

Research to Practice Brief

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Teaching for Understanding

By Christine D. Bremer and Catherine Cobb Morocco

Introduction

Most people would agree that education should be about teaching for understanding, but fewer would say that our schools are regularly achieving this goal. While traditional lectures, exercises, and drills may help students memorize facts and formulas and get the right answers on tests, this time-honored style of teaching does not help students achieve the depth of understanding they need to understand complex ideas and apply knowledge in new settings or situations. Noted Harvard psychologist Howard Gardner, in a 1993 interview, commented that studies have shown that many students, even at the college level, “do not *understand*, in the most basic sense of that term. That is, they lack the capacity to take knowledge learned in one setting and apply it appropriately in a different setting” (Brandt, 1993, ¶ 3).

Gardner supported his statement with examples from science, mathematics, social science, and language arts, noting that even students who do well on tests cannot readily apply what they have learned. Rather, many high school and college graduates cannot answer simple questions about things they have been taught. Gardner cites the example of a 1989 video by the Private Universe Project (Nelson, 1999), taped at a Harvard graduation, in which new graduates and faculty were asked why the earth is warmer in summer than in winter. Of the 25 people responding, 22 answered incorrectly that it was because the earth was closer to the sun in the summer. Only three remembered what they had been taught about the tilt of the earth on its axis and the resulting change in the angle of the sun's rays.

In recent years, a number of researchers and education reformers have worked to define student understanding and to identify strategies that teachers can use to help students acquire the skills of understanding. The Research Institute to Accelerate Content Learning through High Support for Students with Disabilities in Grades 4-8¹ (REACH), directed by Catherine Cobb Morocco, has extended this thinking to address the particular challenges of teaching for understanding in inclusive classrooms. These classrooms include students with a range of abilities and educate students with disabilities alongside their non-disabled peers. Morocco (2001) notes that in order to implement teaching for understanding in these classrooms, teachers must learn a new and challenging style of teaching information and concepts, while at the same time addressing the widely varying needs and learning styles of students in the classroom.

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What is Understanding?

We use the words *understand* and *understanding* in varied ways. One dictionary definition of *understand* is “to achieve a grasp of the nature, significance, or explanation of something.” Definitions of *understanding* include “the capacity to apprehend general relations of particulars,” and “the power to make experience intelligible by applying concepts and categories” (Merriam-Webster Collegiate Dictionary, 2002).

The Teaching for Understanding Project at the Harvard Graduate School of Education (Blythe & Perkins, 1998) developed a definition of understanding that it calls the *performance perspective*. In this view, “understanding is a matter of being able to do a variety of thought-provoking things with a topic, such as explaining, finding evidence in examples, generalizing, applying, making analogies, and representing the topic in new ways” (p. 12).

Research Findings

Several research efforts have focused on enhancing students’ understanding through improved teaching methods. Unfortunately, few of these studies report results for students with disabilities. An extensive research effort on teaching for understanding in high school classrooms was undertaken by researchers at the Harvard Graduate School of Education from 1988 to 1995. During this time, researchers collaborated closely with four high school teachers in Boston-area schools to address the following questions:

1. What topics are worth understanding?
2. What must students understand about the topics?
3. How can we foster understanding?
4. How can we ascertain what students understand? (Wiske, 1998a, p. 3).

The researchers found that each teacher’s experience was unique, and that efforts toward teaching for understanding varied in their impact on student performance. However, this study showed the promise of teaching for understanding, as some of the teachers saw notable improvements in student performance. These findings inspired others to explore teaching for understanding with students in inclusive classrooms.

Recent research by REACH on teaching for understanding with students with disabilities includes studies involving upper elementary classrooms (Baxter, Woodward, Voorhies, & Wong, 2002; Cutter, Palincsar, & Magnusson, 2002; Ferretti, MacArthur, & Okolo, 2001; MacArthur, Ferretti, & Okolo, 2002; Palincsar, Magnusson, Collins, & Cutter, 2001; and Woodward, Monroe, & Baxter, 2001) and seventh and eighth grade middle school classrooms (Hindin, Morocco, & Aguilar, 2001; Morocco, Hindin, Mata-Aguilar, & Clark-Chiarelli, 2001; Morocco & Hindin, 2002). Morocco (2001) notes four cross-cutting findings of these studies:

1. When students with disabilities participate in instruction based on the four principles Morocco describes (see below), they show gains comparable to those of their normally achieving peers.
2. Students with disabilities may benefit from explicit instruction about ways of investigating and learning within each domain of knowledge.
3. In order to successfully implement these new ways of teaching, it is important that teachers have access to ongoing professional development.
4. The design of assessments is critically important. Proper assessment requires that teachers be well versed in the content domain being studied, and that they use assessments that reveal the depth of students’ understanding. Assessments may include methods like interviews, problem-solving tutorials, and journaling.

In each of the REACH studies, teaching for understanding included aspects of both curriculum design and delivery of instructional units. Curriculum unit design is linked to several guiding principles of instruction for teaching for understanding. These principles reflect a convergence of social, cognitive, and special education research around how understanding develops. They include the following:

1. Authentic tasks

Instruction designed around authentic tasks helps students become fully engaged in learning and developing an understanding of content. Authentic tasks have three key characteristics. First, they

engage students in constructing knowledge by integrating preexisting knowledge with new information. Activities that promote such integration include formulating questions, seeking information, and synthesizing information. Second, the tasks employed should be tailored to each content area to help students understand major ideas. Finally, the tasks should have real-life relevance and provide a basis for understanding issues and problems encountered outside of school.

2. Opportunities to build cognitive strategies

Strategies for upper elementary and middle school students range from more basic skills such as organizing materials and correcting spelling to higher level skills like editing the content of a class paper for coherence, breaking down a math problem into its elements, and writing persuasively. It is possible to teach cognitive strategies either through explicit instruction or by modeling and encouraging use of these strategies within a subject area.

3. Learning that is socially mediated

Learning and understanding are enhanced when students are able to interact constructively with one another in building and integrating new knowledge. Morocco suggests several ways that teachers can support socially mediated learning: (a) ensure shared ownership of the learning activity; (b) encourage students to make their thinking visible to each other through visual representations or dramatization; and (c) select problems and materials that allow for a range of perspectives.

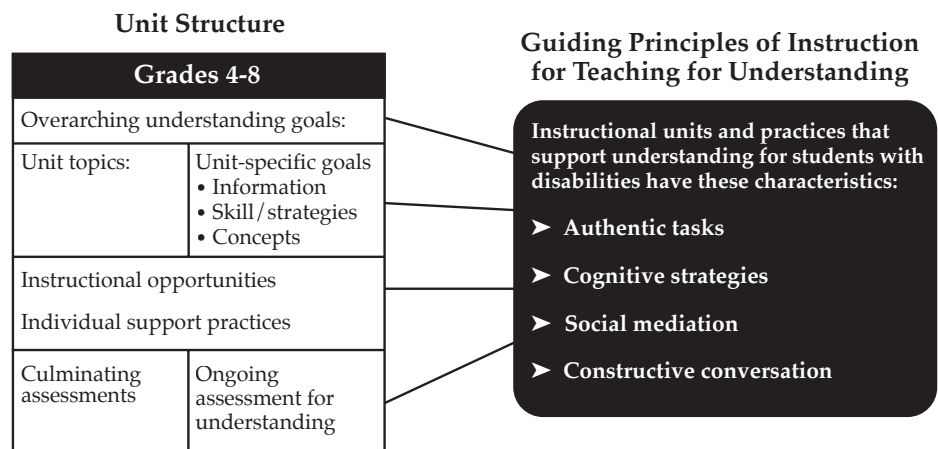
4. Engagement in constructive conversation

Students can best engage in constructive conversation when they are able to express their own ideas and questions and listen

to and integrate the perspectives of others into their own thinking. Teachers can encourage constructive conversation by maintaining a focus on a theme, allowing time for significant discussion, and responding thoughtfully to the content of students' comments in class.

Figure 1 presents a template for the design of a curriculum unit that reflects these four principles. A unit is organized around a set of *overarching goals* related to understanding particular ideas and concepts in a subject area. These goals might encompass several months of work. The unit addresses these large goals through a specific *unit topic* and *unit-specific goals* related to that topic. The unit includes a set of *instructional opportunities*—authentic tasks that encourage students to actively construct knowledge through experience. These activities engage students in learning with one another and participating in conversations that encourage them to express ideas, pose questions, and synthesize information. *Individual support practices* make the activities accessible for students with a range of abilities and individual learning needs. One frequent source of support is instruction in the ways of thinking and learning (cognitive strategies) that are important within a content domain.

Figure 1. Supporting students with disabilities in achieving understanding goals in inclusive classrooms.



Note. From "Teaching for understanding with students with disabilities: New directions for research on access to the general education curriculum," by C. C. Morocco, 2001, *Learning Disabilities Quarterly*, 24, p. 11.

Assessments take two forms (see the bottom left of Figure 1): ongoing assessments of student understanding that guide the teacher in further modifying the instruction, and a culminating assessment activity that enables the student to demonstrate his or her understanding of the major skills, strategies, and concepts emphasized in the unit. These assessments are themselves authentic tasks that require students to express their understanding of important ideas in the unit.

One example of a curriculum unit designed around this structure is a middle school social studies unit on the topic of immigration to the United States in the late 19th and early 20th centuries (MacArthur, et al., 2002). Students were asked to investigate the experience of one of two immigrant groups: Chinese or Eastern European Jews. An overarching goal of this and earlier units was to help students understand some of the causes and consequences of immigration. A unit-specific goal was to study these groups' ways of life that gave rise to their immigration and the conflicts that ensued as a result of arriving in the United States. Instructional opportunities included working together in heterogeneous groups to study and interpret information about the immigrant and nativist viewpoints on immigration (nativists were Americans who opposed immigration between 1870 and 1920, often for economic reasons). For the most part, materials that students investigated were excerpted from authentic primary sources that historians use in their investigations, including diaries, drawings, and photographs.

The designers used a pilot test of the unit to identify students' misconceptions about the topic and their difficulties with the central concepts and then revised the unit for further classroom-based research. Based on the pilot findings, the designers constructed a "migration and conflict" schema to help students organize the information they gathered about their immigrant group and to better grasp the unit's big ideas. For the migration part of the schema, students were asked to determine how the immigrants' ways of life gave impetus to the migration. For the conflict part of the schema, students compared and contrasted the immigrants' and nativists' ways of life to understand why these two groups were in competition. Students found the schema useful for comparing and contrasting differing viewpoints about immigration.

Each lesson provided teachers and students with opportunities for ongoing assessment. One culminating assessment strategy was a debate about the desirability of immigration in this period of American history. Students were placed in cooperative teams to represent the immigrant or nativist viewpoint. To provide all students with access to the debate, the unit included a planning sheet that prompted students to generate reasons on both sides of the debate and to think of supporting arguments.

Curriculum units based on this design were selected or developed for REACH investigations of inclusive instruction in mathematics, science, and language arts, as well as social studies. An essential element of this curriculum/instructional model is that teachers build individualized instruction and support for individuals and groups of learners into the unit design phase. Providing multiple instructional opportunities ensures that students can use a variety of approaches to understanding complex ideas. In addition to considering individual support practices within this unit design, teachers take into account district goals and align the unit to district and state standards.

Authentic and Inclusive Teaching and Learning

The view that active learning promotes understanding is shared by the Research Institute on Secondary Education Reform for Youth with Disabilities (RISER), which has published a set of criteria and indicators for identifying schools that are models of authentic and inclusive teaching and learning. These criteria and indicators are based on the work of Newmann, Secada, and Wehlage (1995) regarding successful school restructuring. The RISER indicators related to learning experiences can be seen as exemplars of the four research-based principles described by Morocco (Table 1).

A Framework for Teaching for Understanding

Researchers at Harvard's Teaching for Understanding Project developed a framework that complements the approaches described above (Wiske, 1998b). Within this framework, the first step is to identify *generative topics* central to the subject matter, and then to organize curriculum around those top-

Table 1. Relationship of Authentic and Inclusive Teaching and Learning to Principles of Teaching for Understanding

Indicators for Authentic and Inclusive Teaching and Learning ^a	Principles of Teaching for Understanding ^b			
	Authentic Tasks	Opportunities to Build Cognitive Strategies	Learning That is Socially Mediated	Engagement in Constructive Conversation
Students organize, synthesize, interpret, explain, or evaluate information in addressing a concept, problem, or issue.		X		
Students consider alternative solutions, strategies, perspectives, or points of view in addressing a concept, problem, or issue.		X	X	X
Students manipulate information and ideas by synthesizing, generalizing, explaining, hypothesizing, or arriving at conclusions that result in new understandings.		X		X
Students show understanding built on ideas, theories, or perspectives considered the base knowledge of an academic or professional discipline.		X		
Students use methods of inquiry, research, or communication characteristic of an academic or professional discipline.		X		
Students elaborate on their understanding, explanations, or conclusions through extended writing, product, or performance.			X	X
Instruction addresses each topic's central ideas with enough thoroughness to explore connections and relationships and to produce complex understandings.	X			
Students engage in reflective conversation with teachers and/or peers in a way that builds a shared understanding of ideas or topics.			X	X
Students address concepts, problems, or issues similar to ones they have encountered or are likely to encounter in non-school settings.	X			
Students communicate their knowledge, present a product or performance, or take some action for an audience beyond the teacher, classroom, and school building.	X		X	
Students engage in structured, experiential learning outside the school setting, including job/career shadowing, community service learning, or formal work-based learning (e.g., cooperative education, youth apprenticeship).	X			
Students make connections between knowledge and either public problems or personal experiences.	X			

^aIndicators are adapted from Research Institute on Secondary Education Reform (n.d.), Learning Experiences section.

^bPrinciples of Teaching for Understanding are those developed by Morocco (2001).

ics. Generative topics are those that are considered central or important to understanding the field; can be related to present-day experiences or events; can provide a basis for progressing to the next level of instruction or understanding; are intrinsically interesting to the students and teacher; represent recurring themes in the field; and can be approached at several levels of complexity. Examples of generative topics include:

- Literature (e.g., fantasy, humor, coming-of-age themes, multiple perspectives);
- Science (e.g., global warming, endangered species, rocketry, forensics); and
- History (e.g., exploration, revolution, use of power, impact of technology on warfare).

The second step is to develop explicit *understanding goals* that relate clearly to the ideas and questions that form the basis of a content area. Understanding goals answer the question, “What do you most want your students to understand by the end of their term or their year in your class?” (Wiske, p. 69). Explicit understanding goals are key to developing appropriate assessments of student learning. For example, one of the understanding goals for a biology unit with the generative topic “plants and animals” might be: “Students will understand how biologists distinguish between plants and animals.”

Third, students are engaged in *performances of understanding* in which they demonstrate their ability to apply their knowledge and understanding in new settings or situations. For a mathematics unit on fractions that has the understanding goal, “Students will understand U.S. standard and metric units of measurement,” a performance of understanding might include preparing a recipe using each system; creating a visual display comparing U.S. standard and metric units of measurement; and explaining to the class the advantages and disadvantages of each measurement system.

Fourth, there is *ongoing assessment* of student performances in order to measure understanding and provide the information teachers and administrators need to improve planning and instruction. Such assessments are most helpful educationally when they are frequent, use clear and public criteria related to the understanding goals, involve both students and teachers as evaluators, and result in constructive suggestions for improvement.

Conclusion

Teaching for understanding promotes in-depth learning over covering a broad range of material, and applying knowledge to real-world problems over performance on short-answer quizzes. This is most likely to occur in schools that view themselves as communities of learners. It can be time consuming, and it requires teachers to present material in nontraditional ways that engage active participation from students with a wide range of learning styles and learning abilities. It requires teachers’ commitment to understanding the challenges students face in working with intellectually demanding material and to using or designing strategies that make the material accessible to a variety of learners. Ultimately, the result is well worth the effort: Students truly learn and are able to take that learning with them and use it as they make the transition into adult life.

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Resources

ALPS Teaching for Understanding

<http://learnweb.harvard.edu/alps/tfu>

Includes detailed information on teaching for understanding, projects developed by teachers (elementary through grade eight), curriculum design tools, and opportunities to communicate with other educators.

Jasper Woodbury

<http://peabody.vanderbilt.edu/projects/funded/jasper>

Researchers at Vanderbilt University developed this mathematics program as an example of a curriculum using authentic tasks. While originally developed for upper elementary grades, the curriculum has been successfully used for high school students with disabilities.

Teaching for Understanding

<http://www.exploratorium.edu/IFI/resources/workshops/teachingforunderstanding.html>

David Perkins, co-director of Harvard's Project Zero from 1972 to 2000, explains why teaching for understanding is important and provides ideas for teachers.

WISE, the Web-based Inquiry Science Environment

<http://wise.berkeley.edu/welcome.php>

WISE projects and curricula are designed to complement school coursework and meet National Science Education Standards. Each project includes activities that are divided into inquiry steps. WISE employs cooperative learning and has been used in inclusive settings.

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