Technology Enhancement

Problem-based learning (PBL) units that are developed as part of Project T² are specified as technology-enhanced not to indicate a different form of PBL, but to highlight the vital role technology plays in problem-based experiences. Rather than viewing technology as a separate feature of PBL, technology is infused in all other features and provides teachers and students with an essential tool for accessing, managing, analyzing, and sharing information. It also serves as an important tool in constructing the products and performances during the final phase of problem-solving.

**Accessing Information**

Technology allows students to access information that would have been impossible to obtain even ten years ago. Virtual libraries provide ready access to reference materials including encyclopedias, magazines, professional journals, newspapers, historical records, and primary sources. Powerful search engines guide student researchers to locations where they can access information as media as well as text: They can view documents, photographs, and video clips; they can hear speeches, sounds, and music. Real-time data collection is also possible, allowing novice investigators to access data from weather satellites, space probes, and topographical maps just as professionals do. The world of information is literally at their fingertips. Students can also generate and manipulate data using technology. Laptop and handheld computers allow researchers to carry them into the field and use them with electronic probes and sensors. Visualization tools enable the easy construction of graphs and models so that students can construct and explore representations easily and quickly.

**Managing and Analyzing Information**

Using databases and spreadsheets encourages students to think in meaningful ways to increase conceptual understanding. Databases allow users to search, sort, and retrieve selected information in order to answer questions. Spreadsheets are used as computational tools for analyzing data and as modeling tools for interpreting data or speculating with numbers. Use of databases and spreadsheets allows efficient data management and retrieval and enables users to think critically about the information. On the other hand, creation of databases and spreadsheets calls for high levels of thinking by requiring learners to identify the underlying dimensions of the content in order to organize it.

The creation and use of simulations, or “microworlds,” allow students to learn by doing. This use of technology is both motivating and intellectually challenging. Models and microworlds permit students to manipulate and generate information in artificial environments so that they can pose hypotheses and ask “what if” questions to test their predictions. Learners can create an exploratory learning environment where they can navigate, manipulate or create objects and test their effects on one another, then revise their conceptual model if necessary.

**Sharing Information**

Teleconferencing and networking provide access to peers and experts in other locations, thus allowing interaction and collaboration across time and place. Both synchronous and asynchronous environments allow learners to share ideas, ask questions, and discuss their projects. Powerful software is available that can structure collaboration among peers or teams to
create an intentional learning environment. When it comes time to present findings or to display products, students can choose from among a number of representations. Multi-media provides options that include audio and video in addition to text. The possibilities for modes of expression are almost limitless.

**Cognitive Aids and Scaffolds – Universal Design for Learning**

One of the most significant uses of technology in Project T² is to provide the support necessary to make problem-based work accessible to all students. “Wizards” or “intelligent tutors” are available on most software now, making it possible to create a graph, design a table, or publish a brochure with little or no experience. Characteristic of universal design, these tools are not always specialized nor are they only helpful to persons with special needs. They provide assistance to everyone.

Technology allowed us to build universal design features into each of our T² units. Multiple levels of tasks and a wide variety of resources are provided within each unit. Some students might complete a partially developed database while others design a spreadsheet from “scratch.” Some students will read government documents while others use software that will read documents aloud. Still others, who may have visual impairments, enlarge the text to be more easily readable. Many of the tasks associated with T² units have built-in optional content enhancements or “pop-up” reminders for students to use a particular strategy as they work on their task. Universal design is becoming integral to quality curriculum and brings a world of possibilities to learning environments.

Judith B. Howard, Ph.D.
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**Related Reading**


**Websites**

Center for Applied Special Technology (CAST)  

IT-Assisted Project-Based Learning  
[http://darkwing.uoregon.edu/~moursund/PBL/](http://darkwing.uoregon.edu/~moursund/PBL/)