Curriculum Update

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Using Real-Life Problems to Make Real-World Connections

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by Karen Rasmussen

As soon as the 8th grade students in Harriet Carlson's science class enter their classroom at Indian Trail Junior High School in Addison, Illinois, they realize it won't be a typical school day. A video showing a prom night automobile accident plays at the front of the room and on each student's desk is a folder containing accident reports and a name card identifying them as "Inspector." As the students take their seats, Carlson steps to the front of the room and addresses them as investigators for the state attorney's office. A drunk driving accident occurred the previous night, and the students are in charge of the investigation. They have five days to review existing evidence and investigate further. Then they must recommend an indictment to the state attorney's office and notify the press of their conclusions.

This lesson is part of the Inspector Red Ribbon Unit, a problem-based learning (PBL) project that involves all of the 8th graders at the school and 15 teachers from various content areas, including English, math, physical education, science and social studies. Teachers at the school are enthusiastic about the PBL unit because it allows students to develop and exercise problem-solving skills as they identify the actions that should be taken during the mock investigation. The teacher's role throughout the unit is to guide students as they search for solutions to this real-world problem. During the next five days, students will work individually and in groups to interview witnesses, visit and assess the scene of the accident, review medical reports, and make their recommendations in a press conference.

Carlson and two of her colleagues, a math and a social studies teacher, created the unti after receiving PBL training from the Center for Problem-Based Learning at the Illinois Mathematics and Science Academy in Aurora, Ill. Developing the Inspector Red Ribbon Unit has proven to be "the most exciting and exhausting project" she's ever been involved in, says Carlson, a teacher of 22 years. "This was a shot in the arm for a lot of teachers. For experienced teachers, the project was something new and different. For beginning teachers, the unit gave them an approach to add to their teaching methods," states Carlson.

Ninety percent of the material covered in each subject over the course of the project is part of the 8th grade curriculum, according to Carlson. During the unit, students work on the case in each class. They analyze accident reports, learn how to differentiate between fact and opinion, and write a report to meet language arts requirements. In science, students perform lab experiments to determine blood alcohol levels and impaired reaction time, while in physical education they administer field sobriety tests to each other.

For math class, students visit the school athletic field where teachers, working with the Addison police department, have spray painted an intersection and positioned two cars as if they had been in an accident. Aluminum foil affixed to the teachers' cars indicates the point of impact. In teams, students examine the evidence and measure skid marks. Later they develop computer spreadsheets and calculate the speed of the cars based on what they observed at the scene.

During the mock press conference, each student reports what charges they recommend be brought against the driver who caused the accident based on the evidence he has gathered during the past five days. Students receive a memo from a fictional police captain stating whether their findings were appropriate for the police to act on or if more information is needed. Other assessments occur in each class. Carlson's students, for example, conduct three labs on which they are graded.

The best measure of the unit's success can be found in the students' excitement. Although student conversations in the hall and cafeteria usually focus on what occurs outside of the classroom, Carlson reports that with this project "you hear, This witness said she had six drinks, but another said she had less.'"

Beyond the Basics

The activities included in the Inspector Red Ribbon Unit at Indian Trail Junior High School are examples of the kind of learning experiences students receive through problem-based learning. PBL activities allow students to assume roles of real-world professionals, experts say. The problems also help students see the connections between various content areas.

PBL allows students to study interdisciplinary material that is organized around a common goal, says Brad Martin, a 5th grade teacher at LaEntrada School in Menlo Park, Calif. What's more, he contends, "the benefit of PBL is that it meets curriculum requirements and allows students to go beyond required learning." Martin adds that for PBL to be successful, "the teacher needs to accept that he or she has less control and must act as a coach or mentor." Martin has been using PBL in his class for four years but says he's been working toward a PBL-approach throughout his 30-year career.

To study anatomy, local history, cultures, and religion, Martin took his class to a nearby building site where they "discovered" a plastic skeleton. Artifacts such as a woven basket, stones, and shells were found near the remains. After discussion, the students decided they should call the police. Martin had made arrangements with the police department, so the dispatcher was prepared for the students' phone call. A doctor volunteered to act as a coroner and prepared a mock report for the class.

The class was charged with deciding how to bury the skeleton, and they determined that they needed to learn about religious and cultural burial customs before making that decision. The student invited a rabbi and priest to speak to them and searched the Internet in teams for information about cultures and religions.

Teachers using PBL must discover how to set parameters for a project without dampening the students' enthusiasm. "My biggest challenge is how to turn the kids *off* to the problem. At some point, you must shut it down, but they want to keep going and engage further. I have students who are now in the 8th grade coming to me to discuss problems we worked on three years ago," says Martin.

Community Connections

At its best, PBL helps students understand how they can use what they learn in school outside the classroom. Teachers at Urbana East Elementary School in Urbana, Ohio, for example, channel their students' enthusiasm into improving the community while also helping them learn how to communicate with various audiences.

When students and teachers noticed that graffiti and gang activity were becoming prevalent in their town, Kathy Norviel, a 5th/6th grade teacher and Joanne Petty, a 4th/5th grade teacher, decided to take advantage of PBL training they had received through Ohio SchoolNet. They asked their classes, How can we improve the image of Urbana?

Planned originally for a four- to six-week period, their project has grown into a yearlong activity. "We thought we could get in and out of the problem, but it has grown as the Urbana

business community has become more involved," says Norviel.

The teachers introduced the project by asking students to define "community." After a brainstorming session, students wrote acrostic poems using the letters of Urbana. "By writing the poem, the students were able to identify and present their perceptions of their hometown," explains Norviel.

As a large group, the students created a list of interview questions for each student to ask three people: two who lived in Urbana and one who did not. Questions included, What do you really like about the community? What do you dislike about the community? What could improve the city park?

After completing the interviews, the students developed graphs and presented their findings in groups as either a multimedia presentation, a poster, or a brochure, or a video. Members of the Urbana business community evaluated the presentations using a rubric developed by the students and teachers. At the request of the business leaders, students are creating a community Internet Web site and are offering to link local businesses' home pages to the site.

"The kids at our school are used to working in cooperative groups, doing projects, and using rubrics, so PBL is a natural progression for everyone involved," explains Norviel. The project includes aspects of the curriculum—such as making graphs and spreadsheets and learning about civics—that Norviel and Petty would have covered in class using other teaching methods, but PBL "has made what the students learn more meaningful for them," Norviel maintains. "Students are showing interest in the community and giving something back to it by highlighting the positive aspects of Urbana."

Learning Outside the Classroom

Rick McKelvey agrees that PBL can help students make connections between school subjects and the world outside of school. For that reason, he's based his 12th grade geoscience class entirely on ill-structured problems, teaching six PBL units during the school year. Each unit lasts six weeks. "We want to tie together the students' high school experiences in each subject and teach the kids that science happens outside of the classroom" says McKelvey, who teaches at Cary Grove High School in Cary, Ill.

For one unit, students receive a letter stating that a volcano in Yellowstone Park is showing signs of activity. If it erupts, the middle third of the United States could be wiped out. In response, students work in groups to study volcanoes, determine the probability that such an event would occur, and describe the effect a major natural disaster would have on jobs and politics in the region. Rather than invite speakers to the class, McKelvey encourages his students to locate information on the Internet.

Students prepare a final paper for this unit, but may present oral reports for the other units. Their suggestions range from drilling into the volcano to relieve the pressure and developing evacuation plans to not informing the public because, as students reason, the volcano is unlikely to erupt, there is no way to predict or prevent an eruption, and widespread panic would lower property values and scare industry away from the area. None of the suggestions are right or wrong, says McKelvey, but each suggestion must be supported by student research.

Tying It All Together

Experts point out that virtually any lesson objective can be taught through a PBL approach. For example, Gerri Appleberry, a 10th grade geometry teacher at Dumas High School in Dumas, Ark., asked students to take on the roles of marketing representatives and tie designers for a problem based on neckties. "PBL doesn't replace what you normally teach," says Appleberry, the material is just taught in a different way. The tie project meets state standards in basic math, geometry, and statistics.

Appleberry distributes PBL guidelines to her students and shows them ties discarded from her husband's closet. "They laugh at the ties because they are too short or too narrow by today's fashion standards," says Appleberry. Students work in groups organized around the learning issues—the missing pieces—of the problem, such as What are the most popular colors? What are the most popular patterns? Who is the target audience?

PBL stimulates students to creatively seek answers, Appleberry has found. "PBL trains students to find places other than the encyclopedia to find information. One student called Dillard's, the local department store, to ask a salesperson what kinds of ties were selling," she explains.

For the final project, students create a tie and an accompanying advertisement, which are judged during a tie fair in the school's auditorium. Judges, who don't know anything about PBL, receive guidelines so that it's not the prettiest tie that wins, but the one that shows a student's understanding of geometric and spatial properties. The advertising copy that students write is expected to show an analysis of marketing statistics and must convince the judges that the tie will improve corporate profits through increased sales.

Students receive the equivalent of a test grade for the project, which concerns some students, Appleberry observes. "A lot of top-notch students feel threatened by PBL because they know they are good at taking tests but aren't sure they'll get a good grade this way. Students that some consider low achievers get into PBL; they get excited, have a game plan, and think," she says.

For students and teachers alike, PBL can be an adventure, Appleberry adds. "PBL allows students to learn by discovery, not by listening to the teacher in the front of the class saying this is what symmetry is.' It teaches students life skills."

Association for Supervision and Curriculum Development (ASCD)
1703 N. Beauregard Street, Alexandria, VA 22311 USA • 1-800-933-2723 • 1-703-578-9600