



Great teachers aren't born.

THEY'RE TAUGHT.

Deborah Loewenberg Ball

The National Council for Curriculum and Assessment and the Marino Institute of Education

Dublin, Ireland • 30 November 2012

SCHOOL OF EDUCATION UNIVERSITY OF MICHIGAN

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Pre-assessment:
What is involved in skillful teaching?

*With which statement do you **most** agree? Why?*

*With which do you **least** agree? Why?*

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What is involved in skillful teaching?

(1) The most important ingredient in skillful teaching is knowing the content very well.

(4) Skillful teaching is primarily a matter of personal style and charisma.

(2) Experience in one's own classroom is the only way to become skillful at teaching.

(3) The core practices of skillful teaching can be specifically trained.

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Overview of day

1. Focusing teachers' education on the development of skill in teaching: High-leverage practice
2. Specific practices of assessing learning
3. Specific practices of building learners' skills with numeracy

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What is "skill" in teaching?

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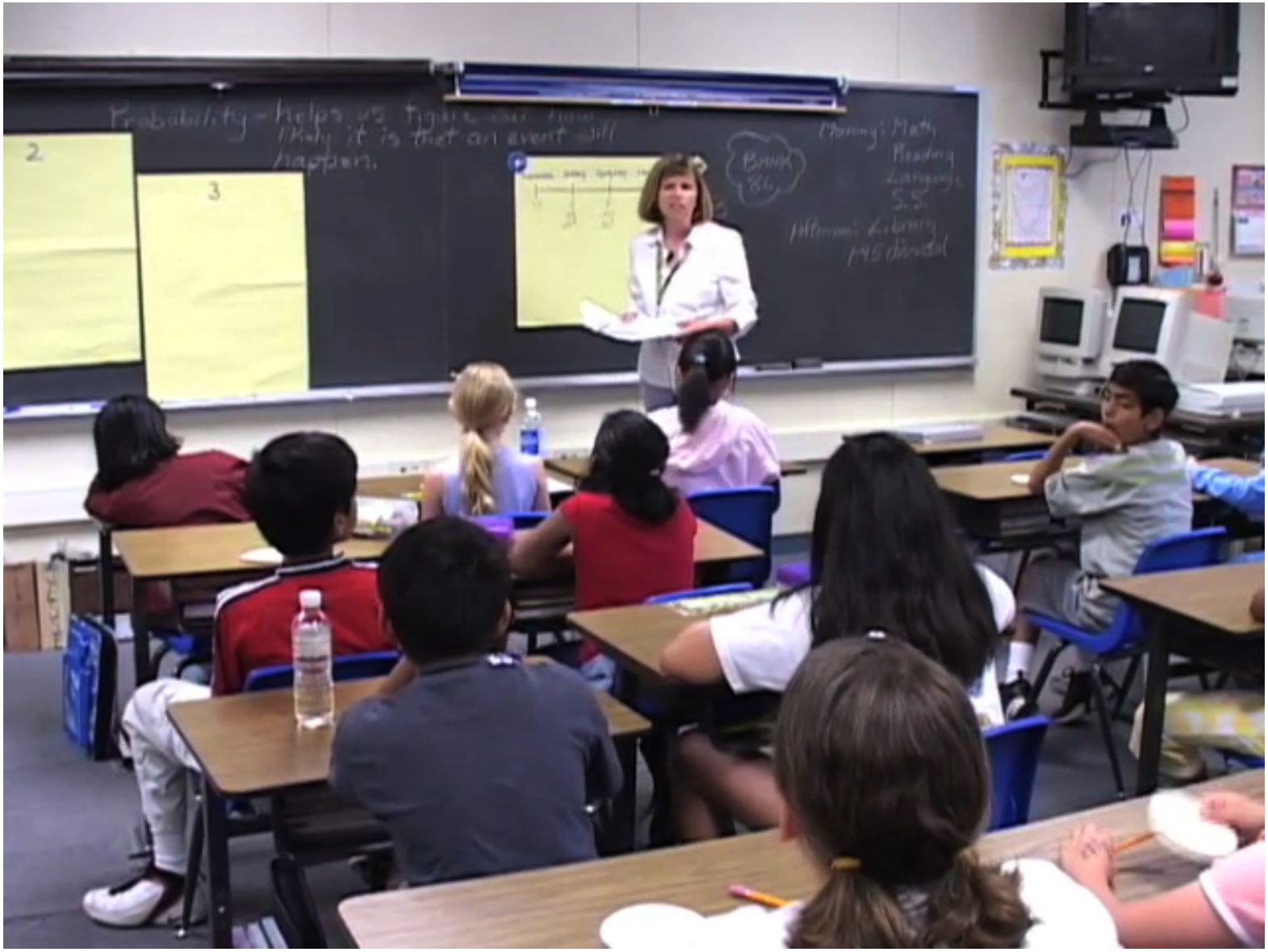
1. Was that 'skillful teaching'?

2. Identify four skills of teaching that you saw in the video clip, or that were lacking.

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What specific skills of teaching were common in all three clips?

1. Leading a whole class discussion focused on specific content
2. Asking questions for strategic instructional purposes
3. Focusing on learners' thinking about the content
4. Implementing organizational routines, procedures, and strategies to support a respectful learning environment
5. Using voice and physical presence to gain and manage students' attention to the content

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Our problem

1. Teaching effects are significant in accounting for variation in learning.
2. Teachers report learning more 'on the job' than from their professional education. This supports an individual and often idiosyncratic approach to teaching.
3. There are important changes needed in learning, for which teaching will have to change.
4. Teacher preparation and continuing education is not focused on practice.

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Features of strong training for skillful responsible practice

1. Clear **specification of skills, capabilities, and qualities of performance** necessary for independent practice
2. Detailed **developmental clinical training**, progressing from observing to simulations to supervised apprenticeship to supervised independent practice
3. **Performance assessment** of individual competence necessary for independent practice

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Focus in this session

1. Clear **specification of skills, capabilities, and qualities of performance** necessary for independent practice
2. Detailed **developmental clinical training**, progressing from observing to simulations to supervised apprenticeship to supervised independent practice
3. **Performance assessment** of individual competence necessary for independent practice

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High-leverage instructional practices

High-leverage practices (HLPs) are instructional tasks and activities that powerfully promote student learning and are fundamental to skillful teaching.

Based on work done at the University of Michigan School of Education in the redesign of our teacher education program, and at TeachingWorks, a new organization whose mission it is to improve the quality of teaching and learning by transforming. teachers' education.

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Criteria for choosing high-leverage practices

1. Are used frequently in teaching
2. Are crucial to promoting learning
3. Are not commonsense to perform skillfully
4. Can be specified and taught to novices, and further developed in experienced teachers
5. Can be assessed

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Examples of high-leverage practices

1. Explaining, representing, and modelling core content
2. Setting up and managing small-group work
3. Recognizing and identifying common patterns of student thinking in a content domain
4. Posing questions
5. Eliciting and interpreting learners' thinking
6. Establishing norms and routines for a respectful and effective learning environment
7. Selecting and using specific methods to assess students' learning on an ongoing basis
8. Conducting a meeting with a parent or caregiver

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Explaining, representing, and modelling core content

How would you explain to a learner what it means to 'summarize' a short text?

*Work with 1-2 other people and produce explanations of how to **summarize** a text. Analyze the strengths and problems of each one, imagining how a 10-year-old would understand.*

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Produce explanations of how to 'summarize a text.' Analyze the strengths and problems of each one, imagining how an 10-year old would understand.

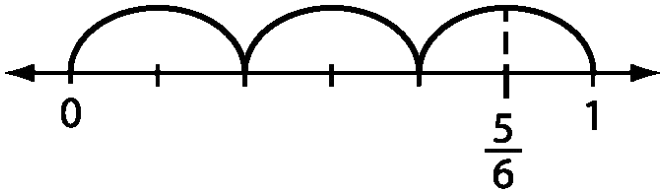
How can you survive a fire in your home?

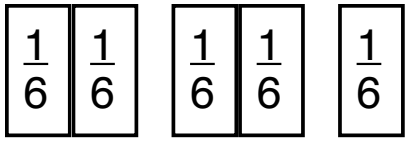
One important thing to remember is that a closed door is a powerful ally. A door will slow the spread of the fire, and a wet towel or cloth at its bottom can block the smoke. A second thing to know is that in buildings that are not fireproof, such as most all private homes, brownstones and low-rise older apartment buildings that have external fire escapes, the safest approach is to get out right away. That's why you need a working smoke alarm. If the door or exit route is too hot, close the door. Only after the door is closed, should you open an external window — and not one in a bathroom — if fresh air is needed.

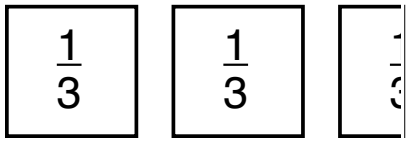
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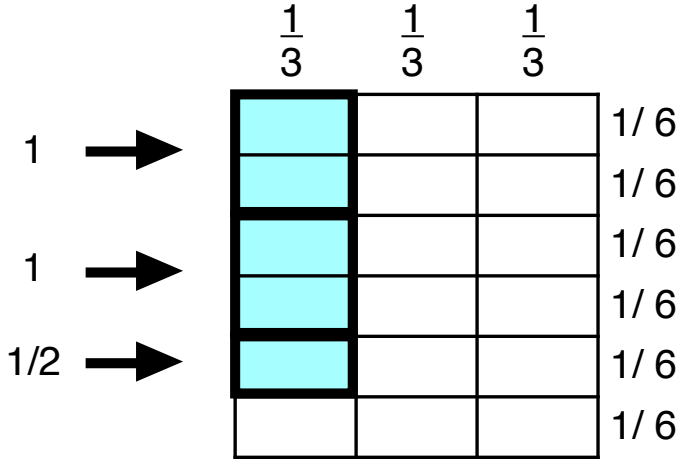
Analyzing and narrating representations

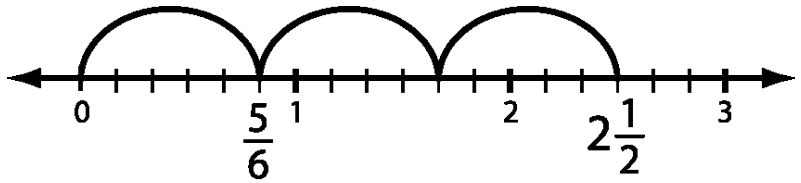
Which of these can be used to represent $\frac{5}{6} \div \frac{1}{3}$? Explain with reference to all parts of the expression.











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Interpreting learners' thinking: Analyzing errors

What mathematical steps could have produced this answer?

(a)

$$\begin{array}{r} 49 \\ \times\ 25 \\ \hline 405 \\ 108 \\ \hline 1485 \end{array}$$

(b)

$$\begin{array}{r} 49 \\ \times\ 25 \\ \hline 225 \\ 100 \\ \hline 325 \end{array}$$

(c)

$$\begin{array}{r} 49 \\ \times\ 25 \\ \hline 1250 \\ 25 \\ \hline 1275 \end{array}$$

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Listening to learners' ideas



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Knowing content for teaching

A paradox of skillful teaching: In order to teach, must know content very well oneself; in order to teach, must think, know, and keep learning it from learners' perspectives.

1. **Explaining, representing, and modelling core content**
2. **Interpreting learners' understanding**
3. **Posing questions of learners and probing learners' thinking**

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What is involved in knowing and using content in teaching?

- Unlearning what is tacit
- Relearning into multiple forms
- Putting one's own thinking on the back burner, and being genuinely attentive to someone else's thinking
- Much more than a special kind of academic task: Doing this in real time, interactively

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Revisiting and continuing to focus on features of strong training for skillful responsible practice

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An endemic problem of teaching

Did my learners
learn what I taught?

CHALLENGES TO FINDING OUT

Incentives run high to confirm one's hopes

Difficult to develop good questions that will provide reliable and precise information

Others?

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High-leverage practices of assessment

- Eliciting and probing learners' thinking
- Selecting and using particular methods to check understanding and monitor learners' understanding and skill during and across lessons
- Composing, selecting, and interpreting and using information from quizzes, tests, and other methods of summative assessment

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Checking for understanding at the end of a lesson: Using 'end of class checks'

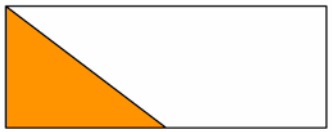
1. Targets a key skill or understanding on which the lesson was focused
2. Is quick, and possible for every learner to begin and complete
3. Might include reflective as well as content-focused questions
4. Is easy for the teacher to look over quickly for completion and correctness

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Example: End-of-class check #1

1. Write an equation for 10 that has more than two terms to the left of the equals sign.

2. What fraction of the rectangle is shaded orange?



3. Look at the Learner Contract on the wall. Do you think you are doing a good job of doing the things that are on the contract? Give two examples of things you did well today that are on the Learner Contract.

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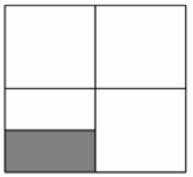
End-of-class check #2

1. Put a number in the blank to make the number sentence true.

   6+ 5 = ___ + 2

   Explain your answer:

2. What fraction of the big square is shaded gray?

   Explain your answer:

3. What is one thing you did today that helped you learn maths?

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Checking for learners' understanding

Fifth class, beginning of year

Many learners who are 'behind' in maths

Diverse cultures and languages

Checking for learners' understanding

- Design an exit task to check to see whether students have learned.

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A mathematics lesson

How many different three-digit numbers can you write using the digits 1, 2, and 3, and using each digit exactly once?

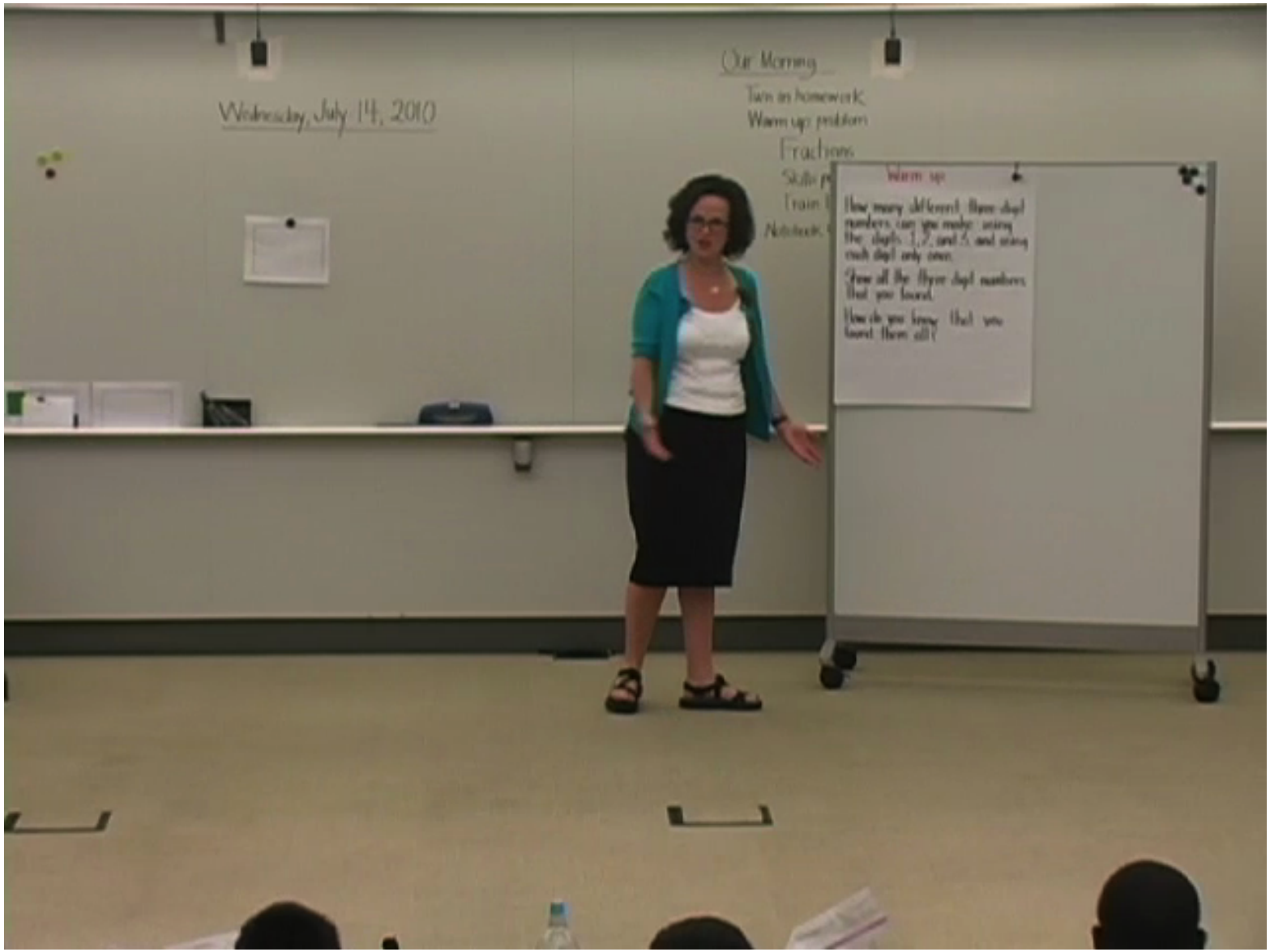
Show all the three-digit numbers you found.

How do you know you found them all?

LEARNING OBJECTIVES

1. How to analyze the 'conditions of a problem'
2. To figure out all the permutations of 3 items and prove the completeness of the solution

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$$9\frac{2}{10}$$

$$-\ 6\frac{7}{10}$$

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Does this learner understand?

$$\begin{array}{r} 9\frac{2}{10} \\ -\ 6\frac{7}{10} \\ \hline 2\frac{5}{10} \end{array}$$

POSSIBILITIES?

1. The learner does understand the underlying concepts.
2. The learner subtracted 'up' and made a basic calculational error.
3. The learner overgeneralized from base 10 whole number subtraction.

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ASSESSMENT OF TEACHING PRACTICE

Diagnosis: Eliciting and interpreting learners' thinking

1. Analyze learners' work on fraction tasks.
2. Prepare for an interaction with a 'standardized learner' about one piece of learner's work.
3. Probe the standardized learner's thinking to understand the steps she took as well as why she performed the particular steps.
4. Respond to questions about the diagnosis.

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Teacher intern #1



$$\begin{array}{r} 8\,\not{9}\,{}^{1}\frac{2}{10} \\ -\;6\,\frac{7}{10} \\ \hline 2\,\frac{5}{10} \end{array}$$

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Teacher intern #2



$$\begin{array}{r} 8 \not{9}\,{}^{1}2\tfrac{}{10} \\ -\ 6\tfrac{7}{10} \\ \hline 2\tfrac{5}{10} \end{array}$$

$$\begin{array}{r} 2\tfrac{2}{5} \\ -\ 1\tfrac{3}{5} \\ \hline \end{array}$$

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Building new assessments of teaching practice

- Improvement-oriented: Useful for diagnosis and continuous improvement of teaching
- Linked to teaching specific content
- Based on actual performance of teaching
- Conducted in a variety of settings for practice, depending on what is being assessed
- Valid, reliable, and fair

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An endemic problem of teaching

How can I develop my learners' broad skills using numeracy?

CHALLENGES TO WORKING ACROSS THE CURRICULUM

Risks of trivializing mathematics (e.g., counting or calculating only)

Understanding sites for robust connection across fields

Losing instructional focus

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Three sites for developing learners' skills with (and through) numeracy

1. Developing care with language
2. Focusing on disciplined explanation, representation, and reasoning
3. Using mathematical ideas and skills to work on problems in other domains

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Viewing focus

What are the components of the teacher's approach to introducing a new mathematical term?

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Examples of specific teaching skills visible in this clip

- Making transitions
- Getting and holding the floor
- **Introducing a mathematical term**
- Creating a safe classroom learning environment
- Designing and sequencing lessons for specific mathematical goals
- Engaging learners in experimentation to develop probability concepts
- Posing questions
- Assessing students' prior knowledge and their learning
- Launching a task
- Providing positive reinforcement

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Introducing a mathematical term

1. 'What numbers can you get?' (*concept*)
2. 'We call those outcomes.' (*new term*)
3. 'Possible results of an experiment.' (*definition*)
4. Puts up poster. (*signals importance, supports remembering and using term*)
5. 'How many outcomes are there?' (*practice*)

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Why is language so important?

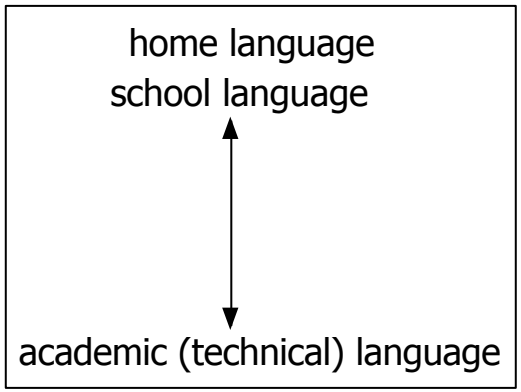
- Knowledge and reasoning in any field depends on and is supported by specific language.
- Teaching and learning depends on and is supported by language.
- Academic language is both content to be learned and a medium for learning content.

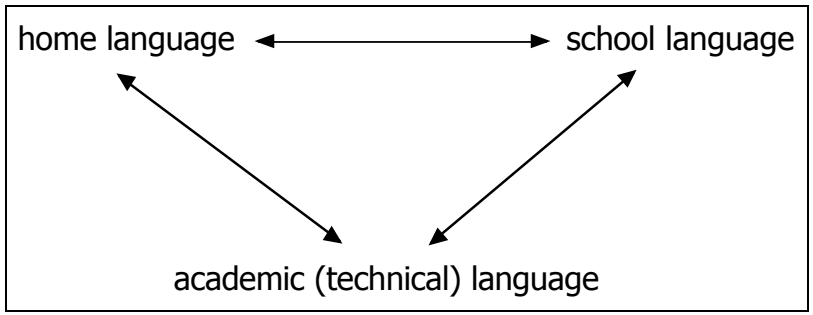
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Issues with mathematical language: Mathematical vs. everyday language

Mathematics often uses and specializes everyday language rather than coining a separate technical vocabulary -- both enabling and complicating entry to its register.

Equity issue: Additional dimension for children who must navigate between home, school, and mathematical languages





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Dilemmas of using language

1. Learners necessarily use imprecise language.
2. We want to encourage learners to express themselves.
3. Informal language can serve as a bridge or a support.
4. Attending to the needs and resources of second language learners.

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What makes a "good" definition?

Mathematically precise — correctly identifies the kind of object, process, property

Usable by user community — based on already-defined and understood terms

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What is a mathematically precise and usable definition of "even number" for learners?

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Using a definition of 'even number'

a) An even number is a number that can be divided into two equal parts.

b) An even number is any multiple of 2.

c) An even number is any integer multiple of 2.

d) An even number is any number whose unit digit is 0, 2, 4, 6, or 8.

e) A whole number is even if it is the sum of a whole number with itself.

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a) An even number is a number that can be divided into two equal parts.

b) An even number is any multiple of 2.

All numbers, for example 7, 3/5, √2, p, are even!

c) An even number is any integer multiple of 2.

This is a correct definition of an even number.

d) An even number is any number whose unit digit is 0, 2, 4, 6, or 8.

In this case, 36.7 is an even number!

e) A whole number is even if it is the sum of a whole number with itself.

This is a correct definition of evenness for whole numbers, and is consistent with the general definition for integers that will arrive later.

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Academic and intellectual language

1. Specific terms from a subject (e.g., outcome, text, genre, pistil, character, filibuster)
2. Terms for knowledge or knowing within a subject (or across disciplines) (e.g., evidence)
3. Terms for intellectual work (e.g., confer, propose)

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Focusing on developing academic language

Literacy and Language	Mathematics	Social Studies	Science	General
theme character	conjecture proof representation correspondence	source interpretation	prediction explanation observation	confer revise propose claim evidence argument

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Focusing on explanation, representation, and modelling



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Being explicit about explanation



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Clinical training is more than 'getting experience'

1. Focus on the curriculum for teaching practice
   - What skills, techniques, capabilities
   - Ways of representing, decomposing, and approximating practice (Grossman & McDonald)
   - Pedagogies for teaching those: analyzing, modeling, rehearsing, coaching, etc.
2. Settings appropriate to the learning goals, including video and cases, simulations, labs, real students and classrooms

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Practicing defibrillation



Practicing a guided reading lesson



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High-leverage practices involved in building students' skills in (and through) numeracy

1. Modelling and teaching care with language, in mathematics and across academic work
2. Focusing on explanation: probing learners' thinking, making visible what is involved in explaining, teaching learners to attend closely to one another's explanations, teaching learners to critique arguments carefully and respectfully
3. Using mathematical ideas and skills to work on problems in other domains

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Building strong professional training for skillful responsible practice

1. Clear **specification of skills, capabilities, and qualities of performance** necessary for independent practice—high-leverage practices
2. Detailed **developmental clinical training**, progressing from observing to simulations to supervised apprenticeship to supervised independent practice
3. **Performance assessment** of individual competence necessary for independent practice

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Post-assessment:
What is involved in skillful teaching?

*With which statement do you **most** agree? Why?*

*With which do you **least** agree? Why?*

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What is involved in skillful teaching?

(1) The most important ingredient in skillful teaching is knowing the content very well.

(4) Skillful teaching is primarily a matter of personal style and charisma.

(2) Experience in one's own classroom is the only way to become skillful at teaching.

(3) The core practices of skillful teaching can be specifically trained.

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What *is* TeachingWorks?

- A national organization housed at the University of Michigan School of Education.
- Based on work done at the University of Michigan in our own programs and also in partnership with other programs and organizations.
- Focused on ensuring that every child gets skillful teaching every single year by building strong professional infrastructure for the training, development, and assessment of teaching practice.

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Four main arenas of work

① Supporting the development of a common curriculum for teaching

② Building resources for teaching practice, and performance assessments of specific high-leverage practices that appraise a teacher's readiness for independent practice

③ Providing training for those who work with teachers

④ Advancing the case for the importance of effective professional training

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