(How) Can Teacher Preparation Be Improved?

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AASCU Summer Meeting • San Francisco CA • 28 July 2012
Overview

1. What is the problem?
   - Common solutions, and why they may fall short (again)

2. What strong professional training for teaching would require
   - Training for instructional practice
   - Training in academic knowledge for teaching

3. TeachingWorks
① What is the problem? Improving U.S. students’ learning

1. U.S. students score poorly overall when compared with students across the country.

2. Enormous gaps in learning opportunities and disparities in achievement.

3. Changing school population.

4. Higher, more complex academic goals

5. High expectations for all students
The Common Core State Standards


- The first attempt to stipulate a common curriculum in English language arts and mathematics, K-12, including topics and disciplinary practices

- 45 states have agreed

- Major investments in new cross-state assessments of these learning goals
Teaching has significant effects on student outcomes

• Differences in teachers account for 12%-14% of total variability in students’ mathematical achievement in each of grades 1, 2, and 3.

• Students assigned to three effective teachers in a row score at the 83rd percentile in math at the end of 5th grade; children assigned to three ineffective teachers in a row score only at the 29th percentile.

• The cumulative effects of being taught by a highly effective teacher can substantially reduce differences in student achievement that are due to family background.
Common remedies for teaching quality problem

- Be more selective in admissions to teacher education
  - Scale
  - Huge teacher turnover and retirement boom
  - Diversity: gap between composition of U.S. school population and teacher workforce
- The cycle: teachers are graduates of the school system we seek to improve

- Evaluate teachers based on student growth models
  - Already in practice; children at risk
  - More focused on categorizing than on improving
### The realities of scale

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number Employed (in thousands)</th>
</tr>
</thead>
<tbody>
<tr>
<td>teachers (elementary, middle, secondary)</td>
<td>3,681</td>
</tr>
<tr>
<td>secretaries and administrative assistants</td>
<td>3,632</td>
</tr>
<tr>
<td>janitors, maids, household cleaners</td>
<td>3,343</td>
</tr>
<tr>
<td>registered nurses</td>
<td>2,449</td>
</tr>
<tr>
<td>sales representatives</td>
<td>1,842</td>
</tr>
<tr>
<td>waiters and waitresses</td>
<td>1,811</td>
</tr>
<tr>
<td>home health aides</td>
<td>1,639</td>
</tr>
<tr>
<td>accountants and auditors</td>
<td>1,617</td>
</tr>
<tr>
<td>chief executives</td>
<td>1,362</td>
</tr>
<tr>
<td>engineers (all types)</td>
<td>1,313</td>
</tr>
<tr>
<td>counselors and social workers</td>
<td>952</td>
</tr>
<tr>
<td>lawyers</td>
<td>819</td>
</tr>
<tr>
<td>physicians and surgeons</td>
<td>185</td>
</tr>
<tr>
<td>psychologists</td>
<td>180</td>
</tr>
<tr>
<td>architects (non-naval)</td>
<td></td>
</tr>
</tbody>
</table>
A transient workforce

Teacher Experience as Share of Workforce

1987-1988

Mode: 15 years of experience.

2007-2008

Mode: 1 year of experience.

Weak focus on improving training

- Many reject teacher preparation as a lever at all
- Attention to improving teacher training focused almost entirely on inputs
- Other attention focused on distal outputs
- Little attention to improving teachers’ actual skills and knowledge and on assessing their readiness for professional responsibility
No professionally-grounded system for teachers’ training

1. No common curriculum for the professional training of teachers—specific, professionally-agreed upon learning objectives for new or practicing teachers

2. Over 2,000 independent providers of initial teacher training, and an uncountable number of providers of professional development

3. No common standard of performance for entry to independent practice with (on) young people
   - Most licensure-level assessments focus on written assessments of knowledge rather than performance of practice
   - Others are portfolio-based, reflection-oriented, and tend to be under-detailed

4. Consequence: Primacy of personal experience; individual and idiosyncratic learning
Our problem

1. Evidence of teaching effects → increased interest in importance of teaching

2. Broad skepticism about the efficacy of teacher education and professional development

3. → focus on recruitment, outcomes, instead of training → does not augur well for redressing educational inequity and uneven quality
Features of strong training for responsible practice

1. Clear specification of skills, capabilities, and qualities of performance necessary for basic 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 before allowing independent practice
② Seeking a real solution: A COMMON CORE FOR TEACHING

A professionally-warranted set of basic instructional capabilities that teachers must be able to carry out effectively in order to be allowed to take independent responsibility for students’ learning.

HIGH-LEVERAGE PRACTICES
High-leverage practices . . .

1. are necessary for basic and responsible academic instruction in the Common Core State Standards
2. are fundamental to managing effectively the environment of teaching practice
3. are specific enough to be named, identified, and taught (useful for professional training and development)
4. can be assessed directly
Other examples

- Being able to explain what a “real number” is in a 9th grade algebra class, to students who are still struggling with fractions
- Launching and conducting a productive discussion of a major theme in *Romeo and Juliet* in a 9th grade English class
- Being able to work on a specific reading skill with a small group in a 1st grade class, while the rest of the class is working independently on appropriate assignments
- Calling a parent or guardian on the phone and discussing a student’s progress
Implications for identifying the practice curriculum

- Crucial to identify elements of the work of teaching that can be assessed in performance situations
  - Leading a discussion
  - Managing small-group work
  - Holding a conference with a parent
  - Identifying common patterns of student thinking
- Will not work just to hope important elements of teaching come up in the course of regular practice and can be evaluated then
Needed: A new generation of assessments of teaching practice

- Useful for: diagnostically-based improvement; licensure; hiring decisions; licensure renewal and advancement
- Based on specific core practices for teaching specific K-12 content (keyed to the Common Core)
- Scored based on how well candidates use a particular practice to reach particular content-specific instructional goals
- Based on actual performance appropriate to the practice being assessed: e.g., planning versus leading a discussion versus diagnosing common patterns of student thinking
- Conducted in real classrooms, in performance centers, through simulations (“standardized patient” or computerized); some live and some scored through records of practice
“Practice-based” applies to the academic preparation of teachers, too: The case of mathematics

- Teachers often lack basic understanding of mathematical ideas and procedures
- The number of mathematics courses taken does not predict student achievement below secondary school; weak predictor at secondary school level
- The number of “mathematics methods” courses is a better predictor
Asking a better question

- Not “how much” does a teacher know, but “in what ways” and “how well” does a teacher know mathematics

- Must be related to the use of mathematics in practice – teachers’ use of mathematics in teaching
Knowing how to do multi-digit multiplication

49
x 25
49  
\times 25  
\underline{1225}
Seeing multiplication from the learner’s perspective

(a) $\begin{array}{c} 49 \\ \times 25 \end{array}$

\[
\begin{array}{c}
405 \\
108 \\
\hline
1485 \\
\end{array}
\]

(b) $\begin{array}{c} 49 \\ \times 25 \end{array}$

\[
\begin{array}{c}
225 \\
100 \\
\hline
325 \\
\end{array}
\]

(c) $\begin{array}{c} 49 \\ \times 25 \end{array}$

\[
\begin{array}{c}
1250 \\
25 \\
\hline
1275 \\
\end{array}
\]

What mathematical steps and reasoning might have produced these answers?
Teaching is mathematically intensive work

- Studies to investigate the kinds of mathematical knowing needed in teaching: initial evidence related to student achievement
- Many mathematical demands arise in the course of teaching
- Mathematical skills involved in planning and assessing
Representing content

- Choosing and using representations with care

\[
\begin{align*}
2 + 3 \\
2 - 3 \\
2 + (-3) \\
2 - (-3)
\end{align*}
\]
Using curriculum materials

- Figuring out the mathematical point of a task or a lesson in the curriculum and being able to use it in real time with students to achieve that point (Sleep, 2010)
- This more than being able to do the task oneself
A primary grade task

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.
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.
Mathematical ideas and practices involved

- Even and odd numbers
- Powers of two
- Properties of integer addition
- Constructing and critiquing mathematical arguments
- Symmetry
What are the mathematical purposes of the task?

1. Noticing and using the structure of the solution space:
   - Symmetry: Realizing that reversing the checkers gives the opposite number (so it suffices to consider positive numbers).
   - All numbers you get are differences of powers of two.
   - Finding that to get an odd (positive) number, the negative checker must be on the 1-square, so you can only get a power of two minus one (i.e., this rules out 5.)

2. Reasoning and proving:
   - Developing habit of asking whether a solution exists and that its existence (or lack thereof) can be proved.
   - Developing habit of finding all the solutions, and proving completeness.

3. Practice with adding integers and explaining answers.
Many other ways in which teaching is mathematical work

Examples:

- Explaing mathematical ideas and procedures clearly and correctly, attuned to learners
- Choosing pedagogically strategic examples
- Devising and asking mathematical questions in class
- Managing a discussion of a set of solutions to a problem
- Figuring out how to fill in learners’ gaps while also advancing their progress
- Writing and evaluating quizzes and tests
Needed: Practice-focused academic preparation and assessment

- Provides opportunities to learn, re-learn, and sometimes even unlearn the curriculum to be taught
- Includes learning “horizon knowledge” (Ball, Thames, & Phelps, 2008)
- Provides specific coached experience in solving content problems of teaching
- Assesses candidates’ knowledge and use of academic subject matter
TeachingWorks

Website: www.teachingworks.org
Email: info@teachingworks.org
What is TeachingWorks?

- A national organization housed at the University of Michigan School of Education
- Focused on improving the standard of teaching practice by building strong professional infrastructure for the training, development, and assessment of teaching
- Engaged in four main arenas of work:
  1. Advancing the development of a **common professional core** for teaching
  2. Creating and distributing **resources** for a comprehensive practice-based curriculum
  3. Building **training** for those who work with teachers
  4. Conducting and using **research** on teaching, on professional training and assessment of teaching, and relations to students’ learning
  5. Advancing the case for the importance of **rigorous practice-based** teacher training
- Based on work done at the University of Michigan in our own programs and also in partnership with other programs and organizations
Why is this worth doing?

- Develop more practice-focused teacher training, including powerful materials and other resources
- Develop more consistent teacher training that will lead to greater equity in the supply of effective teaching
- Build a professionally-based licensure system
- Provide infrastructure for R&D in teaching and teacher training

**IMPROVE STUDENT LEARNING**
Great teachers aren’t born. THEY’RE TAUGHT.