MET project

BILL & MELINDA GATES foundation

Content Knowledge for Teaching and the MET Project

Introduction

Teachers have more impact on student learning than any other factor controlled by school systems, including class size, school size and the quality of after-school programs—or even which school a student is attending[1]. But currently, there is no agreement among education stakeholders about how to identify and measure effective teaching. In an effort to improve the quality of information about teaching effectiveness, in the fall of 2009, the Bill & Melinda Gates Foundation launched the two-year Measures of Effective Teaching (MET) project to rigorously develop and test multiple measures of teacher effectiveness.

MET partners from more than a dozen reputable academic, non-profit and for-profit organizations are analyzing data collected during the 2009-10 and 2010-11 school years from over 3,000 teacher volunteers and their classrooms across Charlotte-Mecklenburg Schools, Dallas Independent School District, Denver Public Schools, Hillsborough County Public Schools, Memphis City Schools and the New York City Department of Education. Teachers and classrooms in Pittsburgh Public Schools are also participating in the project by helping researchers with early-stage development and testing of the effectiveness measures before they are tested in the other MET project districts.

[1] Steven G. Rivkin, Eric A. Hanushek, and John F. Kain, "Teachers, Schools, and Academic Achievement," *Econometrica,* Vol. 73, No. 2 (March 2005), pages 417–458. http://edpro.stanford.edu/Hanushek/admin/pages/files/uploads/teachers.econometrica.pdf

The project's data is collected across five critical research areas:

1. Student achievement gains on state standardized assessments and supplemental assessments designed to measure higher-order conceptual thinking
2. Classroom observations and teacher reflections
3. Teachers' content knowledge for teaching
4. Student perceptions of the classroom instructional environment
5. Teachers' perceptions of working conditions and instructional support at their schools

A close analysis of each of these critical aspects of teaching effectiveness will help establish how teaching practices, skills and knowledge relate to student learning. This paper seeks to define and explain how assessments of content knowledge for teaching factor into the MET project.

About Assessments of Content Knowledge for Teaching

Pedagogical content knowledge is a type of knowledge unique to teaching – a subject-specific professional knowledge that bridges content knowledge and knowledge about the practice of teaching. The concept was introduced in 1986 by researcher Lee Shulman, who described it as comprising an understanding of the content being taught; a mastery of the illustrations, examples and explanations that best support students' learning; and an understanding of what

makes learning the content easy or difficult for students of different ages and backgrounds.

Researchers from the Educational Testing Service (ETS) and the University of Michigan are leading an effort to develop new assessments of content knowledge for teaching mathematics and English language arts (ELA). Building on the groundbreaking work of the University of Michigan's Learning Mathematics for Teaching (LMT) project, these assessments are focused on the particular forms of specialized knowledge that teachers need to effectively engage in critical tasks of teaching such as:

- Choosing instructional strategies
- Interpreting student responses
- Detecting and addressing student errors, and
- Understanding instructional challenges faced by English language learners.

Assessments of content knowledge for teaching in mathematics and English language arts will be administered to teachers as part of the MET project in order to establish the links among content knowledge for teaching, instructional practice and student achievement.

The assessment's mathematics-focused questions measure content knowledge closely tied to the work of teaching mathematics, such as:

- Choosing and using appropriate mathematical representations
- Choosing examples to illustrate a mathematical concept
- Interpreting student work, including use of non-standard strategies, and
- Evaluating student understanding.

A sample mathematics question follows:

Mr. Sucevic is working with his students on understanding the use of proportional relationships in solving problems. He wants to select some problems from a mathematics workbook with which his students can practice. For each of the following problems, indicate whether or not the problem would be answered by setting up and solving a proportional relationship.

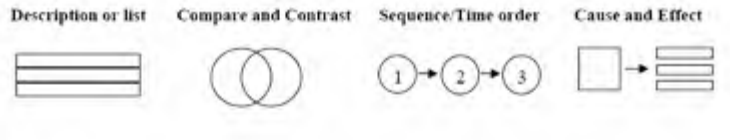
	Would Be Answered by Setting Up and Solving a Proportional Relationship	Would Not Be Answered by Setting Up and Solving a Proportional Relationship
A) Cynthia is making cupcakes from a recipe that requires 4 eggs and 3 cups of milk. If she has only 2 eggs to make the cupcakes, how many cups of milk must she use?		
B) John and Robert are each reading their books at the same rate. When John is on page 20, Robert is on page 15. What page will John be on when Robert is on page 60?		
C) Julie and Karen are riding their bikes at the same rates. Julie rides 12 miles in 30 minutes. How many miles would Karen ride in 35 minutes?		
D) Rashida puts some money into an account that earns the same rate each month. She does not remove or add any money to the account. After 6 months, the balance in the account is $1,093.44. What is the balance in the account after 12 months?		
E) A square with area 16 square units can be inscribed in a circle with area 8π square units. How many square units are in the area of a square inscribed in a circle that has area 24π square units?		

The assessment's English language arts-focused questions measure content knowledge closely tied to the work of teaching ELA, such as:

- Choosing a text to support a specific teaching goal
- Selecting an activity to highlight a particular feature of a text or literary technique
- Choosing an activity to assess students' understanding, and
- Analyzing student writing for weaknesses or strengths.

A sample English language arts-focused question is below:

Ms. Flowers is completing a unit from a textbook that includes the following examples of graphic organizers:



Ms. Flowers is considering how to present these examples to her students and explain how graphic organizers can help them comprehend informational text. Which of the following best explains why graphic organizers will help students become better readers of informational text?

a) Students will learn the definitions of different important graphic organizers.
b) Students will be able to identify and describe different graphic organizers.
c) Students will comprehend that nonfiction texts are used to extract factual information.
d) Students will recognize that nonfiction texts are organized, unlike fictional texts.
e) Students will anticipate patterns of information by identifying commonly used structures.

The assessments will be administered to MET project participating teachers in the spring of 2011. Each teacher's score will ultimately be compared against his or her classroom's average year-over-year improvement on a statewide standardized test and on a supplemental assessment to determine how closely correlated a teacher's score on the assessment of content knowledge for teaching is with average changes in test scores in his or her classroom, as well as with other measures that are part of the MET project. (See www.metproject.org for more information on this process.)

For more information about the study of assessments of content knowledge for teaching and the assessments themselves, contact Barbara Weren (bweren@ets.org).

About Educational Testing Service

Educational Testing Service (ETS) is a nonprofit whose mission is to advance quality and equity in education for people worldwide through creating assessments and conducting educational research, analysis and policy studies. ETS is using its expertise in teacher assessment, assessment design, natural language processing and psychometrics to help develop, administer and score the assessments of content knowledge for teaching.

The MET project is helping to support ETS' efforts to improve and enhance approaches to teacher assessment by including questions that focus on the specialized types of content knowledge encountered in the day-to-day work of teaching.

Fore more information about ETS, contact Barbara Weren (bweren@ets.org).About the Learning Mathematics for Teaching (LMT) Project

The University of Michigan's Learning Mathematics for Teaching (LMT) Project investigates the mathematical knowledge needed for teaching, and how such knowledge develops as a result of experience and professional learning. The project accomplishes this by writing, piloting and analyzing problems that reflect real mathematics tasks teachers face in classrooms. Assessments composed of these problems are used to measure the effectiveness of professional development intended to improve teachers' mathematical knowledge. For the MET project, the LMT Project's assessment has been expanded to measure both mathematical knowledge in the area of Algebra 1 and the subject-specific knowledge used in teaching English language arts.

About the Measures of Effective Teaching Project

The Measures of Effective Teaching (MET) project seeks to develop an array of measures that will be viewed by teachers, unions, administrators and policymakers as reliable and credible indicators of effective teaching. By determining exactly what measures predict the biggest student achievement gains, the MET project will give teachers the feedback (including exemplary practices) they need to improve. In addition, a greater understanding about which teaching practices, skills and knowledge positively impact student learning will allow states and districts to develop teacher evaluation systems that will help strengthen all aspects of teaching—from recruitment through retention.

The MET project has enrolled over 3,000 teachers from a number of school districts around the country and is gathering a variety of data, including videotaped teacher observations, student surveys, teacher surveys and supplemental student assessments, and represents a real opportunity for teachers to inform the national discussion on education reform, in order to determine which measures are most strongly correlated with high levels of student achievement. The MET project's final findings will be shared broadly at the project's conclusion in winter 2011-2012.

For more information about the MET project, please visit www.METproject.org or send an email to info@METproject.org.

Note: The inclusion of a given research protocol, tool or measurement in the MET project is not an endorsement by either the MET project or its partners of that protocol, tool or measurement. In many cases, the research instruments included in the MET project are still being tested and do not yet have verified results associated with them. Other protocols, tools and measurements similar or equivalent to those used in the MET project may exist.

In addition, selection of a given academic, non-profit or for-profit organization to participate in the MET project does not constitute an endorsement by the MET project of that organization. Other organizations may exist who do work that is similar or equivalent to the work done by the organizations participating in the MET project.