

A Review of the Problem Based Learning Approach and its Application in a High School in Shenzhen

Dandan Xie

The Hong Kong Polytechnic University, Hong Kong 100872, China.

Abstract: This report reviews Problem Based Learning (PBL) and its application in a high school in Shenzhen. It first defines PBL as an educational approach that uses real-world problems as a context for students to learn critical thinking and problem-solving skills and summarizes its key features. The report then analyzes the implementation of a PBL-based curriculum called GLOBE in a Shenzhen high school. It finds various challenges such as teacher roles, curriculum materials and so on. In conclusion, fully implementing PBL requires overcoming barriers related to culture, resources and evaluation in the high-pressured exam environment.

Keywords: The Application of PBL; High School; Challenges

1. Introduction

Problem Based Learning (PBL) has been applied to education in many professional fields. It gradually developed into an educational program during the 1960s. Since then a increasing number of PBL programs are adopted worldwide and PBL has been recognized by a number of international organizations(Tompkins, 2001). In recent years, the application of PBL in different contexts has its own advantages and disadvantages. While it is argued that the PBL shaped students into more independent and self-directed learners, it is also claimed that it is hard to find effective ways to measure and interpret the outcomes of PBL program. The second part of this essay reviewed the application of PBL in a high school in Shenzhen according to the five key features of PBL curriculum. In a real high school context, the PBL curriculum may not be likely to be implemented to its full extent due to a range of reasons.

2. What is Problem-based learning?

Problem-based learning (PBL) originated from graduate medical school courses to bridge the gap between academic knowledge and real-world problem-solving (Gallagher, Stepien, Sher, & Workman, 1995). The McMaster Philosophy, established in 1969 in Ontario, forms the basis of PBL, with an emphasis on applying theory to practical issues, developing targeted competencies, and fostering lifelong learning skills (Bayard, 1994; Engel, 1991).

Successful PBL involves initiating learning with a defined, ill-structured problem and positioning the educator as a guide (Gallagher, 1997). Duch, Groh, and Allen (2001) identified that PBL develops learners' abilities in critical thinking, complex problem-solving, resource evaluation, collaborative work, effective communication, and lifelong learning. Torp and Sage (2002) defined PBL as targeted learning addressing real-world problems, with students acting as problem solvers and self-guided learners. Hmelo-Silver (2004) further emphasized the need for collaborative problem-solving in PBL, where students determine necessary conditions, apply learned knowledge, and evaluate methods' effectiveness.

For successful PBL implementation, educators must select ill-structured problems, guide learning processes, and effectively summarize learning experiences (Tchudi & Lafer, 1996). Well-formulated problems should arouse curiosity, stimulate new thinking, test knowledge boundaries, encourage skill and knowledge discovery, promote interdisciplinary exploration, foster strong learning communities, and necessitate collaboration. The outcomes should be observable externally, with collaborative work done predominantly during class time to boost teamwork skills.

3. Advantages and Disadvantages of Problem-Based Instruction

Problem-based learning (PBL) provides several advantages and disadvantages. It offers an environment that mimics real-life scenarios, enabling students to understand interdisciplinary interactions and foster independent learning skills (Gallagher, 1995). Although PBL students may underperform in multiple-choice tests compared to their lecture-based counterparts, they demonstrate superior long-term knowledge retention (Norman & Schmidt, 1992). This advantage may relate to PBL's approach to knowledge structure, promoting acquisition, recollection, and enhancing self-directed learning skills and motivation (Bayard, 1994).

However, PBL evaluations present challenges (Boud & Feletti, 1991). Measuring and interpreting PBL outcomes can be complicated due to standardized testing's inadequacy in capturing process skills cultivated in PBL curricula (Bayard, 1994). While structured short-answer questions can assess problem-solving and knowledge recall abilities, they are time-consuming to develop and score.

The time commitment required by PBL outside of class is another concern. In a university context, PBL students invest more time studying and accessing extracurricular resources (Bayard, 1994). Whether this is viewed as an advantage or disadvantage is subjective. However, the study time for students in high school or elementary school contexts has not been analyzed.

4. The application of PBL approach in a high school in Shenzhen

Shenzhen Senior High School, a top-ranking public school in Shenzhen, implemented a unique curriculum called GLOBE in 2012, primarily based on Problem-Based Learning (PBL) principles. The curriculum's nine principles encompass problem-orientation, cooperative work, multi-dimensional interaction, critical thinking, cognitive connection, reading and speech, belief construction, culture promotion, and intellectual skills. Teachers utilize a mind-map (Figure 1) to execute the curriculum, and an annual "GLOBE Teaching Skills Competition" encourages practical application of these principles. However, the full extent of GLOBE curriculum implementation remains uncertain. Newman (2005) outlines five key features of a PBL curriculum. A detailed analysis of the GLOBE curriculum's implementation (referred to as the PBL approach in the following discussion) in Shenzhen Senior High School will ensue, guided by these five key features.

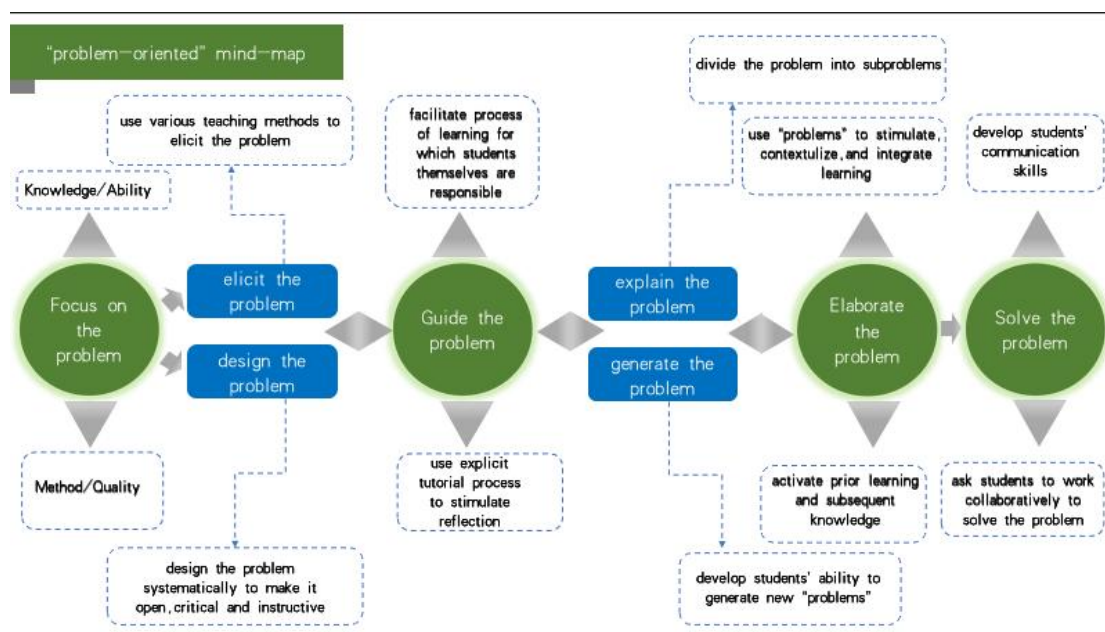


Figure 1: The mind-map of the "problem-oriented" structure

4.1 Teacher as Facilitator

In PBL, the role of teachers is crucial for success (Gordon et al., 2001; Maxwell, Bellisimo, & Mergendoller, 2001; Torp & Sage, 1998). They are required to shift from traditional instructional methods to facilitating learning, acting as project guiders and experienced consultants. However, PBL implementation can be challenging due to limited teacher training, curriculum materials, and academic pressures in Shenzhen Senior High School.

4.2 The Use of an Explicit Process to Facilitate Learning

The PBL tutorial process assists in developing emotional, cognitive, and metacognitive skills. However, the process may be challenging for lower proficiency learners, potentially widening the gap with advanced learners and lowering their motivation (Wolf, 2000).

4.3 Use of "Problems" to Drive Learning

Problems are critical to constructing the learning environment in PBL (Schmidt, 2000). However, the quality of problems in practical teaching can vary due to constraints like tight schedules, specific teaching goals, or language proficiency.

4.4 Learning in Small Groups

Small group learning can facilitate cognitive and metacognitive development (Benson, Noesgaard, Drummand-Young, 2001), but classroom structure can influence its effectiveness. Traditional classrooms in Shenzhen Senior High School, where students sit in fixed rows and lines, may hinder small group discussions.

4.5 Assessment and Problem Based Learning

PBL proponents believe that assessment methods should align with PBL objectives. Formats like the revised thesis question (MEQ) (Knox, 1980) and the triple jump exercise (Painvin, Neufeld, Norman, 1979) have been used to evaluate PBL. However, Shenzhen Senior High School still relies on standardized testing, making it challenging to measure and interpret PBL curriculum outcomes.

5. Conclusion

Implementing PBL in Shenzhen Senior High School presents several challenges. First, the teacher's role transformation from knowledge providers to learning facilitators is a demanding shift (Ertmer & Simons, 2006). Second, the lack of adequate curriculum materials, including sample problems and assessment tools, places a significant burden on teachers. Finally, the current assessment approach, primarily product-driven and reliant on standardized tests, fails to evaluate critical thinking and process skills. These barriers, combined with an examination culture prioritizing test scores, impede the full implementation of the PBL curriculum in this high school context.

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