A REVIEW OF 'PROBLEM BASED LEARNING' AS A STUDENT-CENTRED PEDAGOGY

Dr. Venkata Ramani. Challa
Associate Professor, Department of English
K.L.E.F (Deemed to be University) Guntur-522502

ABSTRACT: Problem-based learning (PBL), as an emerging pedagogical approach in tertiary education has caused considerable recognition. Students work in collaborative groups to identify what they need to learn to tackle an issue. They participate in self-directed learning (SDL) and then apply their new knowledge to the issue and reflect on what they learnt, and the adequacy of the techniques utilized. The teacher acts to encourage the learning process instead of giving information. The objectives of PBL include helping students develop 1) adaptable learning, 2) viable critical thinking skills, 3) SDL skills, 4) effective collaboration skills, and 5) intrinsic motivation. This paper aims to provide a review of the process of PBL and the studies examining the effectiveness of PBL. Emphasis is given on how to design and execute appropriate problem situations while facilitating critical thinking among students. An undisclosed finding of the study is that PBL, if implemented meticulously, will bring benefits beyond one's expectations.

***Index Terms*: Problem-based learning (PBL), Self-directed learning (SDL), Critical thinking**

1. INTRODUCTION

Education seems to be constantly changing. Students are no longer expected to sit passive at a desk and take notes on a lecture. Teaching has become more engaging and interactive. With or without a form of technology, interactive learning helps students strengthen problem solving and critical thinking skills. This paper is about problem-based learning (PBL) and its utilization in advancing higher-order thinking in problem-oriented situations, including figuring out how to learn. The model is also referred to by other names, such as project-based instruction, authentic learning, and anchored instruction. Most imperative, the instructor provides platform—an auxiliary framework—that enhances inquiry and scholarly development. Problem-based learning cannot happen unless teachers create classroom environments in which a transparent trade of thoughts can occur. In this regard, many parallels exist among problem-based learning, cooperative learning, and classroom discussion. Problem-based learning shares its scholarly roots with concept and inquiry-based teaching.

1.1 Characteristic Features Of Problem-Based Learning

Various developers of problem-based learning (Cognition & Technology Group at Vanderbilt, 1990, 1996a, 1996b; Krajcik & Czerniak, 2007; Slavin, Madden, Dolan, & Wasik, 1994) have described the instructional model as having the following features:

- **Driving inquiry or problem**. Rather than organizing lessons around specific academic standards or skills, problem-based learning composes guideline around questions and issues that are both socially vital and specifically meaningful to students. They address genuine circumstances that sidestep basic answers and for which contending arrangements exist.
- **Interdisciplinary focus**. Although an issue-based lesson might be focused in a specific subject (Language, Science, Engineering), the genuine issue under scrutiny is picked in light of the fact that its answer expects students to dive into numerous subjects.

- **Authentic investigation**. Problem based learning requires that students seek after valid examinations that look for genuine answers for genuine issues. They should analyse and characterize the issue, create speculations and influence expectations, to gather and break down data, direct tests (if suitable), make inductions, and make inferences. The specific investigative strategies utilized, obviously, rely upon the idea of the issue being contemplated.
- **Production of artefacts and exhibits**. Problem based learning expects students to build items as antiques and exhibits that clarify or speak to their answers. An item could be a mock debate, a report, a physical model, a video, a PC program, or a student-built webpage. Artefacts and exhibits, as will be portrayed later, are arranged by students to exhibit to others what they have realized and to give an invigorating contrasting option to the conventional research project or exam.
- **Collaboration**. Like the cooperative learning model, problem-based learning is identified by students working with one another, frequently in pairs or small groups. Cooperating gives inspiration to managed inclusion in complex undertakings and improves open doors for shared inquiry and exchange, and for the advancement of social aptitudes.

Problem-based learning was not designed to help teachers convey huge quantities of information to students. Direct instruction and presentation are better suited to this purpose. Rather, problem-based learning was planned principally to enable students to build up their reasoning, critical thinking, and scholarly abilities; learn adult roles by experiencing them through real or simulated situations; and become independent, self-governing learners.

2.LITERATURE REVIEW

Direct instruction draws its hypothetical support from behavioural psychology and social cognitive theory. The educators' role in a direct instruction lesson consists primarily of exhibiting data to students and demonstrating specific skills in a clear and productive manner. Problem-based learning, on the other hand, draws on cognitive and social constructivist theories for its support. The focus is not so much on what students are doing (their behaviour), however on what they are considering (their cognitions) while they are doing it. Despite the fact that the part of an educator in issue-based lessons infrequently includes presenting and explaining things to students, it more often involves serving as a guide and facilitator so that students learn how to think and to take care of issues without anyone else.

John Dewey (1933) described in some detail the significance of what he named reflective thinking and the processes teachers should use to enable students acquire productive thinking skills and processes. Jerome Bruner (1961) underlined the importance of discovery learning and how teachers should help learners become "constructionists" of their own insight. Richard Suchman (1962) developed an approach called inquiry-based teaching in which teachers inside a classroom setting present students with perplexing circumstances and encourage them to inquire and seek answers.

The effects of the model, however, are mixed. Problem-based learning originated in science and medical education. Bredderman (1983) did a meta-analysis of 57 studies on the effects of activity-oriented science programs that had been developed in the 1960s and 1970s. He found that the activity-based curricula had the most effect on student achievement in two vital areas: comprehension of scientific method and creativity. However, it did not seem to have much effect on student procurement of science content when compared to more conventional methodologies. More recently, studies by Hmelo and colleagues (2000, 2004, 2006) and a meta-investigation by Gijbels, Dochy, Van den Bossche, and Seeger (2005) discovered similar results. Students instructed with problem-based learning were exceptionally energetic, achieved further and more complex

understandings, and could apply information to new situations. However, the model, as shown in earlier studies, had weak effects on acquisition of factual knowledge.

Along these lines, although the hypothetical establishments for problem-based learning are solid and convincing, some (Hickey, Moore, & Pellegrino, 2001; Mergendoller, Bellisimo, & Maxwell, 2000) argue that the results are unconvincing and hazy. The best guidance at this point, as with any specific approach, is that PBL is not a panacea, and that it will help accomplish a few objectives, but not others—again making the argument for repertoire.

3. PLANNING AND IMPLEMENTING PROBLEM-BASED LESSONS

3.1 Planning PBL Lessons. The problem-based learning model is quite straightforward, and it is easy to grasp the basic ideas associated with the model. Effective execution of the model, however, is more difficult. It is the teacher's planning that facilitates smooth movement through the various phases of problem-based lessons and the accomplishment of desired instructional goals.

3.1.1 Decide on Goals and Objectives. Deciding on specific goals and objectives for a problem-based lesson is one of three important planning considerations. Some problem-based learning lessons may be aimed at achieving all these goals simultaneously. It is more likely, however, that teachers will emphasize one or two goals in particular lessons. Regardless of whether a lesson is focused on a single objective or has a broad array of goals, it is important to decide on goals and objectives ahead of time, so they can be communicated clearly to students.

3.1.2 Design Appropriate Problem Situations. Designing appropriate problem situations or planning ways to facilitate the planning process is a critical planning task for teachers. A good problem situation must meet at least five important criteria. First, it should be authentic. Second, the problem should be somewhat ill defined and pose a sense of mystery or puzzlement. Third, the problem should be meaningful to students and appropriate for their level of intellectual development. Fourth, problems should be sufficiently broad to allow teachers to accomplish their instructional goals yet sufficiently confined to make lessons feasible within time, space, and resource limitations. Finally, a good problem should benefit from group effort, not be hindered by it. As you approach choosing a situation for a lesson, consider these points:

- Think about a situation involving a problem or topic that has been puzzling to you. The situation must pose a question or problem that requires explanation through cause-and-effect analyses and/or provides opportunities for students to hypothesize and speculate.
- Decide if a situation is naturally interesting to the group of students with whom you are working and decide if it is appropriate for their stage of intellectual development. Some PBL teachers like to give students a strong hand in selecting the problem. A good problem situation should be authentic, puzzling, open to collaboration, and meaningful to the students.
- Consider whether you can present the problem situation in a fashion that is understandable to your group of students and that highlights the "puzzling" aspect of the problem.
- Consider whether working on the problem is feasible. Can students conduct fruitful investigations given the time and resources available to them?

Obviously, many problem situations can be defined and posed to students. Indeed, the list is almost limitless. Some of these are tightly focused and can be completed in rather short periods of time. Others are more complex and require a whole course of study to complete.

3.1.3 Organize Resources. Problem-based learning encourages students to work with a variety of materials and tools, some of which are in the classroom, others in the college laboratory or computer lab, and still others outside the school. Getting resources organized and planning the logistics of student investigations are major

planning tasks for PBL teachers. In almost every instance, PBL teachers will be responsible for an adequate supply of materials and other resources for use by investigative teams. Teachers must plan in detail how students will be transported to desired locations and how students will be expected to behave while in off campus settings. It also necessitates teaching students' appropriate behaviour for observing, interviewing, and perhaps taking photographs of people in the local community

3.2 Conducting PBL Lessons

There are five phases of problem-based learning

3.2.1 Orient Students to the Problem. Teachers should communicate clearly the aims of the lesson, establish a positive attitude toward the lesson, and describe what students are expected to do. With students who are younger or who have not been involved in problem-based learning before, the teacher must also explain the model's processes and procedures in some detail. Points that need elaborating include the following:

• The primary goals of the lesson are not to learn large amounts of new information but rather to investigate important problems and to become independent learners. For younger students, this concept might be explained as lessons in which they will be asked to "figure things out on their own."

• The problem or question under investigation has no absolute "right" answer, and most complex problems have multiple and sometimes contradictory solutions.

• During the investigative phase of the lesson, students will be encouraged to ask questions and to seek information. The teacher will provide assistance, but students should strive to work independently or with peers.

• During the analysis and explanation phase of the lesson, students will be encouraged to express their ideas openly and freely. No idea will be ridiculed by the teacher or by classmates. All students will be given an opportunity to contribute to the investigations and to express their ideas.

The teacher should convey the problem situation to students as interestingly and accurately as possible. Usually being able to see, feel, and touch something generates interest and motivates inquiry. Short videotapes of interesting events or situations illustrating real-life problems such as pollution or urban blight are similarly motivational.

3.2.2 Organize Students into groups. Problem-based learning requires teachers to develop collaboration skills among students and help them to investigate problems together. It also requires helping them plan their investigative and reporting tasks. Obviously, how student teams are formed will vary according to the goals teachers have for projects. After students have been oriented to the problem situation and have formed study teams, teachers and students must spend considerable time defining specific subtopics, investigative tasks, and time lines. The challenge for teachers at this stage of the lesson is seeing that all students are actively involved in some investigation and that the sum of all the subtopic investigations will produce workable solutions to the general problem situation.

3.2.3 Assist Independent and Group Investigation. Investigation, whether done independently, in pairs, or in small study teams, is the core of problem-based learning. Although every problem situation requires slightly different investigative techniques, it involves the processes of data gathering and experimentation, hypothesizing and explaining, and providing solutions.

3.2.4 Data Gathering and Investigation. This aspect is critical. The aim is for students to gather sufficient information to create and construct their own ideas. Teachers should assist students in collecting information from a variety of sources, and they should pose questions to get students to think about the problem and about the kinds of information needed to arrive at defensible solutions. Students need to be taught how to be active

investigators and how to use methods appropriate for the problem they are studying: interviewing, observing, measuring, following leads, or taking notes.

3.2.5 Hypothesizing, Explaining, and Providing Solutions. During this phase of the lesson, the teacher encourages all ideas and accepts them fully. As with the data-gathering and experimentation phases, teachers continue to pose questions that make students think about the adequacy of their hypotheses and solutions and about the quality of the information they have collected. Teachers should continue to support and model free interchange of ideas and encourage deeper probing of the problem if that is required.

3.2.6 Develop and Present Artefacts and Exhibits. The investigative phase is followed by the creation of artefacts and exhibits. Artefacts are more than written reports. They include videotapes that show the problem situation and proposed solutions, models that comprise a physical representation of the problem situation or its solution, and computer programs and multimedia presentations.

3.2.7 Analyse and Evaluate the Problem-Solving Process. The final phase of problem based learning involves activities aimed at helping students analyze and evaluate their own thinking processes as well as the investigative and intellectual skills they used. During this phase, teachers ask students to reconstruct their thinking and activity during the various phases of the lesson. When did they first start getting a clear understanding of the problem situation? When did they start feeling confidence in particular solutions? Why did they accept some explanations more readily than others? Why did they reject some explanations? Why did they adopt their final solutions? Did they change their thinking about the situation as the investigation progressed? What caused this change? What would they do differently next time?

3.3 USING THE INTERNET WITH PROBLEM-BASED LEARNING

Students involved in problem-based learning projects can use the Internet in a variety of ways, including accessing required information for PBL projects and participating with virtual problem-based learning Web sites. For example, Adventure Learning Foundation provides curricula materials connected to online "Adventure Learning Expeditions." This Web site and its resources provide virtual cultural and travel experiences for many places in the world. The Website is packed with information, picture, maps, and problem-based learning lesson plans for teachers. 'Think Quest' is another Website that helps students connect to exploration, problem-based experiences, and cultural connections including an e-pal exchange. There is a particular Think Quest Web site for individuals, such as you, who are preparing to be teachers. Teachers need to help students use the Internet effectively. Three concerns need to be addressed.

4. ASSESSMENT AND EVALUATION

Problem-based learning goes beyond development of factual knowledge about a topic and aims instead at the development of rather sophisticated understandings of problems and the world that surround students. Assessment procedures must always be tailored to the goals the instruction is intended to achieve, and it is always important for teachers to gather reliable and valid assessment information. Along with pen-and-paper test and rewarding students' for both individual and group work, scoring rubrics can be created to measure - The work products created by students, oral presentation, and problem-solving potential.

5. FINAL THOUGHT

The current interest in problem-based learning is quite extensive. It provides an attractive alternative for teachers who wish to move beyond more teacher centred approaches to challenge students with the active-learning aspect of the model. PBL also utilizes powerful Internet resources that make its use more practical than in pre-Internet times. However, problem-based learning still has some obstacles to overcome if its use is to become widespread. The organizational structures currently found in most colleges are not conducive to problem-based approaches. For instance, many colleges lack sufficient library and technology resources to

support the investigative aspect of the model. The standard forty- or fifty-minute class period typical of most secondary schools does not allow time for students to become deeply involved in out-of-college activities. Additionally, because the model does not lend itself to coverage of a great deal of information or foundational knowledge, some administrators and teachers do not encourage its use. Drawbacks such as these cause some critics to predict that problem based learning will fare no better than Dewey's and Kilpatrick's project method or the hands-on, process-oriented curricula of the 1960s and 1970s. It all depends on careful planning and execution, and primarily in the passion of the teacher.

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