Examining and Developing Practice Through Live Laboratory Teaching

Deborah Loewenberg Ball, Nicole Garcia, Julie McNamara

April 8, 2014 • NCSM 2014 • New Orleans, LA
What great teachers often say about teaching

“Teaching has always come naturally to me.”

“I can’t explain what I do — teaching is really an art and you have to follow your intuition a lot.”

“I have learned what I do from experience; I like to pass on what I know to student teachers.”

“I have developed my way of doing things that works for me and my style.”
What’s wrong with this?

1. Undermines the idea that teaching is a profession that can be developed through careful unpacking of the practice and a common technical language
2. Perpetuates the belief that teaching is individual and tacit
3. Reinforces the predominance of “style” over skill

If teaching is individual and must be figured out by each person on the job, then there is little hope of ensuring that all young people receive skillful instruction.
The work of teaching and the challenge for professional development

1. Unpacking practice into explicitly learnable elements
2. Developing explicit and useful language for practice
3. Accessing and using examples of actual practice
Overview

1. Using of a laboratory context to work on the improvement of teaching: A focus on explicit teaching
2. Teachers’ learning in the Elementary Mathematics Laboratory (EML)
3. Using resources to design professional learning opportunities
What is the EML?

A live laboratory for the design and study of teaching:

- 10-day summer mathematics program for 5th grade students from Ypsilanti Community Schools
- Live setting for the study of teaching, learning, and mathematics by teacher and school district leaders, teacher candidates, teacher educators, researchers, mathematicians and other university faculty, the public
- Source of unusual records of practice
Why is it called a “laboratory”?

Laboratory:
A planned setting developed for real-time studies of the interplay of instructional design, teaching, and learning

Features of the laboratory:
- Teaching that is public, perceptible, and made studyable
- Careful documentation
- Experimentation and interdisciplinary study
A site for collective work on practice

- Opportunity to deliberate collectively about instructional decisions, and to develop and discuss experiments
- Diverse participants with varied interests, areas of expertise, and “lenses” for viewing practice lend different perspectives and expand the range of discussion
What are we studying in the EML?

Ways to unpack and name specific teaching practices with respect to:

- What is involved in teaching specific aspects of the Common Core in mathematics?
- How can students be challenged mathematically with complex mathematical work while also filling in “gaps” in their past learning?
- What is involved in teaching mathematics with a deliberate focus on equity?
Enhancing teachers’ learning

THE IMPORTANCE OF PUBLIC TEACHING
Why engage in public teaching?

- Most teaching occurs behind closed doors
- Teachers report learning “on the job” and on their own from experience most of what they do
- Culture of teaching supports style over method, and individualistic discretion over professional standards
- Weak norms for professional comment on practice
What are the consequences of the pattern of personal and private practice?

- Idiosyncratic path to learning to teach, rooted in apprenticeship of observation (Lortie)
- Reproduction of inequitable practice
- Lack of development of collective professional knowledge (Grossman, Hiebert & Morris, Stigler)
- Inhibitor of instructional improvement
- A broad view of teaching as “can do” by anyone
What is involved in public teaching?

1. Supporting observation (seeing, hearing, understanding)
2. Making teaching and learning visible
3. Minimizing the public-ness: creating a “cocoon”

What is public teaching NOT?

- Modeling “best practice”
- Demonstration teaching for professional development purposes
Challenges of public teaching

1. Easy equating to “modeling best practice” or an opportunity to see a particular teacher.

2. Conflating of the public teacher with the opportunity to study teaching.

3. For the person doing public teaching, remembering that it is about making teaching visible, not doing it “right.” Seeing “bad episodes” or errors as part of the work, and not a failed lesson.

4. The multiple levels of focus, purpose, and attention require deliberateness and attention.
Public teaching, other considerations

SUPPORTING OBSERVING
- Standing and moving to make it easy for observers to see
- Speaking loudly enough and creating a norm of children speaking to be heard by peers
- Making large artifacts and using public space for representation

MINIMIZING THE “PUBLIC-NESS”
- Creating a “cocoon” around oneself and the students
- Focusing intently and persistently on students and creating an serious focus in the room for concentration on the talk and the ideas
- Creating norms of attention to one another’s talk and ideas
- Deliberately non-attending to the observers
Other considerations

1. Public teaching requires practices in addition to those entailed by teaching children.

2. The practices involved in public teaching seem not to interfere with the teaching and learning of the children, and even may enhance the children’s learning opportunities.

3. Need to develop and make more explicit practice of public teaching and opportunities to learn practices of public teaching and not assume that these are natural or just to be figured out on one’s own.
Today’s focus

Two Common Core mathematical practice standards:

1. Make sense of problems and persevere in solving them.
3. Construct viable arguments and critique the reasoning of others.

One high-leverage practice (HLP): Making content explicit

1. What have we learned about teaching through our work in the laboratory?
2. How does the laboratory support teachers’ learning?
WHAT HAVE WE LEARNED ABOUT THESE CCSS STANDARDS AND THIS HLP FROM OUR WORK IN THE LABORATORY?
What is this problem asking, and what is involved in trying to solve it?

Using exactly one positive and one negative checker, find all the numbers that can be represented on this minicomputer board.

Prove your answer and explain why.

(Papy Minicomputer)
Identifying and using problem “conditions”

CONDITIONS OF THE PROBLEM
1. Use exactly one positive and one negative checker.
2. Must be a number that can be made on the Minicomputer.

PROPOSED SOLUTIONS
3. YES, because it can be made with a positive on the 4 and a negative on the 1. This (1) uses exactly one positive and one negative checker and (2) it can be made on the Minicomputer.

9. NO, because it cannot be made on the Minicomputer with exactly one positive and one negative checker on the Minicomputer.
The role of conditions of a problem

- Identifying conditions can help in making sense of and interpreting a problem (MP.1)
- Using the conditions can help in persevering on a difficult problem (MP.1)
- Conditions are useful in constructing a mathematical argument (MP.3)
- Referring to the conditions is useful in critiquing an argument (MP.3)
HLP #1: Making content explicit

- With increasingly greater expectations for engagement in complex mathematical work, it is crucial to unpack and structure opportunities to learn key ideas and practices, e.g.:
  - What it means to explain your thinking about an answer
  - What is involved in showing your work
  - How to work on a hard math problem
  - How to study mathematics on your own

- An entailment of equitable teaching to make ideas and practices transparent and learnable for all students (Delpit, ELA)
Explicit teaching

- Naming, labeling, writing about important aspects of mathematical ideas, concepts, and procedures:
- Naming, highlighting, scaffolding specific mathematical practices
- Naming and supporting qualities of productive mathematical habits and mindset

(Mann, Owens, & Ball, 2013)
Explicit teaching ≠ direct instruction: Investigating similarities and differences

DIRECT INSTRUCTION
- Breaks down practice or knowledge into small constituent parts
- Presentation of information, rules, and examples
- Tasks only address information from the presentation and the task is uncomplicated
- Lessons are composed of 4 – 10 exercises (presentations with task series) with only 10% new material
- Teacher’s role to demonstrate, students follow, shift to independent practice
- Seeks to reduce complexity

EXPLICIT TEACHING
- Unpacks practice or knowledge to make it open to learners
- Teacher’s role to make elements visible, provide language, supports
- Seeks to make complex practice accessible

Engelmann & Colvin (2006)
Explicit teaching ≠ direct instruction: Investigating similarities and differences

SIMILARITIES

- Decomposes practice into smaller parts
- Seeks to support learners’ mastery of specific knowledge and skill

DIFFERENCES

- Reducing complexity versus maintaining and making it accessible
- Teacher’s role to demonstrate versus to support students’ engagement with learning the components
- Students’ role to follow and reproduce versus to appropriate and practice with understanding
Teachers’ Learning in the EML

EXPLICITLY SUPPORTING STUDENTS TO EVALUATE MATHEMATICAL EXPLANATIONS
Professional development themes

- Leading whole class discussions
- Considering worthwhile tasks
- Examining the high-leverage practices
- Teaching the mathematical practices
Professional development process

- Viewing guide
- Observation
- PD workshop debrief
- Focused work with artifacts
- Transfer to practice
Viewing guide

How does the teacher support students in learning to give mathematical explanations that:

- Have a clear purpose
- Have a logical structure
- Use representations and language clearly and carefully
- Have a focus on meaning and are oriented to the listeners
Professional development process

1. The pre-briefing session
   - Discussing the lesson plan, making changes
   - Anticipating what might come up and considering moves

2. The class session

3. The de-briefing session
   - Analyzing the class (design, enactment, students, . . .)
   - Beginning to plan for tomorrow’s class
Pre-Brief
Professional development process

1. The pre-briefing session
   - Discussing the lesson plan, making changes
   - Anticipating what might come up and considering moves

2. The class session

3. The de-briefing session
   - Analyzing the class (design, enactment, students, . . .)
   - Beginning to plan for tomorrow’s class
Dual focus

- Teaching the children
- Making teaching studyable
Professional development process

1. The pre-briefing session
   - Discussing the lesson plan, making changes
   - Anticipating what might come up and considering moves

2. The class session

3. The de-briefing session
   - Analyzing the class (design, enactment, students, . . .)
   - Beginning to plan for tomorrow’s class
Debrief
This work is licensed under the Creative Commons Attribution-Noncommercial-No Derivative Works Version 3.0 United States License: http://creativecommons.org/licenses/by-nc-nd/3.0/us/

© 2014 Teachingworks • School of Education • University of Michigan • Ann Arbor, MI 48109 • mtlt@umich.edu
Professional development process

- Viewing guide
- Observation
- PD workshop debrief
- Focused work with artifacts
- Transfer to practice
Permutations of 1, 2, and 3

- How many different three-digit numbers can you make using the digits 1, 2, and 3, using each digit only once?
- Show all the three-digit numbers that you found.
- How do you know that you have found them all?

Solve the problem and consider how you would explain that a particular three-digit number is or is not a solution.
The conditions of the problem

How many different three-digit numbers can you make using the digits 1, 2, and 3, using each digit only once? Show all the three-digit numbers that you found.
How do you know that you have found them all?

THREE CONDITIONS
1) Use only 1, 2, and 3
2) Use exactly three digits
3) Use each digit only once

WORK OF THE CLASS SO FAR
- Unpacked the conditions of the problem
- Shared non-examples with justifications
How many different three-digit numbers can you make using the digits 1, 2, and 3, using each digit only once? Show all the three-digit numbers that you found. How do you know that you have found them all?

VIEWING FOCUS
To what extent does each explanation:
- Have a clear purpose
- Have a logical structure
- Use representations and language clearly and carefully
- Have a focus on meaning and are oriented to the listeners
How many different three-digit numbers can you make using the digits 1, 2, and 3, using each digit only once? Show all the three-digit numbers that you found. How do you know that you have found them all?

VIEWING FOCUS
To what extent does each explanation:

- Have a clear purpose
- Have a logical structure
- Use representations and language clearly and carefully
- Have a focus on meaning and are oriented to the listeners
Classroom video

How many different three-digit numbers can you make using the digits 1, 2, and 3, using each digit only once? Show all the three-digit numbers that you found.

How do you know that you have found them all?

VIEWING FOCUS

- What is the teacher doing to support students in learning to give mathematical explanations?
- What else might the teacher do?
Professional development process

- Viewing guide
- Observation
- PD workshop debrief
- Focused work with artifacts
- Transfer to practice
Affordances and challenges of using the lab to support this work

**AFFORDANCES**
- Close to practice
- Able to see impact in real time
- Can test teacher moves
- Teacher impact

**CHALLENGES**
- Choosing segments for the session on the same day
- Predictability
Using a laboratory to learn about teaching the Common Core

FINDINGS

- Specific teaching practices that simultaneously “fill in gaps” and also accelerate
- Specific ways to make mathematical practices explicit in class

NEXT STEPS

- Continue to develop ways to support students in constructing oral and written explanations
- Expand work to additional mathematical topics and practices
Using a laboratory as a resource for professional learning experiences

FINDINGS

- The laboratory can support teachers’ learning both in the lab and by using records from the lab.
- The explicitness and detail of the work on instruction has been crucial for creating professional learning experiences.

NEXT STEPS

- Follow up and support learning in the laboratory during the academic year.
- Design opportunities for teacher candidates’ learning in the laboratory.
- Explore how to make the laboratory accessible using streaming.
Learning from the EML

USING RECORDS OF PRACTICE TO CREATE PROFESSIONAL LEARNING OPPORTUNITIES
EML records of practice

- Detailed daily lesson plans
- All student and participant handouts
- Video records of prebrief, class, and debrief
- Copies of student notebooks
- Copies of student work, homework, and assessments
- Images of class-produced anchor charts
How can these records of practice be used to support teachers outside of the laboratory setting?

- Continued support for summer participants
- Topic-focused professional development
- Mathematical practice focused professional development
Thank you!