BRIDGING THE GAP BETWEEN EDUCATION AND WORK: 
EXPERIENCES ON A PROBLEM BASED LEARNING IMPLEMENTATION IN 
SPECIAL EDUCATION

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Abstract

The rapid changes in technology, information and economy call for the new competence such as skills of critical thinking, problem solving, decision making, team working, etc. How to equip students with the requirements for graduate competence has become one of the most crucial responsibilities in school education. Problem-based learning (PBL) emphasizes student-centred process that is constructive, collaborative and calls the students' attention to a "real-world" approach to learning. It also based on the promise that students will be intrinsically motivated toward learning and solve the problems posed because it is presented in a context that simulates real situations.

As an effective pedagogy for improving students' critical problem solving and self-directed learning skills, PBL has been successfully applied for over twenty years in many disciplines. The first and best-known applications of PBL are in the study of medicine in 1960. Since then PBL has spread worldwide to other disciplines in higher education such as architecture, economics, engineering, mathematics, law and education.

Problem-based learning has often been understood only as a method of learning. What distinguish PBL as a teaching technique, as an educational strategy, or even as a philosophy are the changes in the whole learning environment that the approach requires. Defining PBL as an educational philosophy means holistically considering a number of elements: the organizational context; curriculum content and design; and the teaching and learning approach, including the method of assessment and evaluation.

To optimise the benefit of tutorial sessions in special education, the problem based process must be structured. Therefore we present and examine a proposed systematic but simple procedure to design a PBL lesson which is structured to eight phases and we discuss the main functions of the tutor groups which are systematic analysis with activating, collecting, processing and sharing of knowledge.

In this article we present a qualitative overview of a one-year work with students of preschool education. Tutorial groups were formed where students were led through the phases of defining the problem, organizing the information, identifying the learning objectives and applying new knowledge to the problem.

Key words: PBL model, tutor session, special education

1. Introduction

Problem based learning (PBL) has been applied for over thirty years in different fields of education in many countries. The first and best-known applications of PBL are in the study of medicine during the 1960s. Even today can be understood as a revolutionary, radical and real approach to prepare medical students to become effective, efficient and ethical physicians.
Using problems based on actual clinical cases as focal points in a medical program evolved after years of medical faculty and student frustration with the traditional lectures and challenging clinical experiences. Imparting and absorbing the immense amount of content inherent in a medical education was becoming more unrealistic and improbable. Drawing from the tutorial process developed by Barrows (Barrows, Tamblyn, 1980), the medical curriculum shifted from a faculty-centred approach to a student-centred, interdisciplinary process.

Since then PBL has spread worldwide to other disciplines in higher education such as architecture, economics, engineering, mathematics and law. PBL has often been understood only as a method of learning. What distinguish PBL as a technique, as an educational strategy, or even as a philosophy are the changes in the whole learning environment that the approach requires.

The continued use of PBL arises from the recognition that students retain minimal information obtained from traditional didactic teaching and have difficulty transferring knowledge to new experiences (Schmidt et al., 1993). PBL provides an environment in which students can draw upon prior knowledge, learn within the real-world context, and reinforce the knowledge through independent and small group work.

Problem-based learning is an attempt to create learning environments that support meaningful learning.

According to different findings (Chen, 2002) it is possible to compare prescriptive and experiential curriculum. Using these as endpoints on a continuum, one would place PBL close to the latter. Again, depending on one's interpretation and usage of PBL, this can vary. The prescriptive curriculum is more teacher-centred, linear and rational is a part to whole organization. The teaching process is understood as transmitting and learning as receiving. It needs a structured environment. On the other hand the experiential curriculum is more student-centred, coherent and relevant is the whole to part organization. Teaching is seen as facilitating and learning as constructing. It needs a flexible environment.

Bransford (2003) describes some key findings about PBL. Students come to the classroom with preconceptions about how the world works. If their initial understanding is not engaged, they may fail to grasp the new concepts and information that are taught, or they may learn them for purposes of a test but revert to their preconceptions outside the classroom.

To develop competence in an area of inquiry, students must: (a) have a deep foundation of factual knowledge, (b) understand facts and ideas in the context of a conceptual framework, and (c) organize knowledge in way that facilitates retrieval and application. A “metacognitive” approach to instruction can help students learn to take control of their own learning by defining learning goals and monitoring their progress in achieving them.

2. The basics of PBL
2.1. Definitions
There are numerous definitions and interpretations of PBL. Some faculty and institutions ascribe to the original definition which is: PBL is both a curriculum and a process. The curriculum consists of carefully selected and designed problems that demand from the learner acquisition of critical knowledge, problem solving proficiency, self-directed learning strategies, and team participation skills. The process replicates the commonly used systemic approach to resolving problems or meeting challenges that are encountered in life and career (Barrows, Kelson, 1993).

Other definitions abound. A key point to designing, implementing and assessing the student outcomes achievable with PBL is to determine the definition that best fits your teaching philosophy and your institution's mission. Some of the PBL definitions generated include:
PBL is an approach to structuring the curriculum which involves confronting students with problems from practice which provides a stimulus for learning (Boud, Feletti, 1992).

Problem-based learning is an instructional method that challenges students to "learn to learn," working cooperatively in groups to seek solutions to real world problems. These problems are used to engage students' curiosity and initiate learning the subject matter. PBL prepares students to think critically and analytically, and to find and use appropriate learning resources (Duch et al., 2001).

Problem-based learning is a development and instructional approach built around an ill-structured problem which is mess and complex in nature; requires inquiry, information-gathering, and reflection; is changing and tentative; and has no simple, fixed, formulaic, "right" solution (Finkle, Torp, 1995).

Problem-Based Learning (PBL) is an instructional strategy that promotes active learning. PBL can be used as a framework for modules, courses, programs, or curricula (Samford, 1998).

2.2. Aims and characteristics of PBL
Do PBL students gain better qualifications for working and professional life than students pursuing a so-called traditional curriculum? The aim of PBL is build a bridge between working life and education. Research and evaluation is needed to examine how well this succeeds.

According to Barrows and Tamblyn (1980) and Engel (1998), PBL can, regardless of discipline, enhance students' achievement of: (a) adaptation and participation in change, (b) application of problem solving in new and future situations, (c) creative and critical thought, (d) adoption of holistic approach to problems and situations, (e) appreciation of diverse viewpoints, (f) successful team collaboration, (g) identification of learning weaknesses and strengths, (h) promotion of self-directed learning, (i) effective communication skills, (j) augmentation of knowledge base, (k) leadership skills and (l) utilization of relevant and varied resources.

One of the fundamental assumptions in PBL is that it is essential that the students develop effective self-directed learning skills, are able to identify what they need to learn, can locate and use appropriated resources, apply the information back to the problem and reflect on the evaluation of their approach for greater efficiency and effectiveness (Barrows 1998).

Complex structured problems provide the focal point(s) and stimuli for the course, curriculum and/or program. Learning is now student-centred and students work in small groups to solve/provide multiple solutions to problems. Learner assessment is enhanced by self and peer assessment.

2.3. The overview of PBL process
In most courses, students are bombarded with enormous amounts of material to read and display their comprehension by completing related problems. These problems typically have required a neat, pat answer. This method does not prepare our students for professional problem resolution.

PBL begins with students, working in small groups, delving into, determining key issues, and then solving a "real-world" problem under the guidance of a facilitator. By focusing upon a realistic problem, students develop a varied and deeper perspective and knowledge of the subject area. This process is not a new one; indeed, it has its beginnings in the ancient apprenticeship model which is learning by doing.
2.3.1. PBL roles and responsibilities

The facilitator role allows the faculty member or student mentor to act as a/an (a) content and procedural resource person, (b) facilitator of group processes, (c) guide to additional resources, (d) sounding-board person, (e) learner, as well.

Issues for faculty in delving into PBL, particularly in the learning stages, is the amount of time needed to prepare course materials, develop problems, train other facilitators and determine authentic assessment of student work. The other critical issue is the role reversal. Instead of being the "sage on the stage," the faculty member is now to be the "guide on the side." Instead of lectures, the faculty member now models various methods of problem-solving, sometimes referred to as "cognitive apprenticeship" learning (Brown, Collins, Newman, 1989). Meta-cognitive questions such as "How do you know that?" "What assumptions might you be making?" and "What else might you need to know?" are used by faculty versus dictating how to solve a problem.

The student role is altered with PBL. PBL contrasts considerably with the traditional teaching most students have encountered. Students, particularly freshmen, have difficulty with the concept and use of self-directed learning. Be aware that students may react to the idea of PBL with shock, denial, anger, resistance, acceptance and finally, confidence.

Students also must take responsibility for their own learning. PBL encourages students to identify their learning needs and determine the resources they will need to use to accomplish their learning. With the independent learning comes considerable collaboration with other students and faculty. Collaborative work among students facilitates their comprehension of the problem and the application to future situations. Collaboration is an essential skill for students to gain as they will most likely be working as members of teams in their respective workplaces.

Two often difficult tasks that students encounter in PBL is the process of reflection and peer assessment. Reflection, or self-assessment, allows the student to complete the learning cycle. What did I learn? What more do I need to know? How can I approach this problem in the future? And so forth are key questions we want students to ask of themselves. Students must become proficient in not only assessing their own progression in learning, but that of their peers as well. The ability to monitor one's own learning as well as providing credible feedback to one's colleagues is an important personal and professional skill.

Orienting students to PBL is a must. One approach would be to introduce the concept and rationale for use of PBL in a course (or curriculum). Another would be to have the students work on a sample problem which is followed by a debriefing session.

2.3.2. The Poikela model about PBL

In the presented research work was used the Poikela (2003) model about PBL which defines eight stages:

1. Problem setting or selecting discussion leader, recorder and observer and giving their tasks (observer is needed for peer feedback and for developing reflection and learning skills in group; s/he can (should) also participate in problem discussion) with sub stages of reading the problem and clarifying terms and concepts. A typical trap in this stage could be using too much time which can confuse instead of clarifying.
2. Brainstorming or the stage of free association: producing and generating ideas about aspects of the problem is meant for revealing and elaborating previous knowledge and experiences and writing key words on flip charts, white boards or memo sticks.
3. Grouping ideas is the stage of analysing and organising the ideas inductively from down to up, categorising the idea groups to coherent and distinctive characters and creating a logical and thematic basis for problem solving and learning process. A typical trap could be
that we produce too little groups (“Everything seems to connect to everything.”) or too many
groups (“Just a few things seem to be connected to each other.”).

(4) Choosing or analysing and reasoning the problem areas for learning process,
choosing the most actual and essential areas from the point of learners and making decision
about the order of importance and committing to joint task. We could fell in a typical trap of
using the logic of content without discussion about actual learning needs.

(5) Learning task is the stage of finding out the unknown and unclear issues of the
chosen area, formulating learning needs, monitoring means and sources for knowledge
acquisition, checking learning objectives and mutual commitment for knowledge acquisition.
Different typical traps could emerge: too large or too small learning tasks compared the
available time between tutorials; too little time for checking commitments of the learning
tasks; forgetting reflection and assessment of shared learning process of the first session.

(6) Knowledge acquisition is the phase of self-directed information acquiring and
working in pairs or small groups, using different sources of knowledge, studying, reading
and writing likewise researching. A typical trap is unskilled information literacy, insufficient
skills of knowledge acquisition and neglecting theoretical learning material.

(7) Knowledge integration or the stage of introducing the new knowledge acquired
during the self-directed study, reviewing, integrating and synthesizing the shared knowledge,
formulating a visual presentation, map or list of the core and main concepts and links between
them, writing a memo of the results. A typical trap is leaving things open without closing
decision about learning results, presentations or memos.

(8) Clarifying or comparing the new knowledge to the problem at the start of the cycle
is the last stage. Here we are in the process of checking the learning results, assessing the
achievements of problem solving process, group dynamic and shared and individual learning.
A typical trap could be concentrating just to results and neglecting process assessment.

3. Research aims
Our aims are to produce pre-school teachers that are able to (a) engage in the complexity and
diversity of everyday problem situations, (b) become life-long learners through continuing
professional development, (c) use reflection to inform special educational decisions, (d) work
collaboratively within a team, (e) empower the client, through partnership, to identify and
solve their own problems (f) explore students’ understanding and insights into the identified
aspects of curriculum design that enhanced or inhibited their creativity.

4. Methodology
We were directed to analyze the outcomes achieved in small group learning only during the
school period 2005/2006 with forty third grade female students of preschool education who
were attending the course of special education.

In such groups learning represents a laboratory for group problem solving that allows
students to perform many outcomes and it allows the students in the group to examine
meaningfully real world information and situations, discuss, practice and learn from one
another under the guidance of a facilitator within an agreed time frame. The facilitator works
with small team of students to facilitate and stimulate their thinking through observation,
timely intervention and interactive discussions.

The outcomes that can be achieved from small group learning were as follows: (a)
compare learning performance with peers, (b) develop a sense of responsibility for their
learning process, (c) learn about human interaction, develop interpersonal skills and become
aware of one’s own emotional reactions (Learn how to listen, receive criticism, give accurate
and candid feedback to each other and facilitate self-evaluation.), (d) develop models of
workshops to use in future work.
Learning with the Poikela PBL model lasted for sixteen sessions for a four month period. At the end of this period the students were given a questionnaire which was the source for our quantitative and qualitative analysis. The questionnaire was divided in two parts: (1) twelve questions about the suitability of the PBL method to students and (2) one open question for writing their feedback about the used method of learning.

5. Results

5.1. Descriptive analysis of students' questionnaire survey
The descriptive analysis showed that in general students hardly change their way of studying. Although a new model of teaching gave them the opportunity of becoming more and more aware of the importance of self-directed learning, well aware that a deep level approach is more efficient during self-study and that elaboration helps to remember new information better.

Students complained about the amount of work/attention they have to spend to special education and group dynamics.

<table>
<thead>
<tr>
<th>Question</th>
<th>M</th>
<th>Sd</th>
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<tbody>
<tr>
<td>1. My beliefs about learning have changed in the last months.</td>
<td>2.1</td>
<td>1.0</td>
</tr>
<tr>
<td>2. I become more and more aware of the importance of self-directed learning.</td>
<td>3.4</td>
<td>0.9</td>
</tr>
<tr>
<td>3. I use different study strategies to remember new information.</td>
<td>2.1</td>
<td>0.7</td>
</tr>
<tr>
<td>4. I am well aware that a deep level approach is more efficient during self-study.</td>
<td>3.0</td>
<td>0.7</td>
</tr>
<tr>
<td>5. I reflect about the way I study.</td>
<td>2.9</td>
<td>0.6</td>
</tr>
<tr>
<td>6. Based on my reflections I change my study behavior.</td>
<td>2.1</td>
<td>0.8</td>
</tr>
<tr>
<td>7. I am aware that elaboration helps me to remember new information better.</td>
<td>2.8</td>
<td>0.8</td>
</tr>
<tr>
<td>8. I protest when tutorial group members quote literally from literature sources.</td>
<td>1.3</td>
<td>0.6</td>
</tr>
<tr>
<td>9. When students try to skip to brainstorm about a problem. I point out the importance of activation of prior knowledge.</td>
<td>1.3</td>
<td>0.6</td>
</tr>
<tr>
<td>10. I use the technique of concept mapping during my self-study.</td>
<td>1.7</td>
<td>0.8</td>
</tr>
<tr>
<td>11. During the phase of synthesis I insist on developing a concept map or schema.</td>
<td>2.2</td>
<td>0.4</td>
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<tr>
<td>12. During evaluations I bring up the way we discuss the subject matter.</td>
<td>2.8</td>
<td>0.8</td>
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Table: Descriptive statistics of the Student questionnaire (4 point scale).

5.2. Qualitative analysis of students' questionnaire survey
Personal feedback discussions between a tutor and the students revealed an interesting issue: Most of the students found PBL actually quite fun. Students' feedback about the suitability of the PBL-method to students was as follows:

- "I like working in a team. It is also nice to notice the different viewpoints on the topic that are found in the discussions. There is almost always somebody in the team who can help in understanding the problem."
- "I learn more efficiently on traditional lectures. The PBL does not work in most of the given topics. The whole thing doesn't work."
- "I think we now have the confidence and being able to say, well I actually disagree with you."

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"I think you can be more open and think more broadly with your group because you've all been through that period together."

"I know with our group we spend a lot of time outside the timetabled times together..."

6. Conclusion

The PBL implementation in special education promotes students’ team work which supported the learning process of individuals. Students’ social skills and reporting skills developed. The tutors learned to know students better and could take their feedback into consideration very quickly. The co-operation between teachers increased and grew deeper. The tutors got a better view to the students’ study work as a whole. The tutors got better understanding about the curriculum. The creation of problems was difficult but did success every time. Additional advantages were that the students started to think about the teaching, coaching and learning processes. There were many fruitful discussions and planning situations between students. Putting PBL in context tends to solve students’ lack of motivation. They can see the connection between what they are learning and the professional practice. Students are less interested in grades and more in the process.

The purpose of this study was to increase students’ engagement in problem based learning activities and to identify misconceptions about special education. Students showed that they're able to solve real problems, work in small groups, state what they know and what they need to know, find information from different sources, acquire problem solving skills and interpersonal and communication skills.

Students participated actively and took responsibility in their own learning. They integrated their knowledge and skills and constructed their own understanding and knowledge of the world. (Barrows, 1996)

Let us end with John Dewey's (1929) quote: “Genuine freedom, is intellectual, it rests in the trained power of thought, in ability to turn things over, to look at matters deliberately, to judge whether the amount and kind of evidence requisite for decision is at hand, and if not, to tell where and how to seek such evidence.”

7. References


