others (does things more quickly). US has inefficient system for teaching math. Too many topics—not deep.

Research Area: Teacher Preparation and Development: Teaching for Mathematical Proficiency		
Dr. Skip Fennel May 7, 2009	Dr. Skip Fennel May 7, 2009	Dr. Skip Fennel May 7, 2009
<p>Professional Development</p> <ul style="list-style-type: none"> E-learning programs, e-workshops, lesson study courses, and learn-and-reflect sessions at conferences Large-scale assessment tool, intervention, president’s messages, and position statements 	<p>Critical Perspective:</p> <ul style="list-style-type: none"> Teach in distinctly different ways to serve a diverse student population and their unique learning needs. <p>Open Dialogue:</p> <ul style="list-style-type: none"> Important for teachers to guide students to big ideas not the minutia of details. <p>How do we address acceleration effectively?</p>	<p>How can teaching change?</p> <ul style="list-style-type: none"> Change learning opportunities for teachers <ul style="list-style-type: none"> Focus professional development on study of teaching Treat teacher learning as by-product of work to improve teaching

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<p>Advocacy-ARRA (stimulus package money as applied to education)</p> <ul style="list-style-type: none"> • Need for early childhood mathematics specialist <p>?? What is the research for instructional strategies that are more effective in teaching young children basic foundational concepts?</p> <ul style="list-style-type: none"> • Doug Clements • Carol Flousens? <p>?? What are your thoughts on professional development: Content specific vs. general pedagogy?</p> <ul style="list-style-type: none"> • Need more content specific • Vulnerable audiences, MS and upper ES <p>Professional development as it relates to content</p> <ul style="list-style-type: none"> • Three themes: prerequisite knowledge, access, and support <p>How do testing requirements for MD high-qualified teacher compare to what teachers need to know?</p> <ul style="list-style-type: none"> • PRAXIS II, only tests a subset <p>Content knowledge for teaching Algebra</p> <ul style="list-style-type: none"> • Consider body of research Knowledge for Algebra Teaching, Debra Ball • The math you teach is the level of mathematical knowledge needed for teaching 	<ul style="list-style-type: none"> • Core K-5 program with remediation and intervention to support student learning. • Richer, deeper program with critical areas at 6th and 9th grade. • Time and intensity. Need to provide support at critical times. <p>Professional Development</p> <ul style="list-style-type: none"> • Professional interaction, professional sharing, and more transparency <p>Potential Structures for Professional Sharing</p> <ul style="list-style-type: none"> • Structured and focused department meetings • Common planning time—grade and department • Social gatherings before and after school to examine student work • Substitutes for peer visits, coaching, time for debriefing visits • Summer workshops, department seminars <p>(Prof Dev) Next Steps</p> <ul style="list-style-type: none"> • Lesson video study • Professional interaction—PLC • Coaching • Lesson study • Research-based visions of teaching and learning • Induction 	<ul style="list-style-type: none"> • Better learning opportunities for teachers <ul style="list-style-type: none"> ○ Hard work ○ Results show up gradually • Feature 1: On-Site Collaborative Work <ul style="list-style-type: none"> ○ Organize into work groups <ul style="list-style-type: none"> - Share same goal ○ Teachers meet to study more effective ways to help students achieve their goals. (60-90 minutes) ○ Must have weekly meetings • Feature 2: On-Site Leadership <ul style="list-style-type: none"> ○ Organize for work ○ Persist in face of incremental change ○ Feed group new ideas • Feature 3: Work of Improving Teaching <ul style="list-style-type: none"> ○ Begin by designing few lessons with great care ○ Clearly specify learning goals ○ Include problems that challenge students ○ Predict students' responses to these problems to anticipate how to respond ○ Gather evidence on lesson's effectiveness and improve the lesson each time it's taught <ul style="list-style-type: none"> - Collect and study student work - Assess if lesson helped students achieve learning goals <p>?? Won't this approach take years?</p> <ul style="list-style-type: none"> • Yes

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What are criteria for determining successful teacher <ul style="list-style-type: none"> • Knows math • Passion • Setting (mentors, student teaching) 	Potential Strategies for Developing PLCs <ul style="list-style-type: none"> • Classroom visits and demonstration classes with debriefing • Common readings with a discussion focus • Technology demonstrations • Reflection—video analysis of lessons and analysis of student work • Expectations for collaboration are clear and tangibly supported 	<ul style="list-style-type: none"> • Tried approaches for 100 years • Time to take different path Final Words <ul style="list-style-type: none"> • Resources <ul style="list-style-type: none"> ○ Adding It Up ○ Review of Research (2007) Hiebert/Grouws—The Effects of Classroom Math Teaching on Student Learning ○ TIMSS Video Study 1999

Research Area: Acceleration Practices: Mathematics Targets and Acceleration		
Dr. Skip Fennel May 7, 2009	Dr. Skip Fennel May 7, 2009	Dr. Skip Fennel May 7, 2009
Curriculum—Common Curriculum: <ul style="list-style-type: none"> • Teacher respondents: 700/1000 wished students were better at problem solving and had stronger background in fractions Advocacy-ARRA (stimulus money as applied to education) <ul style="list-style-type: none"> • Emerging Issues: Algebra, What and When?, Intervention, Early childhood mathematics, special needs (ELL/Spec ED) -specific needs, HS and College articulation 	Open Dialogue: <ul style="list-style-type: none"> • Gaps are narrowed because resources and talents are put strategically in place. Topic of Algebra (Algebra by grade 8, Algebra II, Defining Acceleration): <ul style="list-style-type: none"> • Opinion of system targets: need targets, adjust when and who receives Algebra. Use diagnostic instruments. • Acceleration is one year ahead of the mainstream. 	

Research Area: Acceleration Practices: Mathematics Targets and Acceleration		
Dr. Skip Fennel May 7, 2009	Dr. Skip Fennel May 7, 2009	Dr. Skip Fennel May 7, 2009
<p>?? What is your opinion on school system target of Algebra by Grade 8? Criteria for Grade 8 Algebra?</p> <ul style="list-style-type: none"> • Dangerous, know mathematics, benchmarks: Brookings Report, Fall 2009, Loveless, Lost in 8th Grade Algebra • Caution that they have success here as it is a gatekeeper for higher-level mathematics <p>?? Should most schools reach Algebra by Grade 8? Should this be a system goal?</p> <ul style="list-style-type: none"> • Importance of higher-level math at MS is important, make sure of background <p>What about Algebra II? Why emphasis on higher level courses?</p> <ul style="list-style-type: none"> • Evidence shows that students that pass Algebra II with success have a higher likelihood for success in higher education • Integrated curriculum is successful • The U.S. is the only country with course-specific math courses in HS • After Algebra II, differences for statistics, pre-calc, trig, variations to title • National discussion of 4 years of math instead of three <p>?? Define acceleration in mathematics? Is Algebra in Grade 8 acceleration?</p> <ul style="list-style-type: none"> • Camela Bendoes? Vanderbilt University: okay for gifted • Not considered gifted, just ready 		

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<p>?? Where is the research on what instructional practices support acceleration in mathematics?</p> <ul style="list-style-type: none"> • Bendoes work • Consider studying research for whom acceleration is for? • Resources to plug gaps <p>Readiness for Algebra I in Grade 8. Determining readiness.</p> <ul style="list-style-type: none"> • Prognostic tests are available for Algebra, teacher observation, MSA • Need to know what we want them to know; knowledge of rational numbers/fractions • Issue is that segment of population ready/not ready • Determine readiness with right teacher, right supports • Districts with similar demographics having success • Possible resource is article: Journal for Research for Math Education: 7 African American males in Algebra; role of parents, Robert Berry, U VA. • Prerequisites and access are important <p>Impact of acceleration of students who already know...and not those needing scaffolding</p> <ul style="list-style-type: none"> • Importance of prerequisites, access, and support 		

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<p>How do colleges look at this (acceleration)? Parent concern with acceleration, what is more important? Course level or grades?</p> <ul style="list-style-type: none"> • Grades are a plus, SAT/ACT less important • Institutional history • Monitor grades, but also monitor stress • Consider having a college admissions representative visit 		

Research Area: Not Placed – but Worth Recording in Summary		
Dr. Skip Fennel May 7, 2009	Dr. Skip Fennel May 7, 2009	Dr. Skip Fennel May 7, 2009
<p>Equity</p> <ul style="list-style-type: none"> • NCTM Equity Resources website, research briefs and clips at www.nctm.org/research.aspx provides briefs and summary of research related to a topic <p>Practices/materials that are effective for poverty/race/ethnicity</p> <ul style="list-style-type: none"> • Berry’s studies <p>The NMP indicates performance of underperforming minorities dependent on social aspects...</p> <ul style="list-style-type: none"> • Consider research of Wade Boykin, Howard University 		<p>Final Words</p> <ul style="list-style-type: none"> • Contributing to changes that matter means planting shade trees under which we know we will not sit—D. Elton Trueblood