WHAT DOES IT TAKE TO PREPARE MATHEMATICS TEACHERS FOR RESPONSIBLE ENTRY-LEVEL PRACTICE?

Deborah Loewenberg Ball

MTE-Partnership Annual Conference

June 22, 2015 • Fullerton, California

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ACKNOWLEDGEMENTS

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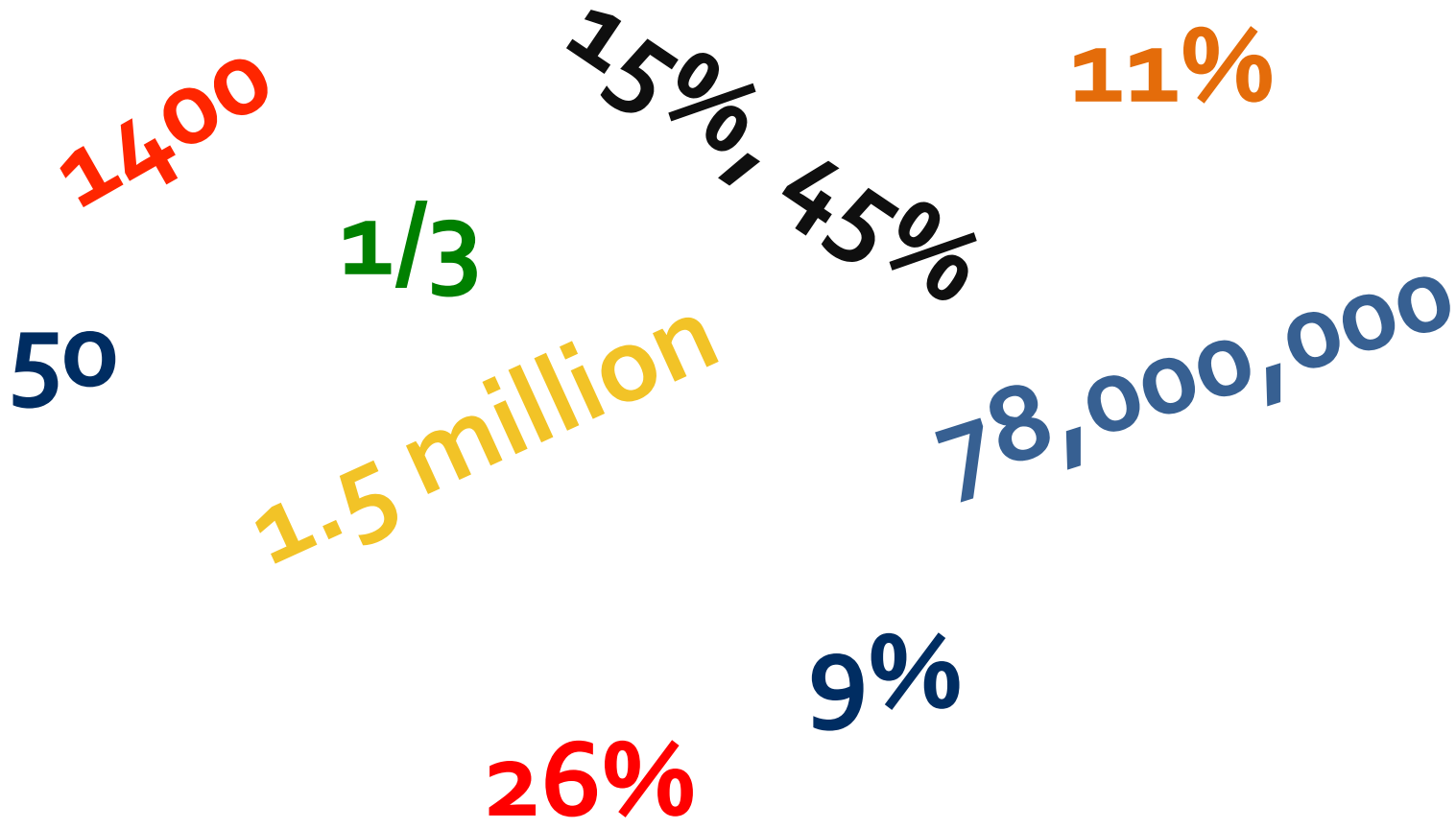
And the National Science Foundation *(all * projects and groups above)*

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THE MORAL URGENCY, BY THE NUMBERS



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K-12 TEACHING AS THE #1 POLICY IMPERATIVE OF OUR TIME

- 74,000,000 children in U.S.
- Schooling: Our society's professed commitment to individuals' lives and to the future of our society
- Educational opportunity and quality are inequitably distributed and significantly associated with income and race
- OECD data are revealing
  - The U.S. spends more per pupil than any other OECD country
  - U.S. students score below the median of the OECD countries
  - The U.S. is fourth from the bottom in upward social mobility
- Evidence of the power of skillful teaching
- Overwhelming lack of public respect for the work of teaching

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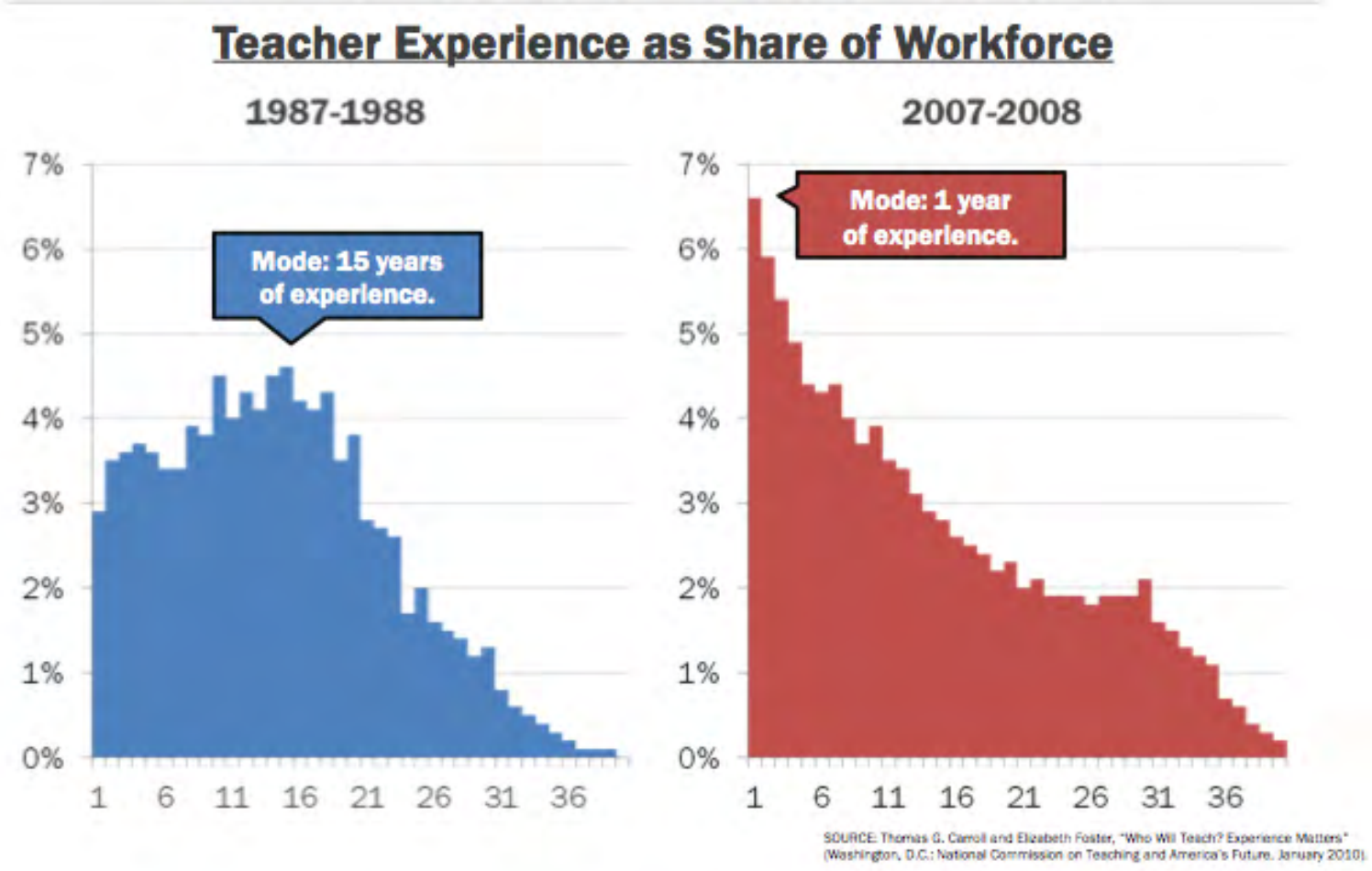
ENTRY-LEVEL TEACHING AS A CRITICAL FOCUS

1. More U.S. schoolchildren have a teacher with fewer than five years of experience than a teacher with any other number of years of experience.

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EARLY CAREER TEACHING ON THE RISE



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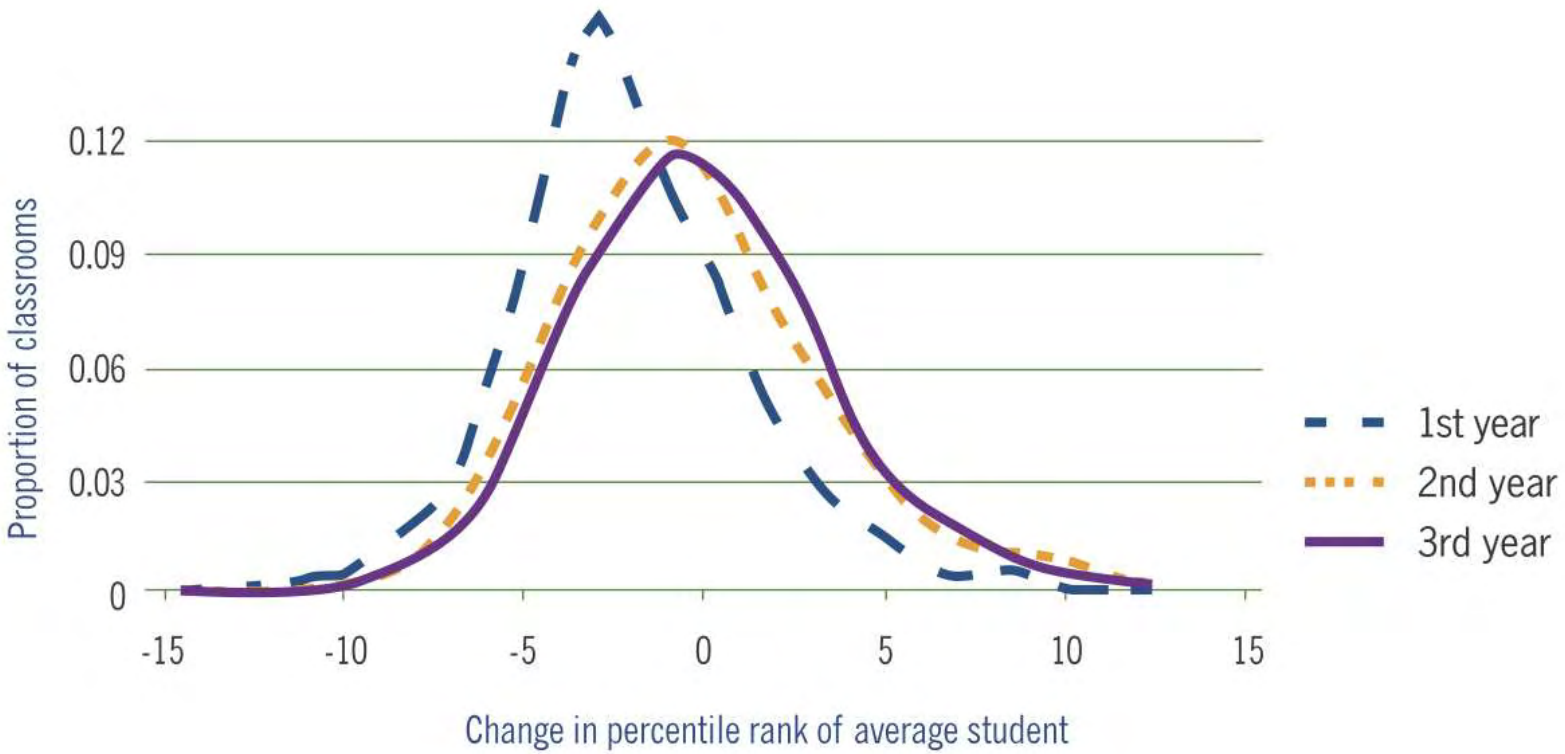
ENTRY-LEVEL TEACHING AS A CRITICAL FOCUS

1. More U.S. schoolchildren have a teacher with fewer than five years of experience than a teacher with any other number of years of experience.
2. Most beginning teachers say they are underprepared for teaching, and on average they are less effective.

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EARLY CAREER TEACHING IS ON AVERAGE LESS EFFECTIVE



Source: Gordon, R., Kane, T. J., & Staiger, D. O. (April 2006). Identifying effective teachers using performance on the Job (Hamilton Project Discussion Paper). Washington, DC: Brookings Institution.

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ENTRY-LEVEL TEACHING AS A CRITICAL FOCUS

1. More U.S. schoolchildren have a teacher with fewer than five years of experience than a teacher with any other number of years of experience.
2. Most beginning teachers say they are underprepared for teaching, and on average they are less effective.
3. Distribution of beginning teaching is concentrated disproportionately in low-income and high-minority schools.

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WHAT SHOULD INITIAL TEACHER PREPARATION AND LICENSURE DO?

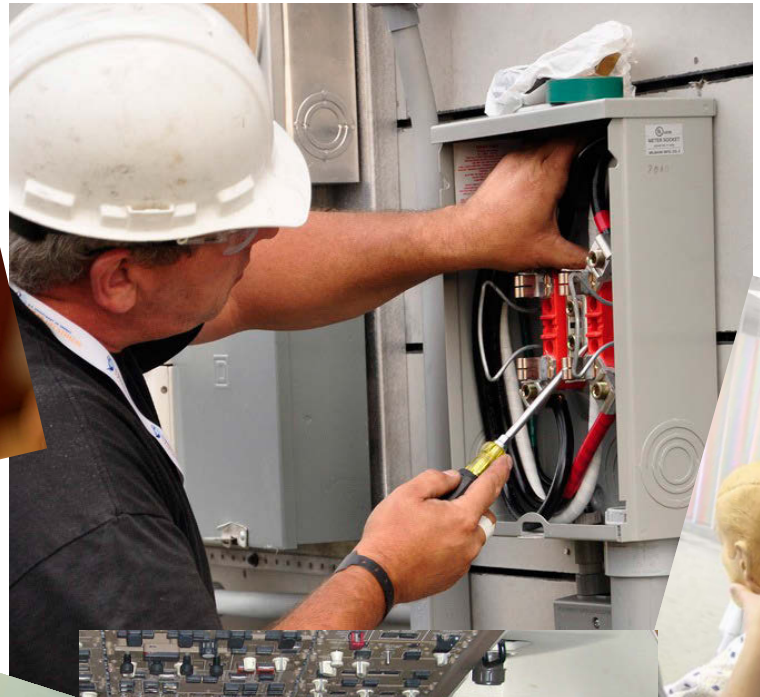
1. Make the **rights of young people and families** the central imperative
2. Focus on ensuring that beginning teachers are ready to care for the **academic, social, emotional, and physical safety** of young people
3. Provide assurance to families and to the public that the beginning professional has met the standards necessary to be given **initial responsibility for students' learning**

In other words, ensure that the beginning teacher meets the standard of "safe to practice"

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FEATURES OF STRONG TRAINING FOR RESPONSIBLE INDEPENDENT PRACTICE

1. **Clear specification of knowledge, skills, capabilities, and qualities of performance** necessary for independent practice
2. **Detailed developmental clinical training**, progressing from observing to simulations to apprenticeship to supervised independent practice; including attention to role of practitioners in novices' learning
3. **Performance assessment of individual competence** before allowing independent practice

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HIGH-LEVERAGE PRACTICES[1]

- Explaining and modeling mathematical ideas and practices
- Leading a mathematics discussion
- Eliciting and interpreting students' thinking
- Establishing norms and routines for classroom discourse and work
- Recognizing particular common patterns of student thinking and development
- Learning about students' cultural, religious, family, intellectual, and personal experiences and resources for use in instruction
- Setting up and managing small group work
- Building respectful relationships with students
- Selecting and modifying tasks and texts for a specific learning goal
- Checking student understanding during and at the conclusion of lessons
- Providing oral and written feedback to students on their work
- Talking about a student with a parent or caregivers

[1] *TeachingWorks and the University of Michigan School of Education*

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KEY TO PREPARING BEGINNING TEACHERS FOR DAY 1 AND BEYOND

1. Zoom in on mathematical knowledge for teaching, and its special uses in actual practice
2. Focus on a set of high-leverage practices of teaching
3. Wrap attention to equity throughout
4. Assess candidates' development across time

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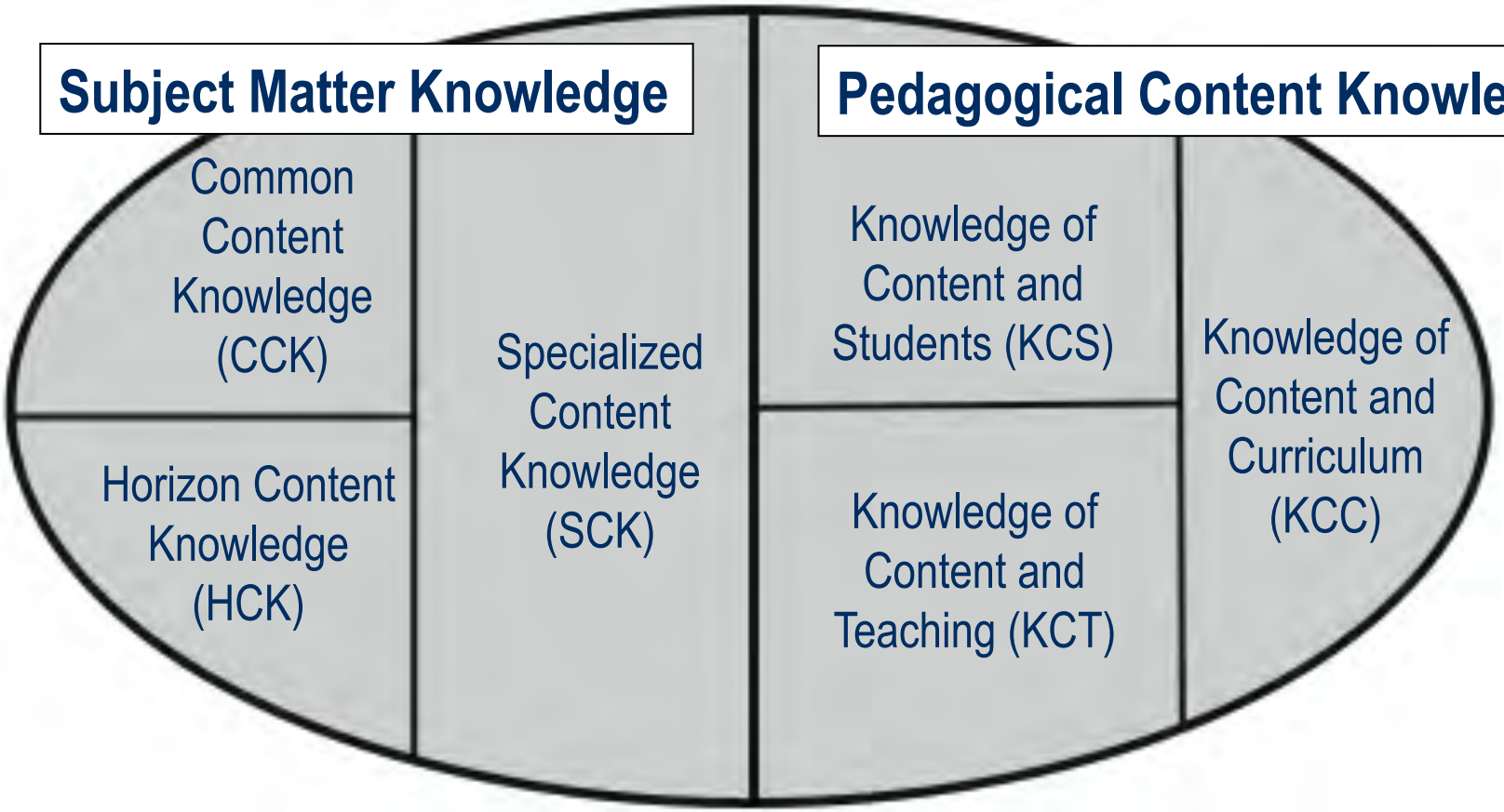
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① ZOOM IN ON MATHEMATICAL KNOWLEDGE *FOR TEACHING*, AND ITS SPECIAL USES IN ACTUAL PRACTICE

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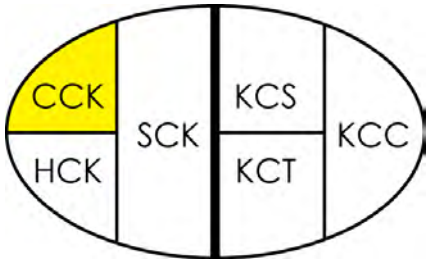
MATHEMATICAL KNOWLEDGE FOR TEACHING (MKT)



Ball, D.L., Thames, M.H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education, 59* (5), 389-407.

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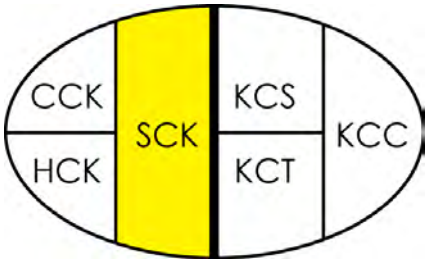
COMMON CONTENT KNOWLEDGE (CCK)

Draw a **rectangle**.



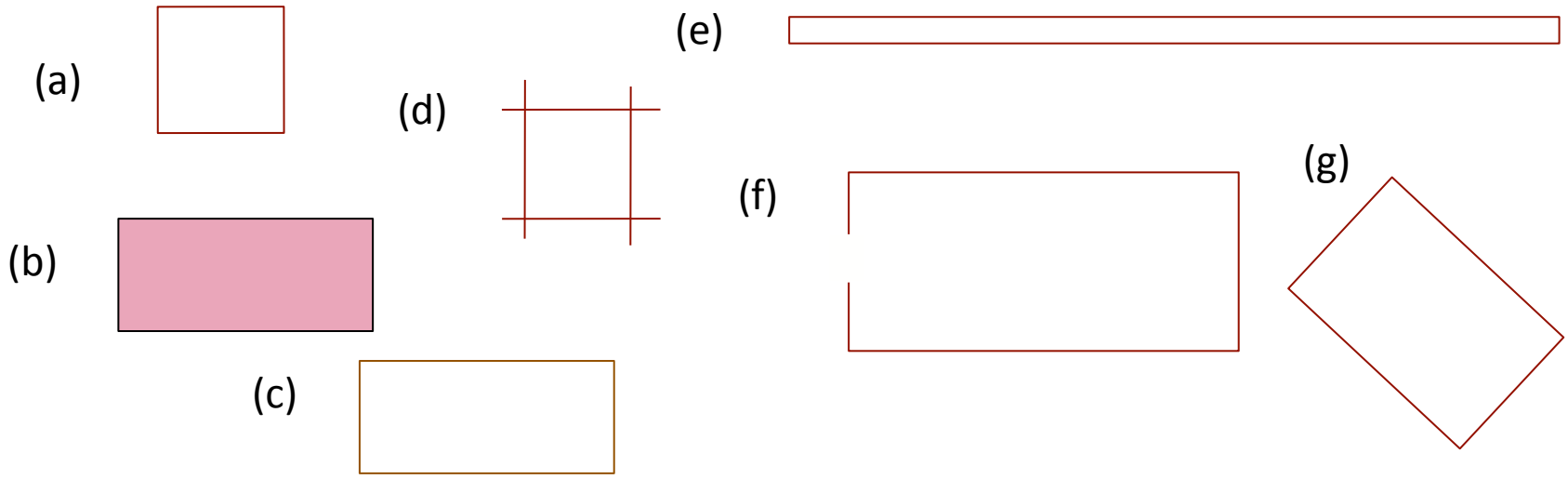
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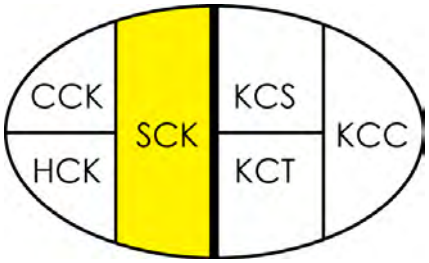
SPECIALIZED CONTENT KNOWLEDGE (SCK)

Which of these figures would be good to present to assess whether students understand what a rectangle is, and why?



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SPECIALIZED CONTENT KNOWLEDGE (SCK)

Which of these is a mathematically accurate definition of "rectangle"?

① A rectangle is a figure with four straight sides, two long and two shorter.

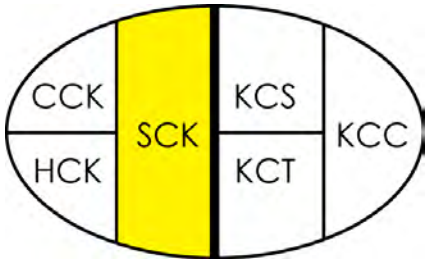
② A rectangle is a shape with exactly four connected straight line segments.

③ A rectangle is flat, and has four straight line segments, four square corners, and it is closed all the way around.

For any that are not mathematically accurate, give an example that shows what is wrong.

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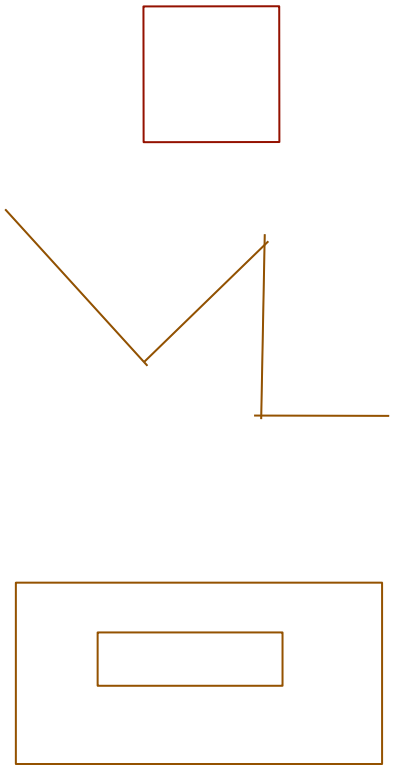


SPECIALIZED CONTENT KNOWLEDGE (SCK)

① A rectangle is a figure with four straight sides, two long and two shorter?

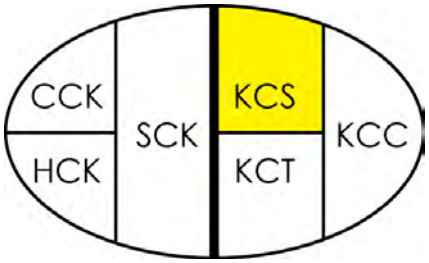
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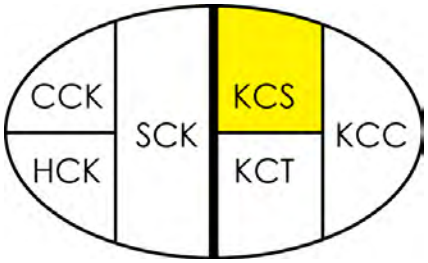
KNOWLEDGE OF CONTENT AND STUDENTS (KCS)

- Write a mathematically accurate definition of "rectangle" that is usable by second graders.

- How can the notion of "simple closed curve" be expressed in a way that is both mathematically accurate and usable? Which part of this phrase is most challenging for children?

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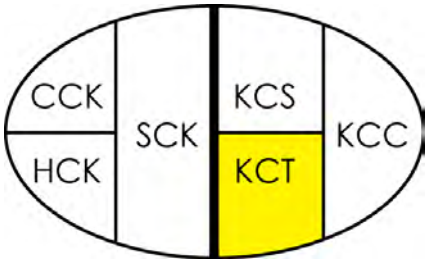


KNOWLEDGE OF CONTENT AND STUDENTS (KCS)

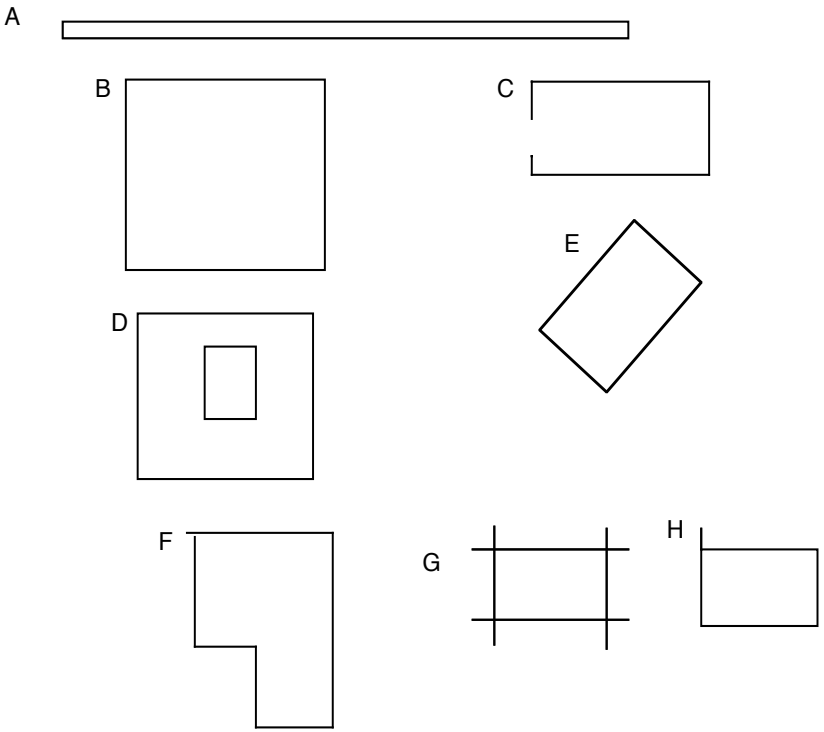
- What are students likely to know about what a rectangle is?
- What do students typically have difficulty with in learning about rectangles, and why?

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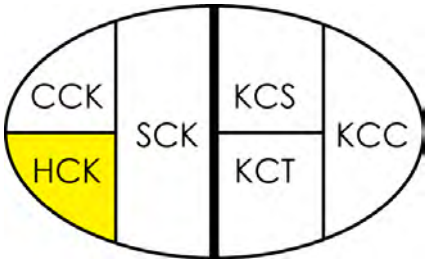
KNOWLEDGE OF TEACHING AND CONTENT (KCT)



- How would you sequence these figures to discuss the concept of a rectangle?
- What task would you create using these figures (or others) to set up a productive discussion aimed at developing a definition?
- In a whole-class discussion, which one would be good to discuss first?

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HORIZON CONTENT KNOWLEDGE (HCK)

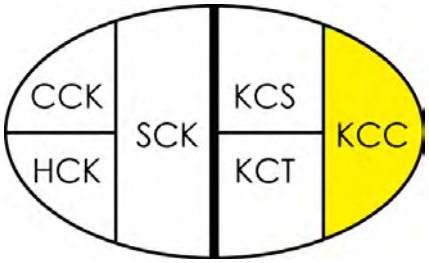
- Is it okay to shade in the figures shown to students – e.g.,



- Is it important to make sure that students know that rectangles are simple closed curves?

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KNOWLEDGE OF CONTENT AND CURRICULUM (KCC)

- Knowing that rectangles are taught before polygons (so can't depend on definition of polygon to develop rectangle)
- Knowing that many materials that children see represent squares as not also being rectangles
- Determining learning goals about rectangles for a particular activity

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IMPORTANT NEXT STEPS IN DEVELOPING MKT

- Licensure and formative assessments of MKT
- Developing an understanding of “MKT fluency”
- Figuring out this can help to recruit a more diverse teaching force

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② FOCUS ON A SET OF HIGH-LEVERAGE PRACTICES OF TEACHING

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A GLIMPSE OF BEGINNING TEACHING

1. What does the video reveal about the challenges of beginning teaching, with respect to:
   - Specific high-leverage practices
   - Content knowledge for teaching and its uses in practice
   - Attention to equity
2. Assessing beginning teaching developmentally: What is skillful about this teaching? What is less so?

(Video not available to be shared)

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WHAT IS THE WORK? LET'S LOOK AT THREE EXAMPLES

1. Explaining and modeling the concept of "average" (mean)
2. Modifying a textbook task
3. Checking student understanding during and at the conclusion of lessons

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MAKING LEARNING OPPORTUNITIES FOCUS ON PRACTICE

① EXPLAINING "AVERAGE"	② MODIFYING A TEXTBOOK TASK	③ CHECKING STUDENT UNDERSTANDING
Explain orally what an "average" means. Plan how to do it; stand up and try to say it as though talking to a group of middle school students.	What about the "arm span" task needs to be modified and why? Exactly how would you revise it, and defend your revision as per its: • The specific mathematical focus • Usability • Equitable accessibility	Formulate 2–3 questions that could be asked DURING this segment to check students' understanding; be attentive to actual wording and the precise mathematical issue. Write a usable "exit ticket" for this lesson.

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⑤ WRAP UP

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WHAT SHOULD KEEP US (AS A PROFESSION) UP AT NIGHT

- The lack of a shared view of good, responsible practice
- The reliance on proxy measures of skillful teaching
- The declining interest in entering teaching
- The gap between who the teachers are and who the young people are
- The long history of teacher education reform that has produced little change
- The context of public critique
- The national crisis around early-career teaching, and, in particular, the impact on low-income youth of color
- The problem of scale

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WHAT WOULD HAVE TO BE DIFFERENT THIS TIME?

The *profession* could organize *collectively* to:

- Identify the core professional knowledge and skills needed for responsible entry-level practice
- Refine and develop specific methods of clinical experience to fine-tune pedagogies of teacher education to focus on candidates' levels of skill and knowledge in practice
- Develop measures and tools for assessing candidates' specific levels of skill and knowledge
- Work in connection with K-12 schools to build quality teaching

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DATA FOR SLIDE #3

What's the problem?

And what can we do about it? What should we do about it? What must we do about it?

- 1400 – # of higher ed institutions that prepare teachers
- 50 – separate "systems" for preparing teachers
- 1/3 – one in three Black males will be incarcerated in their lifetime
- 1.5 million – # of new teachers needed in next 5 years (while interest in down and a shortage was already projected)
- 15%, 45% – teachers of color, students of color
- 78,000,000 – # of people < 18 in the U.S.
- 9% – percentage of 9th grade cohort that completes college
- 11% – percentage of all Hispanics that complete college by 29
- 26% – percentage of teachers with fewer than 5 years of experience

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