



AUTHENTIC PROBLEM-BASED COLLABORATIVE LEARNING PRACTICES FOR PROFESSIONAL DEVELOPMENT IN TEACHER EDUCATION

Pushpa Devi

A.P. JCD College of Education, Sirsa

Nisha Goyal

A.P. JCD College of Education, Sirsa

Madhu Bala

A.P. in Chemistry, JCD Memorial College,
Sirsa

Abstract

Problem-based learning (PBL) is an educational approach whereby students learn course content by actively and collaboratively solving real-world problems presented in a context similar to that in which the learning is to be applied. In this paper we describe the evolution of the development of the challenges and we provide instructions on creating a challenge and using it in the classroom to enhance student learning. The collaborative learning practices provided the opportunity to not only give and receive knowledge among the participants but also view this exchange as a responsibility to create a collaborative culture within the university.

Key words : Problem-Based Learning, Collaborative Learning, Professional Development, Teacher Education.

Introduction

Problem Based Learning was developed in the 1970s for use in medical education, and it teaches students content and enhances critical thinking through the collaborative solving of authentic real-world problems. Unlike project-based learning that requires students complete a project *after* they have mastered the material, in problem-based learning students master the material *in the process of solving a problem*. Students are active participants in their own learning, placed in a situation where problem parameters are not well defined and more than one outcome is possible.

Problem-based learning (PBL) is an instructional approach that challenges students to seek solutions to real-world (open-ended) problems by themselves or in groups, rather than learn primarily through lectures or textbooks. More importantly, PBL

engages students in developing skills as self-directed learners. Problems are selected to exploit natural curiosity by connecting learning to students' daily lives and emphasizing the use of critical and analytical thinking skills.

According to Gallagher (1997), the primary goal of PBL is characterized as learning for capability rather than leaning to acquire knowledge. The effectiveness of PBL depends on the nature of student engagement and the culture of the classroom, as well as the appropriateness of the problem tasks assigned. Proponents of PBL believe that when students develop their own problem-solving procedures, they are integrating their conceptual knowledge with their procedural skills.

Although PBL meshes well with constructivist views of learning, it did not emerge in response to educational theory (White, 2001). PBL provides students with opportunities to direct their own learning while developing critical thinking and evaluation skills through analysis of real life problems (Smith, 1995). "PBL's proponents emphasize that it improves thinking and learning skills and cognitive abilities in students. It has been reported that PBL-trained students are more frequent users of libraries and other information resources, which support independent learning. They acquire life long study skills, especially in their early years of study, giving rise to sustained learning. PBL educated students have a more holistic approach to their subject, more readily integrate new information, adapt to change and work well as member of a team. Generally PBL appears to increase student interest and enjoyment to the subject and enhance their professional development"

Key Characteristics Of "Authentic Pbl" Are

1. **Problem-based.** It begins with the presentation of a real life (authentic) problem stated as it might be encountered by practitioners.



2. **Problem-solving.** It supports the application of problem-solving skills required in "practice." The role of the instructor is to facilitate the application and development of effective problem-solving processes.

3. **Student-centred.** Students assume responsibility for their own learning and faculty act as facilitators. Instructors must avoid making students dependent on them for what they should learn and know.

4. **Self-directed learning.** It develops research skills. Students need to learn how to get information when it is needed and will be current, as this is an essential skill for professional performance.

5. **Reflection.** This should take place following the completion of problem work, preferably through group discussion, and is meant to enhance transfer of learning to new problems.

Key Components In Problem-Based Learning

The Problem-based Learning model involves the use of real problems to create an active, student-centered learning environment. The key components of the process are:

- Problem formulation
- Data collection
- Brainstorming solutions
- Evaluating and selecting solutions
- Implementing the solution

These components give the students direction and provide them with a format for completing the written part of the final product (Seifert & Simmons, 1997). Problem Formulation is a strategy composed of three questions that give students a format for beginning the problem-solving process.

- What do we know?
- What do we need to know?
- What should we do? (Stepien and Gallagher, 1993)

The data collection component is designed around the answers to the "What do we know? Questions and involves different methods of research. For example, it might involve, interviewing strategies, survey techniques, library research, and Internet research techniques. In the data collection component students are encouraged to use their imagination as they collect data by

searching in places they would not normally search, view problems from many perspectives, listen carefully and be open to new ideas. The brainstorming solutions component involves the students immersing themselves in the problem by reviewing as many things as possible about the ideas. It may also require the students to rearrange the order of the parts, keep a list of ideas, and share ideas. Then there is the evaluating and selecting of the solution component. This is where students need to access the selected solution based on the data that they have gathered. It is important that the whole group come to a consensus before choosing a final solution. Implementing the solution is vital and reflects the cohesiveness of the group, because it is at this point that the group must defend their solution based on their data. The final component is product assessment. This is left up to the discretion of the teacher/tutor. Many times the tutors will decide to let the students develop their own assessment.

A problem-based learning environment provides learners with an instructional mechanism that can increase their higher-order thinking skills while exploring authentic and ill-structured problems, participating in social interactions, and receiving coaching from peers and teachers (Albanese & Mitchell, 1993; Hmelo & Ferrarri 1997). However, PBL also brings cognitive challenges. For example, students must be challenged to clarify the causes of the problem, to decide important facts in problem situations, and to generate hypotheses for the solutions. To appropriately solve a problem in a PBL environment, it is important that students reflect on their understanding of an issue, new knowledge to develop a solution, and how their new knowledge can be used to address the situation. Reflecting on the problem helps learners to generate concepts and abstractions and enhance the transfer of learning to new problems (Barrow, 1998).

Research suggests that various elements in the learning environment can prompt reflective thinking (Andrusyszyn & Daive, 1997; Griffith & Frieden, 2000; Lin, Hmelo,



Kinzer, & Secules, 1999). Ill-structured, authentic, and complex tasks in a PBL environment, for instance are known to promote reflective thinking. These features of the task help students think reflectively because students have to investigate the problem in order to gather appropriate information to solve the problem (Stepien & Pyke, 1997). Another important element prompting reflective thinking is the type of instructional method used. Virtanen et al. (1999) found that both an inquiry-oriented and an explanation-oriented instructional method were effective in PBL environment. The inquiry-oriented method facilitates reflective thinking by asking reflective questions while the explanation-oriented method directs learners to reflect on important concepts (Moon, 1999; Virtanen et al, 1999). Creating flexible and active learning environments is also important in prompting reflective thinking during PBL. The elements that make the learning environment active and student-centered include allowing students to have enough wait-time to think before answering, providing a learner-controlled instruction, and promoting cooperative and collaborative learning (Michael & Susan, 1998; Williams, 1996). Finally, scaffolding tools are important in prompting reflective thinking during PBL. Andrusyszyn & Daive (1997) and Kinchin & Hay (2000) reported on the effectiveness of journal writing. Research also suggested that question prompts or concept maps could be used as aids to prompt reflective learning (Barrow, 1998; Griffith & Frieden, 2000; Kinchin & Hay, 2000). Therefore, key factors that encourage students to reflect upon learning in a PBL environment seem to focus on the use of ill-structured and authentic tasks, the type of instructional methods, supportive and active learning environments, and scaffolding tools. Problem-based Learning provides the instructional mechanisms for prompting learner reflective thinking. One of the major features of project-based learning is the all important community of inquiry. Inquiry is at the heart of PBL. Community, however, may be a more difficult task to grasp. Diane McGraw is

an associate professor of educational computing, design and online learning at Kansas State University. She has found through research that there was a program called Fostering a Community of Learners (FCL) in which learners collaborate, research, share and reflect on topics that involve them in "deep disciplinary content? This program consisted of five critical pieces that work together, these same five pieces can be found in problem-based learning, and they are:

- Active, purposeful learning
- A learning setting that pays attention to multiple zones of proximal development
- The legitimization of difference
- A community of discourse
- A community of practice (McGraw, 2003)

Problem-based learning fosters a community of learning through collaborative and engaging group interaction. In PBL learners depend on each other to accomplish their tasks. This means that members be responsible to each other and the group, be mutually respectful, and identify as part of the group. All members of the learning community must take responsibility for their accomplishments in PBL.

The Challenge

Modifying traditional instructional approaches and implementing new methods are often difficult tasks for teachers, and incorporating PBL is no exception. Along with the advantages of PBL come disadvantages and limitations, and these have been grouped into six categories by Jones (1996a): academic achievement, amount of instructional time required, role of students, role of teachers, appropriateness of problems, and appropriate assessment of student performance.

Jones (1996a) emphasized that generating proper questions is the most critical aspect of PBL. Further, Jones stressed the importance of appropriate assessment of student performance. Standardized tests are usually designed to assess the academic achievement of students who have learned through traditional instruction, but PBL differs from traditional instruction in a variety of



ways. More appropriate assessment methods would include written examinations or reports, practical examinations, construction of concept maps, peer assessment, self assessment, or oral presentations.

According to Ngeow and Kong (2001), students engaged in PBL become more responsible for their own learning, but the transition to self-directed learning can be difficult for some. Group-based learning is also integral to PBL, and students must learn to function effectively in groups.

Costs and resistance to change among educators are other limitations to PBL that must be addressed through professional development of teachers (Dempsey, 2002; Smith, 1995). The role of teachers in PBL is to serve as mentors once a problem has been introduced to students, so teachers must learn to communicate with students at the metacognitive level, facilitating reasoning by asking questions and not giving too much information (Putnam, 2002).

Conclusion

Problem-based learning (PBL) is an emerging teaching approach which has taken its prominence in tertiary education in recent years (Yeo-2005). PBL crosses a broad spectrum of instructional patterns, from total teacher control to more emphasis on self directed student inquiry (Barell-1998). Patterns of power and control of decision making are affected by what (Fullan-1993) calls "reculturing". It is a shift from the traditional didactic teaching where the core knowledge discovery process lies almost entirely in the hands of the learner rather than the teacher. PBL provides students with opportunities to direct their own learning while developing critical thinking and evaluation skills through analysis of real life problems and also help to improve thinking and learning skills and cognitive abilities in students.

References

Andrusyszyn, M.A. & Daive, L. (1997) Facilitating reflection through interactive journal writing in an online graduate course: quality study. *Journal of Distance Education*, 12(1), 103-126.

- Barell J (1998) " Problem Based Learning, an inquiry approach", Hawker Brownlow Education, Australia.
- Barrow, H.S. (1998) The essentials of problem-based learning. *Journal of Dental Education*, 62(9), 630-633.
- Dempsey, T. (2002) "Problem-based learning (PBL) as a professional development alternative." Paper presented at the Annual Meeting of the National Staff Development Council, Denver, CO. [ED 460 095].
- Gallagher, S. A. (1997) Problem-based learning: Where did it come from, what does it do, and where is it going? *Journal for the Education of the Gifted*, 20(4), 332-362.
- Griffith, B. & Frieden, G. (2000) Facilitating reflective thinking. *Counselor Education & Supervision*, 40(2), 82-92.
- Hmelo, D. E. & Ferreri, M. (1997) The problem-based learning tutorial: cultivating higher order thinking skills. *Journal for the Education of the Gifted*, 20(4), 401-422.
- Jones, D. (1996a) "Disadvantages of problem based learning." Retrieved April 3, 2003 from <http://edweb.sdsu.edu/clrit/learningtree/PBL/DisPBL.html>
- Kinchin, L. & Hay, D. (2000) How qualitative approach to concept map analysis can be used to aid learning by illustrating patterns of conceptual development. *Educational Research*, 42(1), 45-57.
- McNeil, J. D. (2003) Curriculum the teachers initiative. Upper Saddle River, NJ: Pearson Education Inc.
- Michael, J.A. & Susan E.A. (1998) Problem-based learning: The good, the bad, and the ugly. *Journal of Dental Education*, 62(9), 650-655.
- Moon, J.A. (1999) Reflection in Learning & Professional Development, Theory and Practice. London: Kogan Page Inc.
- Ngeow, K., & Kong, Y. (2001) "Learning to learn: Preparing teachers and students for problem-based learning." ERIC Digest. [ED 457 524].
- Putnam, A. R. (2002) "Problem-based teaching and learning in technology education." [ED 465 039].
- Smith, C. A. (1995) Features section: problem based learning. "Biochemistry and Molecular Biology Education," 23 (3), 149-152.
- Seifert, E.H. & Simmons, D. (1997) Learning centered schools using a problem-based approach. *NASSP Bulletin*, 81(4), 90-97.
- Stepien, W. & Gallagher, S. (1993) Problem-based learning: As authentic as it gets. *Educational Leadership*, 25-28.
- Stepien, W.J. & Pyke, S. (1997) Designing problem based learning units. *Journal for the Education of the Gifted*, 20(4), 380-400.
- Williams, M. (1996) Learner Control and Instructional Technology. In Jonassen, D.(Ed.) *Handbook of Research for Educational Communications and Technology* (pp. 957-983). New York, NY: Macmillan Library Reference.
- Yeo, R. (2005) "Problem-based learning: a suitable approach in tertiary education?", in Tan, K., Mok, J., Lee, M. and Ravindran, R. (Eds), "Problem-based Learning: New Directions and Approaches", Teinasek Centre for Problem Based Learning, Singapore, pp. 93-113.
- Fullan M., (1993) "change forces in education; probing the depths of educational reform", London, England: flamer press.
- Virtanen, P.J., Kosunen, E.A-L., Holmberg-Marttila D.M.M. & Virjo, I. O. (1999). What happens in a PBL tutorial session? analysis of medical learners written accounts. *Medical Teacher*. 21(3). 270-276.
- White, H. B. (2001) Problem based learning. "Biochemistry and Molecular Biology Education," 29 (1), 24-25.