


Integrating the World Wide Web and Problem Based Learning

An aerospace company has hired groups of chemical engineers and physicists to determine what surface area, concentration, and temperature two newly developed rocket propellants (dihydrogen monoxide and Alka-Seltzer) will launch a rocket stage the highest altitude. Jon and Maria are doing tests to see if a high concentration of dihydrogen monoxide and Alka-Seltzer, low temperature, and high surface area of Alka-Seltzer will work best. Lindsay and Ricardo are adjusting the temperature of the water, after learning that a high water temperature produces a reaction rate that is too high. Two groups with different hypotheses were able to launch a rocket stage over 30 feet. Did this take place at the Boeing testing facility? No it was in Mr. Ford's 8th grade science classroom. The teams actually consisted of students who were learning about what affects the speed of a chemical reaction. The students were learning the concept via a teaching strategy called problem based learning (PBL). PBL is a challenging learning strategy that motivates students to solve real world problems that have multiple solutions. It is a strategy that can incorporate technology to prepare students to meet challenges beyond public schooling.

PBL is "learning that results from working with problems," which leads to students incorporating concepts for their own use. (Rhem 1998) Problems can vary from creating a newspaper advertisement to persuade people to immigrate to the colony of Pennsylvania, to determining if the yellow star thistles in the school field are a threat to the ecology of the local habitat. Like a researcher,

students must seek out what is known about the problem, which includes learning concepts that are associated with the problem. Students thus must synthesize information to present a solution to the problem. In the problem of enticing people to immigrate to the colony of Pennsylvania, students would have to research (via textbooks or more probably primary sources) information about the colony such as climate, natural resources (for the colonial time not for present day use), colonial living conditions, colonial government and laws, etc. They would have to evaluate the information to make their final product. It results in “orienting students toward meaning-making over fact collecting.” (Rhem 1998)

Problem based learning enhances the learning process by motivating students to solve real world problems. In Glenbard High School in Glen Ellyn, Illinois, Project Omega incorporated PBL as a component to challenge and motivate at-risk students. (Ljung 1996)The developers of Project Omega had the goal of  guiding students to become more aware of their own creative abilities, enabling students to be actively responsible for their own success, and helping students acquire and develop higher level thinking skills. They gave the students a yearlong problem to tackle:

“How can we redesign and utilize the Jewel properties at North Avenue and Glenn Ellyn Road in such a way that we can celebrate cultural diversity, build community cooperation, insure safety, develop and economically self-sustaining structure, and provide fun recreational opportunities that are appealing to its users?”(Ljung 1996)

Due to many factors the program was a success. The problem that the students had to engage in resulted in a “powerful extension into the community”. (Ljung 1996)Students made connections with community members and were to utilize

the skills of those members to help them accomplish their goals. PBL can assist students in their learning the curriculum as well as developing confidence and skills needed in succeeding in life.

In order for a unit or lesson to be considered problem based learning, it must meet certain criteria. The problem must be first presented to the students before prerequisite concepts are covered. (Lowe 1999) This will provide a context in which students will attach their acquired knowledge rather than learning concepts in isolation. That is the principle behind problem-based learning (PBL), a teaching technique that educates by presenting students with a situation that leads to a problem for them to solve. (Delisle 1997) The problem must be "ill-structured". (Lowe 1999) The problems are usually open-ended and have multiple outcomes and/or solutions. The introductory problem of determining what concentration, temperature, and surface area of water and Alka-Seltzer can be used to propel a rocket 10 meters high can be accomplished with multiple solutions. The temperature of the water can be warm, hot, or cold, depending on what the concentration and the surface area are. Students not used to dealing with ill structured problems may be resistant and frustrated at first, but it can lead to discovery and a revelation of creativity that was thought to not exist.

Problem based learning is also student directed and teacher facilitated. (Lowe 1999) Students must research information to the problem and come up with solutions based on prior information. They have to take an active approach to come up with an original solution, especially since there is not a single correct solution. This is not to say that there is no structure to a problem based learning

unit. Teachers provide guidance and feedback in the process. Regardless of the purpose for which a problem has been selected and designed, a teacher generally follows the process of selecting content and skills, determining availability of resources, writing a problem statement, choosing a motivation activity, developing a focus question, and determining an evaluation strategy. (Delisle 1997) Teachers incorporate lessons that will provide some of the requisite knowledge that will aide the students to solve the problem. Questions on aspects on the problem can be given to the students and students can investigate those questions. Students can record their progress in journals, and teachers can give feedback on their progress. If students are having the same difficulties in their progress, the teacher can intervene and serve as a springboard to a class discussion.

To assist students in successfully developing solutions in a problem based learning unit, technology is an essential resource. Research is often needed to learn what is known about the problem. Resources are widely available via the World Wide Web. If students need to know what conditions were like in colonial Pennsylvania, they can find numerous types of resources ranging from primary resources in state archives, to communicating with experts in Pennsylvania colonial history. The Internet is a modern research tool and has a wealth of diverse, timely and hyperlinked information, which also allows students to explore deeper through these "links". (Stepien William J. Senn Peter R. Stepien 2000) Trying to figure out what causes high speeds of roller coasters, database software can be used. It can store large quantities of data, and also sort the data to see if there is a pattern to the data. Another important use of technology in

problem based learning, is making a product. Students that can show the complexities of their solution by creating a multi-page website, Power Point presentations can be made as a culminating demonstration of a solution. Technology is a useful way to preserve and store the products created by students.

Problem based learning is a teaching strategy that is widely used throughout the nation that challenges students to make meaning out the topics covered. It causes students to deal with real life situations and collect information about the problem. The web is a substantial resource that can be utilized to collect the information and to seek assistance. When structured properly, problem based learning can lead to student success.

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