



Connecting Thought and Action in High School Science Classrooms

How experienced teachers manage the complexities of high school science classrooms is the subject of research conducted by education professors Peter Hewson and Robert Hollon. With funding from the National Science Foundation for Project DISTIL (Description and Interpretation of Science Teaching with Implications for Learning), they have studied the thoughts and teaching practices of four teachers each in the areas of biology, chemistry, and physics.

Hewson and Hollon derive teachers' conceptions of teaching science from interviews and observe their knowledge-in-action as they teach three specific topics. They will be using these data to develop case studies for use in science teacher education. In these case studies, pre-service science teachers will find a variety of professional responses to common classroom situations and different approaches to the same topic. Practicing teachers will look for their peers' solutions to problems similar to their own.

Conceptions of teaching science

Teachers initially described their conceptions of teaching science in individual interviews with trained project staff. The interviewer showed the teacher a written description of ten events, one at a time, and asked, "In your view, is there any science teaching happening? Please give reasons for your answer." One biology event is "Junior high school student in class, looking at a chart showing arterial blood as red and ve-



Teachers open and close opportunities for student learning in very different ways.

nous blood as blue, asks the teacher, "How does the blood change color?" A physics example is "College professor lecturing on Einstein's special theory of relativity to a small group of first graders."

Using a transcription of the interview, staff identified statements that defined the teacher's thoughts on the nature of science, learning and the learner, instruction and its rationale, and the nature of teaching. Statements that appeared, with variations, in more than one of the categories were identified as the teacher's themes.

A physics teacher whose nature of science theme is "science is a process that is learned by discovery" gave related statements in all four categories; for example, she described learning as "discovering, going through the processes of science" and teaching as "lending itself

to physical manipulation and to discovery learning." Many teachers echoed the theme of the importance of student involvement or engagement.

A virtue of the analysis process is that it identifies important similarities and contrasts in a natural and self-evident way. For example, even when teachers talk about the same thing, they might interpret its usefulness in very different ways. Three science teachers all advocate the use of questioning as an important part of instruction. Yet one uses it as a means of getting students tuned in and assisting a teacher-led discussion; another asks questions to provide him with feedback from the class; and the third uses questioning as a key that leads into student discussion and discovery learning.

"Each experienced science teacher's conception of teaching science can be represented by a small number of themes," Hewson reports, noting that individuals' conceptions do differ. Hollon says, "Some themes are common to many teachers, but each also has unique themes."

Knowledge-in-action

The researchers used observations and interviews to develop portraits of each teacher's knowledge-in-action, a representation of the implicit and explicit knowledge and beliefs evident in daily patterns of practice. Reflecting on practices in the interviews helped teachers and researchers make explicit some implicit aspects of knowledge-in-action.

cont. from page 1

Teaching practices were observed during three topics, selected to be important but difficult and taught by each participant. The final choices were photosynthesis, mitosis, and Mendelian genetics for biology; stoichiometry, atomic structure, and acids and bases for chemistry; and Newton's second law, energy, and electric circuits for physics.

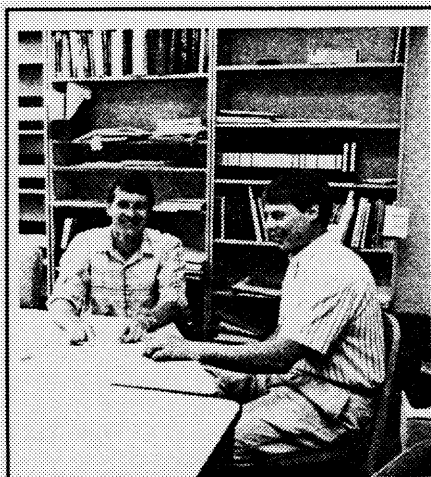
Each topic was taught over a period of about two weeks, with project observers in class throughout. Researchers interviewed each teacher at the end of each topic to explore the reasons for instructional decisions and to inquire about the basis for events judged significant by the teacher or the observer.

Teachers' knowledge-in-action revealed both commonalities and unique features. For example, in their labs three physics teachers set tasks for students that varied in specificity or structure. All three initially observed students and did not intervene; as teachers saw that interventions were necessary, they typically questioned students or made comments to coach or guide them.

The products required of students took different forms: one teacher required students to give presentations about the work they had accomplished and what they had learned; another requested detailed, personally planned lab write-ups; the third expected students to complete the textbook write-up.

Two chemistry teachers' beliefs about learning emphasized students' building on prior knowledge, reading material carefully, practicing using new ideas, and taking responsibility for learning. Both developed elaborate systems of readings, notes, and assignments that students were required to complete before each class. Both designed student tasks to reflect ways they themselves were successful as learners.

One teacher graded students' responses to



Hewson and Hollon wonder what's on science teachers' minds.

classroom questions in class; thus most students completed the tasks as scheduled. Students' answers served as prompts for minilectures that extended the topic without exploring the content of students' responses. The other teacher relied on unit test scores. Students were expected to identify their own questions and ask them during class. Students seldom completed the tasks or generated meaningful questions, frustrating the teacher's attempts to generate quality discussions.

Student learning

Although the primary focus of Project DISTIL is on teachers, the re-

searchers are also looking at students and their learning. They find evidence of learning in students' talk (dialogue, answers to questions posed by others, and their own questions) and actions (general demeanor, problem solving, and lab work).

Hewson and Hollon also find that teachers' beliefs about content, learning, and teaching influence student learning through the different structures—tasks and tools—they establish. Teachers set different tasks for their students, as illustrated in the descriptions of physics labs above. They make different conceptual and physical tools available to their students, as shown in the two chemistry teachers' systems for handling reading in classrooms.

According to Hewson, "We interpret these structures as windows of opportunity for student learning that teachers open and close, maybe implicitly, in very different ways." Thus, students experience different opportunities for learning. "We can't be sure every student learns all that a teacher provides," said Hollon, "but if there isn't any opportunity for an activity such as exploring some intriguing result, we can be pretty sure students won't learn how to do it in that class."

Case studies

The DISTIL staff are preparing a case summary for each of the teachers, integrating material from the conceptions of teaching science interview and the knowledge-in-action shown in the classroom. Integration, according to the researchers, "informs understanding of the teacher in ways that are unique to the individual."

For more information about this project, contact Hewson and Hollon at WCER, 1025 W. Johnson St., Madison, WI 53706.

On the following page, a chemistry teacher who participated in Project DISTIL shares his views on teaching, science, and the project. ■

WCER Highlights Staff

Director.....Andrew Porter
Editor.....Paul Baker
Artist.....Al Divine

Editorial Consultant
...Deborah Stewart
Administrative Contributor
...Lois O'Brien Opalewski

WCER Highlights is published four times a year by the Wisconsin Center for Education Research, School of Education, University of Wisconsin-Madison. WCER is funded through a variety of federal, state and private sources, including the U.S. Department of Education and UW-Madison. The opinions expressed in this publication do not necessarily reflect the position, policy, or endorsement of the funding agencies. Printed at 30 N. Murray St., Madison, Wisconsin. Fourth-class, bulk-rate postage is paid at UW-Madison, Madison, WI. Send changes of address to WCER, UW-Madison School of Education, 1025 West Johnson Street, Madison, Wisconsin 53706 (608) 263-4200. Include the address label from this issue.

No copyright is claimed on the contents of WCER Highlights. In reproducing articles, please use the following credit: Reprinted with permission from WCER Highlights, published by the Wisconsin Center for Education Research, UW-Madison School of Education.

Reflections, Shadows, and Events

Project DISTIL created a nice environment for me to reflect on what I am doing and why I am doing it. The researchers were perceptive and diligent. Talking at length about what I was doing helped me crystallize ideas that were previously amorphous.

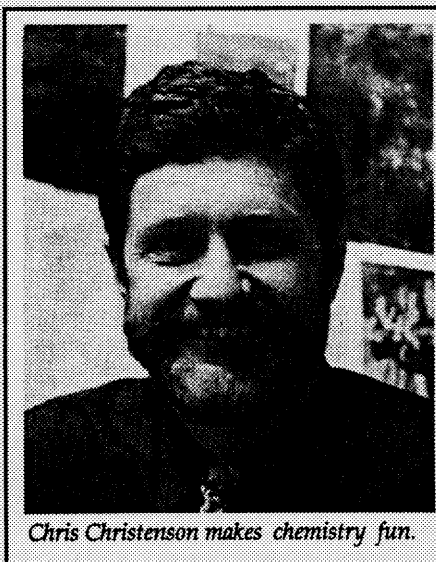
DISTIL also reinforced some concepts I've long held. I teach and treat children as I want my own children to be taught and treated. I believe that my mood sets the mood of the class, and that the way I approach the class determines the atmosphere. Because I want to enjoy the day, I consciously choose to make each class fun and positive.

I use humor in the classroom—sometimes to make a point, sometimes as a mnemonic device. A few years ago when I was in St. Louis at a "science exploration" I noticed the teachers were bright and fresh for each group as they came into the exploring room. I saw how their attitude enhanced their students' experience. For the kids, each experience is new, exciting and wonderful. Teachers need to look at it that way also.

As a science teacher, I tell my students that knowledge is uncertain and changing. We always are working with the best story at that particular time. Ideas tested and tried lead to more ideas.

Like scientists, my students have an innate drive to understand the natural world and explain it. I use their inborn curiosity to get them ready to learn. I show them something or ask them a question—anything to spark their curiosity.

But to keep them thinking, I have to keep thinking. I have always mulled over what I am doing and want to do with my teaching. Life is a Renzulli field trip for me. In a museum, on the street, at a conference, I often see things I can incorporate into my classrooms. When instructors take students on field trips,



Chris Christenson makes chemistry fun.

they can't predict exactly what each student will learn. Some will go far beyond expectations; some fall below. But all will learn something.

Seeing and doing science

I challenge my students by providing 65 laboratory experiences in my classroom. I have some clear, measurable objectives that all students must meet. I also expect my students to learn some very unpredictable things about science or life or living.

My inspiration for lab teaching comes from a Chinese proverb: "Explain to me, I learn a little. Show me, I learn more. Let me do, I learn."

About the author

Chris Christenson teaches chemistry in Oregon, Wisconsin. A graduate of the UW—Madison, he worked for several years as an analytical chemist. He received his master's degree from the UW—Whitewater and has been a teacher for 18 years. Christenson has published articles in *The Science Teacher*, *Chem 13 News*, and *The Crucible*. He instituted a lecture/lab format at Oregon, giving chemistry students equal time in lecture and in laboratory.

He is implementing outcome-based education in his classroom, and his goal is to have ten meaningful real-world outcomes measured by authentic assessments.

During the labs the students are very active in their learning. They say: "Wow! How come? That's neat! Why is...? What if...? Did you notice...? Look at this! What makes it... How about...?" They become interested, curious, and involved.

I design my labs to help my students reinforce a concept, have fun with chemistry, make a calculation, collect and interpret data.

The biggest deficiency of most labs I've seen is that they don't do enough science. Students need to choose a problem, find an original solution, test that solution, and defend it. I'm working on this sort of instruction and I'm planning more of these types of experiences for the future.

I designed and implemented a summer course, for example, called Biochemistry for Kids. Intended for third- through fifth-graders, the course involves four weeks of hands-on experiences. It has become very popular. Young students work with chemicals and plants and manipulate apparatus. They particularly like Bunsen burners! The course goals are to be safe, enjoy science, and have fun.

Why teach science?

Jean-Paul Sartre said, "To do is to be." Teaching makes me feel whole as a person. I am good at it, and teaching makes me feel productive and worthwhile. Socrates said, "To be is to do." I think both were right.

Journalist Eric Severaid once commented that he couldn't remember learning anything in high school, but it was a wonderful experience that shaped his life. This is pretty much the way I view teaching.

If a student leaves my classroom and eventually makes a life-enhancing decision based on logic and reason and some classroom experience, I feel that I have been successful. ☐

Learning is Constructing:

Educators are changing the way they teach mathematics. No longer is it good enough to teach math as sequential content, and isolated from reality. Rather, students are beginning to learn mathematics as an activity. They solve problems from the real world with mathematical tools and concepts. They learn to use mathematics as a language to represent the problems they find in their worlds.

Thomas Romberg is happy to see this shift in emphasis, because he led the campaign to initiate it. He chaired the National Council of Teachers of Mathematics Commission that developed the *Curriculum and Evaluation Standards for School Mathematics*. Published in 1989, the *Standards* have become the focal point for the national reform movement in mathematics. They detail the changes needed if American mathematics education is to be reformed in the coming decade. Romberg and the Commission members saw that the school mathematics curriculum had become outdated.

"Most American students do not have an opportunity to become mathematically literate, yet our culture is rapidly becoming mathematicized," says Romberg, Sears Roebuck Foundation-Bascom Professor in Education. "If our students are to be productive workers and reasonably responsible citizens in the next century, reform is necessary."

The National Science Foundation is funding a number of middle school curriculum development projects in math classrooms across the country. "Mathematics in Context," which Romberg directs, is one of those projects. Using this approach, mathematics teachers are beginning to abandon rote arithmetic drills and pencil-and-paper worksheets. Instead, some students work in groups, define problems, and discuss problem-solving strategies. They work on real-world problems, formulate arguments based on their findings, and critique the arguments of their peers.

The "Mathematics in Context" approach grows out of the belief that the best way for students to make sense of the phenomena in the world is by mathematizing problems. Hands-on activities are frequently part of this mathematizing process. Gathering information and building arguments help students construct an integrated set of ideas.

The challenge of change

A fundamental, nationwide change in mathematics education will not come easily. In fact, Romberg compares the magnitude of the task to the recent restructuring of corporate giants such as Ford and General Motors.

School districts' tight budgets mean few resources are available. "The rhetoric is wonderful," says

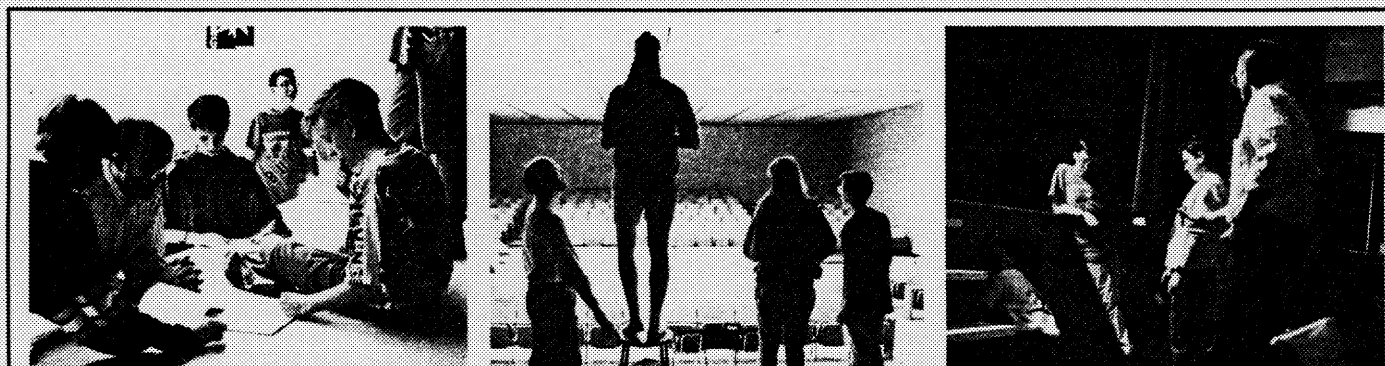
Romberg, "but materials need to be retooled and teachers retrained. You can't make structural changes and staff changes without resources."

Despite the challenges, nearly 200 school districts have asked to try out Mathematics in Context materials. "Teachers in many states have become empowered, and they are asking for different materials and tests," says Romberg. "But it will go slowly. And there will be some illusory change."

When *A Nation at Risk* suggested that our educational system wasn't adequately preparing children to participate in the nation's work force, educators began looking to other countries for models to study. They found that the British and the Australians were already reforming. They were impressed by the work of the late Dutch educator and mathematician Hans Freudenthal.

Freudenthal advocated grounding the curriculum in the real world. That meant getting away from repetitive drills and from working on problems "in a vacuum." Freudenthal showed the benefits of making physical, three-dimensional reality both the source of, and the area for the application of, mathematical concepts and structures; thus the terms "realistic math" or "Mathematics in Context."

These terms refer to learning as constructing, with a concrete orientation, and learning as a social activity, through interactive instruction.



Middle school students use the school auditorium as a laboratory. Standing on the stage, they try to predict where the light from a bright lamp will shine, when overhead lights are dimmed, and where shadows will fall. Working in pairs, they sketch various line-of-sight possibilities, with guidance from their teacher. Then they crouch down where they predicted shadows will fall. When lights are dimmed, a student shines a spotlight into the darkened auditorium. Students who remain hidden in shadow have correctly predicted the line-of-sight limitations of the student holding the spotlight.

Mathematics in Context

Teaching methods based on "realistic math" give students at least the beginning notions of what it means to build mathematical solutions to real problems, says Romberg. To develop materials for students in the United States, Romberg set up a series of meetings and research projects with a team from the Freudenthal Institute (photo at right).

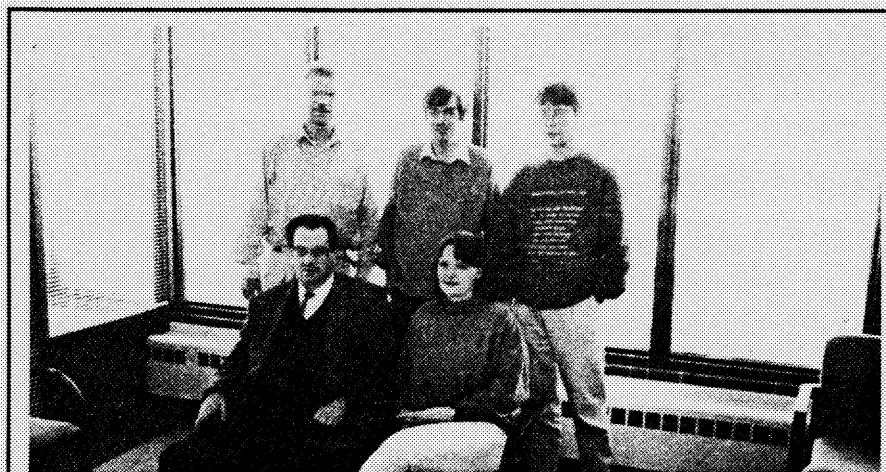
Named after its founder, the Institute is located in Utrecht, the Netherlands. The cooperative relationship led to an ongoing program in which one or more educators from the Institute is always in residence at WCER during the development of the "Mathematics in Context" classroom materials.

As a result, researchers on both sides of the Atlantic are observing and learning from each other's educational systems. American teachers, for example, spend a relatively large amount of time standing in front of a quiet classroom talking at the kids. But in the Netherlands, kids discuss their problems in pairs or work in groups. "Our classrooms tend to be very noisy," says Jan de Lange, who now heads the Freudenthal Institute.

In realistic math exercises, students work together in groups, discuss strategies and solutions, ask questions, examine consequences and alternatives, and reflect on the problem-solving process and how it relates to prior problems.

The goal of "realistic math" is to show students the logic underlying the sequence of steps they perform, says de Lange, rather than presenting exercises as a collection of arbitrarily sequenced steps that in some mystical fashion lead to correct results.

Teachers who have worked with realistic materials sing their praises. But they admit that it's difficult to adapt their teaching styles to fit the realistic materials. It took 20 years for teachers in the Netherlands to adapt completely, says de Lange. During these 20 years, researchers visited classrooms and fine-tuned the curriculum. "The moment of truth was to see whether the ideas would work



Some of the Freudenthal Institute researchers at WCER include (front, from left): Anton Roodhardt, Els Feijs. Rear: Jan de Lange, Koeno Gravemeijer, and Martin van Reeuzwijk.

outside the Netherlands," says de Lange. And a recent project at a high school in Wisconsin shows that they do.

Technology changes focus

Technology is changing the face of mathematics instruction, Romberg points out. It's no longer necessary or useful to devote large portions of instructional time to having students perform routine computations by hand. "Mathematics in Context" assumes that calculators and computers are part of the students' problem-solving tool kit.

"Some drills are still important, and some skills still need to be committed to memory, but some things no longer need to be memorized," Romberg says. "Calculators and computers allow students to spend more time setting up the problem and the relationships, and less time doing rote calculations. Students can talk about what the ideas are, rather than spending so much time doing the routines."

Doing away with repetitive drills means that classrooms can become places where kids explore interesting problems using important mathematical ideas. Students learn effectively as they record measurements of real objects, describe properties using statistics, and explore the properties of a

function by examining its graph.

In a geometry unit, a teacher engages the students in sighting and projecting, locating and orienting, reasoning spatially, drawing and constructing, measuring and calculating. One exercise, for example, requires students to figure line-of-sight angles (photos on page 4).

"Kids show initiative when they're encouraged to construct and produce their own ideas," says Freudenthal Institute researcher Leen Streesland. "We encourage students to discuss their problem-solving strategies and to verify their own thinking, rather than focusing on whether they 'have the right answer.'" Such exercises, over time, enable students to depend less on the teacher to tell them whether they are right or wrong. The students find opportunities to develop confidence in using mathematics.

"The classroom dialog extends beyond answers to such matters as how those answers are reached," Romberg says. "Students explore alternate solution methods, and find possible extensions of problems. They're encouraged to pose questions that require elaboration and allow for extensions of that dialogue."

For more information, contact Romberg at WCER, 1025 W. Johnson St., Madison, WI 53706. ☐

New and Renewing Projects

Improving after-school care

The study of after-school child care is still in its infancy, but education professor Deborah Vandell is helping bring it to maturity.

A project funded by the National Institute of Child Health and Human Development (NICHD) will, over a five-year period, study 200 children in 30 various after-school programs across the country.

Vandell seeks to determine the characteristics of these programs and the associations between quality of care and child outcomes over time. How do after-school experiences, the study asks, affect children's social, emotional, and academic development?

Vandell's project complements two of her other studies of early child care. One examines how non-parental child care affects children's cooperation with adults and compliance with their wishes. Another examines the effects of after-school care on the lives of low-income children.

The new study is one of the first large-scale empirical studies of the varying kinds of after-school programs and how they affect children's development.

Of the 30 programs chosen for the multisite study, some are non-profit, some are for-profit. Some have an academic focus, others have an enrichment focus, and still others have a recreational focus. They reflect not only diversity in curriculum focus but diversity in quality as well.

Vandell is one of the first to try to develop a working definition of "high-quality" after-school care. Her project is also one of the first to link variables of after-school care with children's observed behavior. For example, it will determine how group size is important across different ages.

Children tend to drop out of formal after-school programs during fourth and fifth grade. Vandell wants to determine why, and what

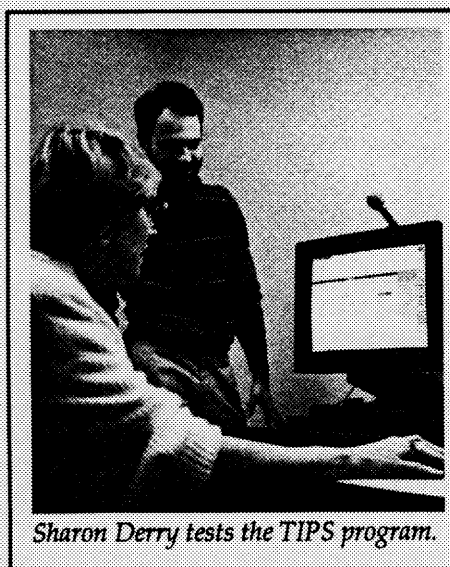
that trend could predict about these children's later development.

"We're also testing our hypothesis about children who experience early entry into latchkey (unsupervised) care, and who continue there," Vandell says. "We believe they report higher rates of loneliness, depression, and behavior problems than children who continue in high-quality, formal after-school programs."

For more information, contact Vandell at WCER, 1025 W. Johnson St., Madison, WI 53706. ☐

Electronic tutor helps young and adult students

A sailor on board a submarine finishes the day's work and has some leisure time. He sits down at a computer and turns it on. Soon, he is constructing interlinking tree-shaped structures on the computer screen.



Sharon Derry tests the TIPS program.

The sailor is not plotting a military maneuver, though. He is sharpening analytical skills that will be applied to a variety of everyday problems, ranging from electronics to automotive mechanics to construction.

He's using TIPS (Tutoring in Problem Solving), being developed by Sharon Derry and colleagues. An education professor at the University

of Wisconsin-Madison, Derry designed TIPS to help users conceptualize mathematics word problems. TIPS helps students assemble the basic building blocks of the word problems, then guides students as they attempt to combine multiple problem-solving routines into more complex problem structures.

TIPS gives students practice in "metacognitive knowledge," or knowledge about the thinking process itself, and how it is controlled. Users' abstract reasoning processes become visible and manipulable on the computer screen as they construct interlinking "problem tree" structures. These "trees" show the relationships among parts of a problem and illustrate a solution path. As students work through the steps of the problem, TIPS traces their performance. It also recognizes and interprets their patterns of errors.

Students command the computer to play back their problem-solving performances. Then they examine and discuss the playbacks, stopping and replaying segments of the routine when necessary.

Derry and her associates compare the performance of different groups of adults and school students as they work individually or in pairs on math word problems. After students complete the examples, they critique their own strategies or those of their peers. Even though the arithmetic itself is not complicated, sorting out the problem into logical steps may be.

Funded by a grant from the Office of the Chief of Naval Research, Manpower, Personnel, and Training R&D Program, TIPS is designed to help its users meld together the multiple concepts and skills acquired in basic training. It helps users avoid overlooking important steps, becoming bogged down in confusion, or pursuing wild goose chases. TIPS will help students to better learn from examples, even in the absence of tutorial prompts.

For more information, contact Derry at WCER, 1025 W. Johnson St., Madison, WI 53706. ☐

Connecting Home and School Cultures

Johnny can't seem to sit still and do his own work in class. He keeps going around to other students' desks and "helping" them with their assignments. Although Johnny does good work, his teacher is irritated because he just won't work alone.

Is Johnny's behavior a problem? Or does he show a strength that could be tapped? It can be a strength, according to education professors Marianne Bloch and Robert Tabachnick. Their just-concluded study, funded by the Spencer Foundation, shows that children bring many strengths to the classroom that go unrecognized or, worse, are considered a liability.

Bloch and Tabachnick explain that teachers can more readily recognize students' "hidden" strengths by understanding students' families, language, and cultural backgrounds better. This understanding doesn't come naturally, Bloch says, when teachers are products of the Euro-American culture and students are products of minority cultures.

Improved communication with parents is part of the solution. Until now, little research has examined factors affecting the quantity and quality of communications between home and school. And few studies have investigated teachers' attitudes toward different ways to communicate with parents and involve them in their children's schooling.

"We're trying to understand the interaction of home, school, language, and ethnic cultures," says Tabachnick.

In one school studied, for example, researchers found that Hmong students learn at home how to tell elaborate stories. But teachers often don't recognize this ability. "Teachers need to redefine their notions of competencies," says Tabachnick. "Kids learn many skills at home that could be recognized and tapped, making it easier for the kids to succeed in school."



Education professors Robert Tabachnick and Marianne Bloch are finding ways to improve students' success in the classroom by better understanding the cultures operating at home.

The Spencer study took place in three schools in a Midwestern city, where the researchers observed students from Hmong, African-American, and Latino-American families. Bloch and Tabachnick found that these cultures emphasize, among other things, reciprocal relationships among the family members. Johnny demonstrated this "sharing" behavior as he helped his classmates. Elements of such "sharing" cultures go against the grain of the values of individuality and competitiveness often found in classrooms.

"The emphasis on collective experience, sharing, and group honor suggests new patterns for schooling," Bloch says. "Our study identifies a number of possible patterns that cut across cultural groups and that might have important implications for school instruction."

Is the student "ready"?

Bloch and Tabachnick believe that a teacher's estimation of children's strengths and readiness for school has as much to do with the teacher's knowledge of children's cultural backgrounds as with the students' in-school abilities, achievements and characteristics. Students' readiness should not be conceived of as an "objective" entity represented by scores, Bloch says.

Instead, the notion of readiness is a socially constructed concept created by communities, teachers, and parents. Behavior that children use with competence and success in one environment may be less successful in another environment with different cultural characteristics and requirements.

The Spencer study showed that different schools respond to kids' ethnic differences in different ways. Some teachers knew they needed to understand kids' family backgrounds better, while others didn't. Some teachers didn't feel a need to encourage parent interactions in any ways other than the usual parent-teacher conferences, while others did.

Teachers have limited time for reaching out to families. But some make that extra effort and they find their efforts rewarded with greater student success. "Family contact is very important," says Bloch. "We need to facilitate a wider variety of interactions, such as holding parent-teacher conferences off site, at neighborhood centers, and developing joint projects."

"An important issue that comes from our data," says Bloch, "is that the teachers, though typically very well-intentioned, still had too little knowledge of their children's back-

cont. from page 7

grounds to understand all of the different ways in which children's competencies could be utilized in the classroom."

A self-fulfilling prophecy

Teachers tend to belong to one of two camps. Some believe that home and school are separate educational institutions with different roles, and they tend not to cultivate relationships with students' families. Other teachers try to help children learn by relating the home and school settings, and they favor efforts to increase parent involvement and communication. Bloch and Tabachnick encourage and support the latter group. "We need to make special efforts to involve low-income and minority parents with schools," says Tabachnick.



We need to recognize childrens' cultural skills that can contribute to school success.

But there are few sources of information for how to do this. "We need more detailed case studies of integrated multicultural schools," Tabachnick says. More in-depth case studies of specific integration efforts,

and of multicultural school contexts, should provide valuable information for other school systems in the country.

"Our data make it clear that 'cultural compatibility' of school and home is difficult to achieve in a genuinely multicultural context," says Tabachnick. "First we need to design ways to create opportunities for teachers and parents to understand more about each other and the contexts in which they live and work. We need to understand the variety of cultural differences we find, including the variation within each culture group, and we need to recognize students' cultural skills that can contribute to school success. Then we can try to develop environments that recognize and use the cultural competencies of all children."

For more information, write to the researchers at WCER, 1025 W. Johnson St., Madison, WI 53706. ■

Wisconsin Center for Education Research
School of Education
University of Wisconsin-Madison
1025 West Johnson Street
Madison, WI 53706

Address correction requested

Project DISTIL, first results:
see page 1.

DISTIL in the classroom:
see page 3.

Maths in Context: see
page 4.

New and renewing projects:
see page 6.

Making the most of diversity:
see page 7.

Nonprofit Organization

U.S. POSTAGE

PAID

Madison, Wisconsin
Permit No. 1622