Chapter 3

Classroom Practice: Problem-Based Language Learning

Joy Egbert and Leslie Huff

Focus

A major foreign manufacturer wants to build a new plant near an impoverished rural community in your region. The area is known for its natural beauty. Supporters of the plant claim that the jobs it will bring to the local people will make a big difference in their lifestyles and that the taxes and fees the plant pays will improve their health and education opportunities. Opponents claim that pollution from the plant will spoil the surroundings and cause more health problems and that the low-paying jobs will not raise the standard of living in the area. Supporters and opponents have scheduled separate meetings for the same night later this week.

You are concerned and want to get all the facts. Which meeting will you attend? Why? Use the Internet, interviews of local experts, newspaper articles and editorials, and any other resources you can find to solve both your own problem and the problem that this community faces.

This scenario depicts a problem-solving situation that occurs regularly around the world. People everywhere are concerned about jobs, health, and opportunity. However, without good reasoning and problem-solving and inquiry skills, many learners who may find themselves in similar situations will not be able to make effective decisions and change their lives for the better. Language learners need the language, thinking skills, reasoning strategies, and tools to address such real-world problems. Gordon (1998) notes,

> whether it's a relatively simple matter of deciding what to eat for breakfast or a more complex one such as figuring out how to reduce pollution in one's community, in life we make decisions and do things that have concrete results. (p. 391)

This chapter describes the problem-solving process and problem-based language learning (PBLL) and suggests how technology can be used to learn about and support this instructional approach.

Background

Problem solving is a process in which learners apply critical and creative thinking skills to a problem. The product of this process is a decision. Learners typically face two types of problems. The first type is *close-ended* problems to which there is a "correct" solution. Most students readily use a set process to find the solution to close-ended problems. The other type is *open-ended* or ill-structured problems. These problems, like the one in this chapter's Focus section, may have more than one solution and no "correct" answer. Open-ended problems require students to apply a variety of strategies and knowledge to making a decision. They also require a great amount of language and interaction to come to a logical solution.

With the current focus on 21st-century skills, research is being conducted in every area to look at the problem-solving process and determine how to produce more efficient and effective problem solvers. To date, research has determined that

1. problem-solving can depend on the context, the participants, and the stakeholders
2. students retain better after problem solving
3. the use of technology in problem-based learning (PBL) increases learning gains (Stites, 1998)

The problem-solving literature points out that both knowledge of the problem content and problem-solving skills are necessary for making effective decisions (Abdullah, 1998), and language is central to both learning and using those skills and knowledge. However, individual differences among students may impact their success. For example, students from some cultures will not be familiar with this kind of learning, and others may not have the language to work with it. According to the literature, the bias of limited or different experience can make it hard to understand all sides of a problem. Teachers must consider these challenges in teaching and supporting student problem solving.

To be successful in a PBLL environment, students need to have skills that enable them to reach the goals of the lesson. Some of these skills include the ability to synthesize information, work cooperatively (Larsson, 2001; M. Peterson, n.d.), compare and contrast data, prioritize, and use language to accomplish these goals. These skills can be difficult to teach because practice is a key factor in the ability to use them. However, certain strategies can be used to teach these essential skills and help students develop them effectively.

D*irect instruction* is one way to introduce skills, language, and the importance of using problem-solving skills effectively. Direct instruction consists of explicit instruction and demonstration, which increase the students' awareness of the skills so that they become the focus of thought. Didactic questioning is

a valuable method of determining and assessing why and how certain skills can be used to achieve goals in the PBLL environment.

I*ndirect instruction* provides a means through which students can practice and develop their problem-solving skills; students' skills progress as they use them to complete different tasks. Concept mapping is one way to increase students' abilities to synthesize materials. For example, after students have found individual sources for researching the impact of manufacturing plants on the environment, they can come together in a small group to synthesize their findings in a concept map. Comparing and contrasting, prioritizing, and working cooperatively are all skills that can be developed though small-group reflective discussions. For example, small groups can read a short scenario similar to that used in the Focus section of this chapter and then come to a consensus on the problems they found in the text and decide which are the most important. T*hink-pair-share* (Ledlow, 2001) is another useful way of consciously thinking about strategies and how they can be applied to solving problems. In think-pair-share activities, students have think time to reflect on their own ideas, followed by collaboration with a partner and then sharing with the larger team or the whole class.

S*elf-directed learning* is another important aspect of learning that must be developed in order for problem-based language instruction to be successful. Students must lessen their need for structured study and learn how to recognize their language learning needs and how to satisfy them effectively (Ngeow & Kong, 2001; Samford University, 2006). Developing effective groups to accomplish tasks can be one strategy for increasing student independence in learning. E*ffective* in this case means that students can make "optimal use of their time and resources while working in groups. Functioning effectively in groups involves knowing how to organize the work, distribute responsibility, break up complex tasks, and provide useful feedback on work that is done" (Ngeow & Kong, 2001, n.p.). By allowing students to scaffold each other and rely less on teacher support, students have more power in the learning process and more opportunities to learn both language and problem-solving skills.

The benefits of PBLL make it worth facing the challenges. Using problems as a basis for language and content learning at all levels means that students can become more engaged in their learning, which can lead to gains in language learning and increased abilities for solving social problems (Elias & Tobias, 1996). As important, in learning language through problems, students better understand concepts, learn and practice skills that are necessary in their lives, and become independent and self-directed learners and thinkers outside of classrooms. In addition, students can develop better language skills by working on problems that require a high level of social interaction (Dooly, 2005). These social interactions in the language classroom can lead to some of the optimal conditions for learning expressed in chapter 1 of this volume.

Throughout the literature, the following steps in problem solving are often presented:

1. Define the problem: Think about what problem needs to be solved.
2. Identify options: Think about the things you can do about the problem.
3. Identify the best solution: Look at all the options from Step 2 and decide which one(s) would work best.
4. Plan how to achieve the best solution: Once you have picked your option(s), you need to plan how you will carry it out.
5. Evaluate results: Once you have carried out your plan, you need to decide if it worked the way you wanted it to and how much was accomplished. (Ohio Literacy Resource Center, 2006)

Teachers can demonstrate, model, and teach problem-solving strategies directly or incorporate them implicitly into tasks. The most important aspect of this instruction is the process, including, in part, examining cultural, emotional, intellectual, and other differences that impact the process.

Examples and Discussion

As discussed in chapter 1, the focus of technology use should be the learning opportunities that it presents. A variety of tools can support aspects of the problem-solving process: computer-aided design software, advanced expert systems that try to reproduce expert thinking processes, semantic mapping software such as Inspiration (2006), and so on. Even a word processor, a database, and spreadsheet software can help students organize and present data to be used in decision making. Throughout this process, learners work with a variety of language forms, skills, and content that are authentic to the task. Whichever tool is used, teachers must design instruction carefully to make sure that it contains an appropriate focus on both language and thinking skills. This section describes some useful tools for PBLL and then presents sample student activities.

Sample PBLL Tools

- *WebQuests*—A WebQuest (Dodge, n.d.-b) is a specifically formatted Web-based activity. Although few WebQuests are currently available for language learners—particularly at lower proficiency levels—there are advantages to creating and using WebQuests as problem-solving and language learning tools at all levels. For example, the WebQuest format includes preselected Web

resources that can be differentiated by student level, collaboration and social interaction are required, and students have a variety of choices in ways to present their language-based solutions.

- *ThinkQuests*—Along the same lines as WebQuests, students can solve problems with their teams by building a ThinkQuest (Oracle Education Foundation, n.d.-a) or participating in a Web Inquiry Project (Molebash, n.d.).
- *TourMaker*—Tramline has developed field-trip generator software called TourMaker (n.d.), which is inexpensive and helps the user create interesting excursions. The problem-solving/creativity/critical thinking exercises require language that is part of many curricula. Ready-made Virtual Field Trips are linked from the Tramline site.
- *Your Sky* (*Walker, n.d.*) *and Water on the Web* (WOW, 2004)—These sites allow learners to explore problems presented by natural phenomena with minimal science equipment. When working with raw data, students have to draw their own conclusions based on evidence. Students develop important problem-solving skills while using authentic, content-based language.
- *Filamentality*—Through fill-in-the-blank activities, students choose a topic, conduct Internet searches, compile a list of links, and create online learning activities. The *Filamentality* Web site (AT&T Knowledge Ventures, 2007b) provides support "along the way through Mentality Tips. In the end, you'll create a web-based activity you can share with others even if you don't know anything about HTML or serving web pages" (¶ 1). The Mentality Tips are instructional guides to common technology activities, such as copying and pasting, searching for Web sites, and so on. *Filamentality* is free and easy to use, so any teacher (or student) with an Internet connection can build or solve a problem using this site. The focus on a variety of language modes is a central part of activities with *Filamentality*.
- *simulation software and Web sites*—A number of interesting simulations are discussed in several chapters of this volume (e.g., chapters 13 and 26). Simulations often present problems such as a mystery to be solved, a city or country to run (which may involve political, economic, and social decisions), or decisions to be made about where to go and how to achieve a goal or complete a quest. Chapter 26 describes several simulations constructed purposely for language learners. (See the *e*-GAME Web site [University of Essex, 1999–2001] for content-based business simulations; and Fasli & Michalakopoulos, 2006, for the pedagogical foundation.)

Content Sites for PBLL

- The Discovery Channel (Discovery Communications, 2006) and Discovery Education (2006a) Web sites present globally oriented problems, some of which focus on language.
- The NASA (n.d.) *SciFiles* present problems, video cases, quizzes, and tools for problem solving.
- *Nature for Teachers* (Public Broadcasting Service, n.d.) provides lesson plans for K–12 students and guides for teachers that involve animals and habitats and use thinking tools such as graphic organizers and Web searches.
- *Superthinkers* (Verizon New Media Services, 1996–2006) is an effective problem-solving site that can be used or adapted in many ways. In addition to various other resources, the site hosts the imaginary and thought-provoking Peetnik Mysteries.
- *Come Visit Wisconsin!* (Hayden, 2006; based on a similar WebQuest by Patricia Link about New Jersey) offers a lesson in which students research information in various categories to compile a brochure to advertise a vacation destination. This idea could be adapted to the students' local community.
- Innovative Designs for Education's (IDE, 2005) *Great Sites for Educators* provides numerous links to authentic learning units, including a PBL link of the month.

Teacher Tools

Instructional strategies, tips, and materials for teaching and supporting student problem solving can be found all over the Web and in a number of technology texts (see, e.g., Egbert, 2005; Hanson-Smith & Rilling, 2006; and chapters in this volume). Abdullah (1998) provides a sample step-by-step process for language teachers to follow in using PBL. Other resources include the following:

- Simple situations for adults to practice PBLL can be found at the Ohio Literacy Resource Center's (2006) *Problem-Solving* site.
- An excellent site with articles, activities, and explanations of PBL in the content areas of math and sciences is the *Problem-Based Learning Network* @ IMSA (Illinois Mathematics and Science Academy, 1993–2006).
- Research summaries can be found on the *Project-Based Learning Research* page of the George Lucas Educational Foundation (2006) Web site.

Other tools, both online and off, that support problem solving are mentioned in chapters 7 and 14, and elsewhere in this volume.

Technology-Enhanced PBLL Activities

Teachers can use tools like those mentioned previously to present learners with problems, or they can develop their own open-ended PBLL activities such as those presented in the following examples. Throughout, a focus must be kept on both the language and the process of problem solving. (For more on combining task-based and language learning, see chapter 13.)

Example 1: *Cliffhanger*

The teacher (or student) chooses a stopping point in a text where one of the story characters must reach a decision. Students discuss the choices that the character has and potential consequences for each. Students choose the most likely decision for the character (and can compare it to the best decision, if the two are not the same). They base their choice on an understanding of the story line and the character. Students create a story line and use a video camera to make a short video that presents their solution to what the character should and will do. Students evaluate both the proposed solution and the real one as they continue to read the text.

Example 2: *World's worst problem solver*

The teacher explains to students that they will have a competition to see who can propose the worst solution to a problem. The teacher proposes a problem that relates to current curricular goals and/or content. Students use preselected Web sites to research possible solutions and create Microsoft PowerPoint (2007) presentations to explain their solution. Students must reach an ineffective and inefficient but possible solution, and they must describe why their solution is the worst.

Example 3: *Librarian*

Students pretend to be a committee of librarians deciding which books to order for the school library. They have access to any book in the world but can choose only 10 books due to funding. (The teacher may choose to give students a preset amount to spend.) Their goals are to entice other learners to read, to meet the school's curricular goals, and to get the best deal for their money. During the process, students frame the problem, research and review books online, consider relevant factors such as what the other students might like to read and which curricular goals are most important, choose their books, and present their suggestions to the school in an electronic format.

Example 4: A *new flag*

The U.S. legislature has decided that the American flag no longer represents the country well. They are asking for well-supported suggestions for a new flag. The teacher asks students to work on this problem; the class will send one suggestion from the class to be voted on by the legislature. Student teams define the problem (e.g., Is it that the flag does not represent the country or that the legislature needs to be convinced that it does?). They research facts about the current flag and the United States on the Web and in texts. They prepare electronic presentations for class members, and the class evaluates each presentation based on known facts. Finally, students use an electronic voting system to choose the class's best solution.

Example 5: B*udgeting for food*

A certain country is in desperate need of money for food for the coming year or many of its people will starve. All together, the country requires US$7 billion. The governments of two countries that want to help are asking for public input on their budget choices. Because of projected budget problems, the political leaders in these two countries are deciding which programs could be cut, and to what extent, in order to help pay for the food. Because it is an election year, these leaders are interested in hearing where the public thinks the money could come from. After listening to this scenario, students at two different school sites must decide what the question is (e.g., How should they deal with the budget? Is this an election-year ploy? How much does the needy country actually require? What are some other potential problems?). Students perform a cost-benefit analysis using financial data, supplied in a spreadsheet, about the needy country and the (imaginary) helper countries (i.e., the two schools). They propose and weigh different solutions and type up a proposed budget for their helper country. Each helper country collaborates with the "public" (students) from the other country to determine which portion of the food money each will contribute.

Example 6: T*reeless*

The owners of the local mall have decided that the trees along the street in front of the mall are obscuring the view of passers-by and costing them business. They hire a tree service to cut down every other tree, providing a much better view of the mall from the street. Many residents of this "Tree Town USA" are upset and angry about the trees being cut down and decide to file a legal action against the mall owners. Students, acting as mall owners, Tree Town officials, town residents, and a mediation team, perform their various roles by counting and researching trees and tree growth, investigating all sides of the issue, and working with others to come to a decision about what should happen next. Students organize their data in a spreadsheet, use decision software to discuss, and use word-processing software to type up their reflections on the process and its outcomes.

These PBLL activities can all be adapted for a variety of student language levels and content, and different electronic or paper tools and processes can be used to meet the goals of each. As stated previously, the focus must be on the content to be learned, the thinking and reasoning skills to be practiced and acquired, and the language needed to succeed in the tasks. Technology helps create an optimal learning environment in which students can readily collaborate, find an authentic audience for their resulting decisions, and reflect on what they have learned.

Conclusion

The world is becoming "smaller" each day, and language students require new skills to mediate and navigate its impact on their lives. Helping students develop problem-solving skills, and supporting their understanding and use of technology, is an integral part of the language learning process.

Explorations

1. How did you learn to solve problems? What skills work best for you in problem-solving situations? How do your skills continue to develop now?
2. How can the strategies and activities that you are already using or are familiar with be adapted to cultivate students' problem-solving strategies? How can technology use support students' problem solving?
3. What are some of the difficulties of or obstacles to developing a technology-enhanced PBLL curriculum in your school or country? How can these difficulties and obstacles be effectively addressed?
4. Develop a problem scenario similar to those in this chapter on one of the following topics that is relevant to your language students: the environment, rural education, globalization, travel, or charity. Write a short introduction explaining the situation and contextualizing the problem. Provide appropriate Web-based resources to help students learn about the issues, for example, in the form of a WebQuest.
5. Visit some of the Web sites that feature problem-based instruction. How can information from these sites be incorporated in your language classroom? Share your discoveries with classmates or your working group.