Problem-based Learning: a Problem with Education?

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Abstract

As the discovery of penicillin from a 'failed' medical experiment illustrates, it is good practice to revisit apparent teaching and learning 'failures'. Two Hong Kong case studies are here reviewed for they report educational 'failures' evidenced by students displaying a negative learning experience while undergoing Problem-based Learning (PBL). The first case study involved Primary Four and Five pupils; while the second investigated post-Secondary school students. An analysis is provided of these two negative learning experiences followed by a critique of possible solutions. The findings are intriguing - Problem-based Learning is shown to provide a flexible, responsive pedagogy that reflects Hong Kong's current learning priorities. It is argued that the reported educational 'failure' reflects a tension between learner diversity and educational priorities, which raises the possibility that these 'failures' indicate not a 'problem with PBL' but rather a 'problem with education'.

INTRODUCTION

Given that the origins of Problem-based Learning (PBL) have been traced back to the educational pragmatism of John Dewey (Menon, 1997) it is perhaps not surprising that PBL's claim to present real-world problems within a learning context currently attracts popular attention amongst educationalists (Savin-Baden, 2000; Little et. al, 2001; Tan, 2003).

Specific educational claims for PBL have arisen from findings in a range of educational settings e.g. PBL has been shown to bridge the gaps between theory and real-world practice in both medical education (Balla, 1990a,b; Schwartz et. al, 2000) and engineering (Perrenet, Bouhuijs, & Smits, 2000). At a more general educational level, PBL has been found to enhance specific learning skills e.g. knowledge construction and reasoning (Albanese and Mitchell, 1993); building positive study attitudes (Kaufan and Mann, 1996) and the transfer and integration of concepts to new problems (Norman and Schmidt, 2000).

Such positive claims have led to the practice of PBL to be subjected to closer scrutiny. For example Tan, Little, Hee and Conway (2000) note that the ability to pose and define a problem can be limited by the learner's access to information. Within conventional school settings for example, the potential of PBL to expose students to open-ended learning was found to be constrained by the higher priority of meeting and following the formal school-based curriculum.

Recognition of a tension between the open-ended learning offered by PBL and the closed-learning of the formal curriculum has stimulated debate that currently focuses on making education relevant to the 'real-world'. This view argues that the real world is filled with problems, projects and challenges and that creating a "curriculum that reflects this reality makes sense" (Glasgow, 1997). Within Asia a similar debate has centred on questioning the ability of the education system to meet the market-demands for a knowledge-based workforce (Levin, 1994; Mok & Chan, 2002). In Hong Kong the argument that education should reflect reality has been strongly promoted (Learning to Learn - Curriculum Development Council, 2000) and accordingly PBL's potential to expose this 'reality' to Hong Kong students would appear to have a pivotal role in fostering current education reforms (Cheng, 2002). Where PBL's potential to expose 'real-life' to Hong Kong students may not be in doubt, professional teachers may legitimately question whether PBL really fosters students' learning.

To explore whether or not PBL fosters students' learning, this paper reviews two Hong Kong case studies where PBL students display learning problems and argues that the findings may question the current assumption that Hong Kong's education should reflect reality.

WHAT IS PROBLEM-BASED LEARNING?

For Tan (2003), a current definition of PBL is:
a progressive active learning and learner-centred approach where unstructured problems are used as the starting point and anchor for the learning process

Tan also acknowledges that, for some students, the experience of PBL can induce a sense of helplessness. Rather than exploring the reasons for their helplessness, Tan offers a three-point checklist for PBL implementation:

1. Is the 'problem' set in a contexts meaningful?
2. Does tutor-support include a protocol of questions?
3. Does appropriate scaffolding support self-directed learning?

However the very need for such a checklist indicates that the implementation of PBL has not always been a complete success. Accordingly it is appropriate to identify and explore why PBL may not be helpful for all students.

To explore the possibility that PBL may not be helpful for certain types of students, two Hong Kong case studies are now examined.

Context And Research Method

The first case study involves Primary Four and Five students (n=240). These students were drawn from a range of Hong Kong Primary schools whose staff volunteered to have their students experience PBL. Their PBL experience comprised a key element which was a Baptist University two-day Summer School initiative that aimed at promoting thinking skills (www.hkbu.edu.hk/~think). The specific PBL experience to be considered here was monitored and reported by the host staff in co-operation with the pupils' regular school teachers (Wu and Chan, 1999).

The second case study involves post-Secondary Hong Kong students (n=25). These post-secondary students were in their first year of a two-year Bachelor in Education (Add-on) programme at the Hong Kong Institute of Education where part of their teacher-training programme employed PBL. This case study was monitored and reported by the relevant teaching staff (Forrester, 2001).

The research method employed here involves revisiting these two published case studies from the

perspective of investigating the students' reported problems with PBL. The research method involves:

1. reviewing the findings of two published PBL case studies
2. analyzing the underpinning problems with PBL
3. critiquing PBL and individual learning styles

Having outlined the context and research method, the following investigation begins by reviewing these two PBL case studies and their respective findings.

1st Case Study: Primary School PBL

Eight PBL forums were formed from (n=240) Hong Kong Primary Four and Five students. Each PBL forum (n= 30 pupils; duration approx 1.5 hrs) was both led and monitored by the Baptist University Summer School host staff and the pupils' regular classroom teachers. Each forum comprised pupils (girls/boys) from the same school/class. Although details of the pupils' family background were not reported, it is reasonable to assume that participation in this thinking Summer School signified that these schools recognized certain limitations with their current curriculum.

All PBL forums first viewed a traditional story modified to include popular local children's cartoon characters. Subsequently, the pupils discussed aspects of the story.

Embedding PBL within a 'discussion scaffold' each PBL forum followed a five-step cyclical sequence that alternated between Student and Instructor-led activities. The assumption here was that thinking is enhanced by prioritizing cooperative and cognitive learning:

PBL Forum: 5-step sequence

Student-led activities	Instructor-led activities
Step 1. view video brainstorm contextual questions	
	Step 2. introduces higher-order questioning (Why, Who, What, When, Where, How.)
Step 3. brainstorm higher-order questions select (by voting) one of the questions	
	Step 4. introduce 1. a set of rules for discussing the selected question. "I dis/agree, because......" 2. how to examine ideas by using thinking skills/tools (e.g. an idea may be valued in terms of its Plus, Minus, Interest)
Step 5. circle-discussion of the selected question	

Findings

The reported research method generated cross-validating observations made in tandem by both participant observers - the pupils' regular classroom teachers and the researchers' own observations. These observations were supplemented by both teachers' and researchers' post-event reflections (Wu and Chan, 1999). Across all eight PBL forums, two different sets of student attitudes or behaviors were observed:

- 'cooperative' students (80%) who discussed fully and with engagement.
- 'non-cooperative' students (20%) whose discussion contributions were characterized as being confusing, chaotic, non-productive, and non-constructive.

2nd Case Study: PBL and the training of post-Secondary students

Post-Secondary students (n=25; age range 19-22 years old, all female) embarking on their first year of a two-year Bachelor in Education programme at the Hong Kong Institute of Education were observed over one thirteen week semester. Part of their studies aimed at promoting professional reflection. Participants were required to:

1. formulate individual research proposals

2. offer an oral presentation of the research project (at local conference standard)

3. present a final written research report (following local conference guidelines)

PBL scaffolding support was dispersed throughout the thirteen-week semester. The assumption here was that reflection is enhanced by prioritizing periodic learning that is practical and cognitive:

- research methods; library search; research report writing conventions

- group meetings
- whole-class'research-in-progress reports'
- explicit awareness both of choice and the need for the individual to be able to defend that choice

Reported Research Method and Findings

The research method involved a participant-observer - the instructor maintained a weekly diary, whose observations were cross-validated by both formal and informal feedback sessions with participants. Supplementary data were obtained from students' mid and end semester anonymous course evaluations. The reported findings were of students rapidly dividing into two groups:

- a larger group (n=20) who engaged with the set practical learning and went on to successfully present papers at an international conference.
- a smaller group (n=5) who, though socially interactive, were disengaged and challenged by the set practical learning.

Participants' informal feed-back was reported as being guarded but towards the end of the programme 'disengagement' was acknowledged and sourced to a questioning of their commitment to teaching as a career. The instructor's weekly diary entries acknowledge this minority's growing 'disengagement', the majority's 'success' and the initial difficulties of identifying the source issue. Formal mid-semester anonymous feedback confirmed 'difficulties' but not the source issue. Approximately two-thirds through the timetable, a source issue was identified and corrective initiatives were implemented - involving counseling and exploring alternative learning paths - however the effectiveness of these initiatives was mitigated by curriculum time-constraints.

Analysis - Why Does PBL Ill Serve Some Students?

The analysis here takes as its focus those students who appear ill served by their PBL experience. This analysis will illustrate potential weaknesses within the open-ended education of PBL.

In both case studies, an analysis of the reported findings reveals two key features.

First, both case studies display contextual similarities. None of the participating students were entirely voluntary - the Primary pupils were 'volunteered' by their respective schools; the post-Secondary students were undertaking a mandatory course. Both curriculums were delivered within fixed time-constraints. Both involved students assumed to be academically homogenous - primary schools shared the same banding; tertiary students passed the same entry vetting-procedures.

Second, neither of the two case studies demonstrates homogenous results - in both case studies, a majority was reported as 'active' PBL learners' alongside a minority reported as being 'ill-served' by PBL.

For school teachers, dealing with students who are neither entirely voluntary nor homogenous learners is perhaps not unusual and is commonly termed either teaching a 'mixed ability' class or taken as an example of the professional challenges presented by 'inclusive education'. Certainly the professional challenge of dealing with such learners is widely acknowledged - along with recommended appropriate strategies. For example, Brown (2001) advises teachers facing 'mixed ability' or 'inclusive education' that group discussion/ presentation may challenge those students who experience general delays in cognitive functioning. In other words, not all students can cope with the exposure of PBL group discussions. Brown's recommended strategy to facilitate such students' learning involves providing repetition and practice of basic information and skills - e.g. hands-on activities. In contrast, Guillaume (2000) offers an alternative view by explaining that students challenged by social and/or behavioral problems commonly display off-task behavior, an inability to work independently and poor social skills. In other words, not all students develop into self-learners. To help such students, Guillaume's suggested strategy is to provide cooperative learning.

For professional teachers engaged in addressing the challenges of 'mixed ability' or 'inclusive education' the strategies recommended by Brown or Guillaume - providing opportunities for 'hands-on' or cooperative learning - are perhaps neither new nor for the professional teacher, too demanding. What such strategies serve here to illustrate is that in education the professional teacher is a flexible teacher who recognizes that the learning context priorities or at least encourages students to have individual learning styles.

PBL and individual learning styles

Two examples serve here to illustrate the relationship between the demands of PBL and students' individual learning styles. For illustrative purposes, both examples are hypothesised as being sited within a Hong Kong class setting, in which a PBL class teacher is adopting one of the two coping strategies offered by Brown and Guillaume. In each example the selected strategy is then critiqued in terms of the learning outcomes.

Following Brown (2001), it is hypothesised that a class teacher presents PBL within a context or problem that emphasises practical applications. A critique of this strategy in terms of the learning outcomes reveals that the teacher may expect to find that this emphasis on practical applications may confound students who flourish within the contexts of cooperative and cognitive learning.

Following Guillaume (2000), it is hypothesised that a class teacher presents PBL within a context or problem that emphasises cooperative learning. A critique of this strategy in terms of the learning outcomes reveals that the teacher may expect to find that this emphasis on cooperative emphasis may confound and disadvantage students who flourish within the contexts of practical and cognitive learning.

As the above two critiques serve to illustrate, PBL by itself, does not offer a panacea to meet all students' individual learning needs for PBL. Instead, like many teaching approaches, it is mediated through the teacher's choice of pedagogy.

The question then arises, what influences the teacher's choice of pedagogy? In both the Primary and post-Secondary case studies, the evidence indicates that the teachers' choice of pedagogy was successful for the majority but less so for the minority. On reflection, this situation may have been improved had the teachers adopted a multi-pedagogic approach - in effect matching pedagogies to individual learning styles. However the teaching contexts of each case study appears to have narrowed the teacher's choice of pedagogy. In the Primary case study, the 'teaching agenda' held that thinking was to be enhanced by prioritizing cooperative and cognitive learning. In the post-Secondary case study, the 'teaching agenda' held that reflection was to be enhanced by prioritizing periodic learning that was practical and cognitive.

What influences the teacher's choice of pedagogy - as illustrated by these two case studies - is the 'teaching agenda'. As is perhaps common throughout Hong Kong's education, teachers are positioned as mediators between a mandatory curriculum and 'streamed-by-ability' students. Where it is assumed that students are 'streamed-by-ability', their teacher's choice of pedagogy will tend to be narrowed to address the perceived imperatives of the mandatory curriculum.

SUMMARY

PBL has been demonstrated to be an inherently flexible pedagogy that reportedly has been successfully implemented across diverse knowledge areas such as medicine and engineering and also - with less reported success - across the more general educational contexts of Hong Kong students ranging from primary levels to post-secondary levels. This flexibility can here be characterized as demonstrating that PBL:

- is adaptive to a wide range of educational contexts
- promotes active learning
- provides a learner-centred approach

A review of two case studies of PBL within the more general educational contexts of Hong Kong students ranging from Primary age to post-Secondary however demonstrates that despite PBL's flexibility, certain students remain ill served. An examination of these PBL-failed students serves here to highlight that solutions and alternative learning scaffolds are available and could readily be adapted to address a plurality of individual learning styles.

A critique of these PBL adaptations then serves to illustrate that in teaching/learning the 'problem with PBL' lies not within this one pedagogy but arguably within a mis-match between educational priorities and student learning styles. For example, where teachers mediate PBL through cooperative learning (as in the first case study involving Primary students), such a priority may ill-serve those who flourish through practical learning. Similarly, where teachers mediate PBL through practical learning (as in the second case study involving post-Secondary students), such a priority may ill-serve those who flourish through cooperative learning. In other words, it appears that it is not PBL but rather the teaching and learning contextual priorities - the 'teaching agenda' - that may not match individual learning preferences.

Recognition that teaching and learning contextual priorities - the 'teaching agenda' - may not match the individual's learning preferences invites teachers to question these priorities. Such questioning is helpful for it serves to highlight that the 'problem with PBL' may reflect a more general 'problem with education'.

Of this more general 'problem with education', Tan, Little, Hee and Conway (2000) have argued that the open-ended learning of PBL can be constrained by formal curriculums. This paper expands their view, by highlighting that formal curriculums may only be part of a broader 'problem with education', which constrains teachers' choice of pedagogy.

As the two case studies illustrate, the teacher's choice of pedagogy can be constrained by contextual similarities. First, both case studies report a curriculum located within a constraining timeframe. Second, both case studies report students as assumed to be academically homogenous. Where students are assumed to be academically homogenous, teaching that addresses a plurality of individual learning styles may have a low teaching priority. It is this combination of contextual similarities that constrained teacher's choice of pedagogy and which suggests that a 'problem with PBL' may rather be a 'problem with education'.

To resolve this learning and teaching 'problem with education', one solution rests in challenging 'ownership' of the curriculum along with pedagogic reliance on assumptions of 'homogenous' learners built on the questionable legitimacy of 'streaming-by-ability'. Where a curriculum accounts for all the allocated time, conflict with learner diversity appears inevitable and the teacher may expect to encounter student 'failure'. However, where a curriculum is 'negotiated', where teachers feel empowered to exercise their professional flexibility, then pedagogic reliance on assumptions of 'homogenous' learners can be reduced and the essential unity of learning and teaching restored.

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