

Problem-Based Learning and the Design of E-Learning Environments

Bijan B. Gillani

California State University, Hayward, USA

INTRODUCTION

There is tremendous pressure today for faculty in academic environments to use Web-based technologies to deliver online instruction. One reason for such pressure comes from the fact that technology can be an effective tool to deliver online instruction. Regardless of the reason, too often the pressure results in using Web technologies as classroom management tools, such as for e-mail, attendance, and posting syllabi, rather than as an effective online curriculum tool to deliver instruction for courses. These online courses have become known as e-learning, which in its strictest sense covers training, teaching, and learning programs that use networked technologies as the medium of choice to deliver instruction. Unfortunately, a great majority of e-learning sites are designed and developed without much regard for applying pedagogy. The most fundamental step in the design and development of effective e-learning environments is the recognition that they must be based on an effective pedagogical model.

There are numerous pedagogical models that have been applied to develop e-learning sites (Gillani, 2003). However, with the explosion of the Web as a medium of delivering instruction, problem-based learning that is based on a constructivist pedagogical model is beginning to become popular as an effective model for delivering instruction online. Problem-based learning (PBL) is an approach to teaching where learning results from working with a presented problem. A PBL model can be defined as an instructional strategy in which students are confronted with real-world problems and are supported in carrying out research to find meaningful solutions. There are good reasons for PBL to become a popular model for developing e-learning applications.

First, it is the matter of timing. We have known for several years that if we can adapt new instructional techniques to the Web, it can be an effective tool to transform the learning process to meet the challenges of education-on-demand. PBL is the right response for the Web to be the tool of choice to deliver instructional objectives. The Web was initially used instructionally by simply pasting traditional text-based materials without much regards to pedagogy. Many students under this

approach simply memorized the pasted material on the Web just to pass the test. Then, within a few months after the test, students either forgot their knowledge or could not apply their knowledge in real-life situations. However, if the PBL model is applied to the design of Web sites, students' attitudes toward learning are changed, and they learn better and retain new knowledge more readily. Furthermore, PBL not only enhances instruction, it is also instrumental for students to learn how to learn for life.

Another reason why application of PBL to the design of e-learning can be successful is because it is similar to the way scientists and adults learn. Gwendie Camp (1996) cites Knowles who has proposed the following criteria for an effective condition of learning:

...a learning environment characterized by physical comfort, mutual trust and respect, mutual helpfulness, freedom of expression, accepting of differences, where learners perceive the goals of the learning experience to be their own goals, where learners accept a share of responsibility for planning and operating the learning experience and therefore have a commitment to it, where learners participate actively, and sense progress toward their own goals. Adults feel a need to learn when the learning process relates to and uses their own experiences. (Camp, 1996, p. 1)

Learning on the Web is not any different from learning in a traditional classroom environment for adults. A PBL approach to designing e-learning environments to educate students supports all the above criteria proposed by Knowles for effective learning.

ORIGINS OF PROBLEM-BASED LEARNING

The origin of problem-based learning can be traced back to the writing of scholars like Dewey (1916), Vygotsky (1978), and Piaget (1952, 1964). John Dewey, one of the first American educational philosophers, believed that teachers should teach to students' natural instincts. Dewey believed that students will learn by doing something. He wrote,

Methods which are permanently successful in formal education ... go back to the type of situation which causes reflection out of school in ordinary life. They give pupils something to do, not something to learn; and the doing is of such a nature as to demand thinking, or the intentional noting of connections; learning naturally results. (Dewey, 1916, p. 154)

Another influential scholar whose writing has been instrumental in the development of the problem-based approach is Vygotsky. He believed in the social formation of the mind, and he claimed that all higher human functions develop at two levels: the social plane and the psychological plane.

Every function in the child's cultural development appears twice: first, on the social level, and later, on the individual level; first, between people (interpsychological), and then inside the child (intrapsychological). This applies equally to voluntary attention, to logical memory, and to the formation of concepts. All the higher functions originate as actual relations between human individuals. (Vygotsky, 1978, p. 57)

Vygotsky introduced the zone of proximal development to explain the dynamic relationship between learning and how development is transformed from the interpsychological level to the intrapsychological. He defines the zone of proximal development as "the distance between the actual developmental level as determined by individual problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers" (1978, p. 86). Vygotsky's theory influenced scholars such as Schumann (1962) to develop PBL as an instructional method.

Yet another scholar who influenced the development of PBL is Jean Piaget. Piaget himself was never involved in the design of pedagogical models, however, he viewed learning as a dynamic process where learners construct their own knowledge by interacting with the world. The role of teachers, Piaget believed, is not to impose steps, procedures, and rigid structure, rather they should be the architects for learning environments that facilitate a process in which students would be able to construct their own knowledge.

These three scholars influenced a historical movement in the US that has become known as the constructivist movement. The constructivist movement in the US impacted instructional design, teaching models, and educational technology. Constructivism assumes that "knowledge" is not an absolute but is "constructed" by the learner based on previous knowledge and overall views of

the world. The main impact of constructivism can be seen mostly in inquiry-training models. Schumann (1962), who was obviously influenced by Piaget and possibly by the writing of John Dewey and Vygotsky, introduced the inquiry-training model as a pedagogical tool to the design of curriculum. The inquiry-training model is a structured teaching model that allows individuals to learn the way scientists learn. Such a model follows specific phases of instruction that include solving a real problem by making hypotheses, gathering and organizing data, and testing different hypotheses to come up with a possible solution in dealing with the problem.

The evolution of the inquiry-training model during the 1960's culminated in a new approach that we call problem-based learning. The most widely implemented use of PBL was first in medical schools. From its origin at McMaster University, Canada's most innovative medical doctoral university, PBL was gradually adopted by other medical schools, and its application continued to increase through the 1970s and 1980s. Now, however, we are seeing an explosion in the use of PBL in its various adaptations. Today, adoption of PBL as a teaching and learning strategy is becoming popular by the faculty of various departments at major universities. In recent years, K-12 educators have also been using PBL to teach a variety of curriculum.

THE STAGES OF A PROBLEM-BASED LEARNING MODEL

PBL has three basic characteristics that include presenting a problem, providing resources for research, and scaffolding students to test their solution to the problem. There is no set agreement with educators who use PBL about the syntax or order of presenting the problem and the process students need to go through in order to solve the problem. PBL begins with presenting a realistic problem that students can recognize and understand. It then proceeds with students working together to determine the key issues and then solving the problem under the supportive guidance of the teachers. This process is especially true when PBL is applied to using the Web as a medium of delivering instruction. However, in order to have guidelines for the sequence of instruction for the Web, I have found that the following syntax works effectively for the Web:

- **Problem:** Present a problem situation that is messy, authentic and is likely to occur in real life.
- **Design Specification:** Specify the goals that students need to achieve. These goals may include

4 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage: www.igi-global.com/chapter/preparing-african-higher-education-faculty/11444

Related Content

Smart City Planning: Complexity

Ulrik Ekman (2018). *International Journal of E-Planning Research* (pp. 1-21).

www.irma-international.org/article/smart-city-planning/204622

Free Public Wi-Fi and E-Planning: The Use of Online Planning to Build Better Networked Public Places

Alex Lambert, Scott McQuire and Nikos Papastergiadis (2014). *International Journal of E-Planning Research* (pp. 70-85).

www.irma-international.org/article/free-public-wi-fi-and-e-planning/114162

Gender and ICT Policy for Development and Empowerment: A Critique of a National ICT Policy

Kutoma Jacqueline Wakunuma-Zoier (2012). *Regional Development: Concepts, Methodologies, Tools, and Applications* (pp. 1005-1027).

www.irma-international.org/chapter/gender-ict-policy-development-empowerment/66161

Defining Parameters for Urban-Environmental Quality Assessment

Oto Novacek, Jesus Lopez Baeza, Jan Barski and Jorg Rainer Noenning (2021). *International Journal of E-Planning Research* (pp. 152-164).

www.irma-international.org/article/defining-parameters-for-urban-environmental-quality-assessment/278828

Energy Investment in Smart Cities Unlocking Financial Instruments in Europe

Francesca Romana Medda, Candace Partridge and Gianni Carbonaro (2019). *Smart Cities and Smart Spaces: Concepts, Methodologies, Tools, and Applications* (pp. 1120-1144).

www.irma-international.org/chapter/energy-investment-in-smart-cities-unlocking-financial-instruments-in-europe/211336