Review Article

Problem-Based Learning: a Time to Reflect and Remediate

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Abstract

Purpose: Problem Based Learning (PBL) has become a widely accepted learning method due to its student-centred philosophy and non-didactic nature. While there are recognized benefits of PBL, there is equal concern about the problems which arise during execution. After several cycles of implementation or reviews, schools should be able to determine whether PBL is effective for their institution, if not, it may be useful to reflect on the challenges and consider remediation.

Methods: The rationalization for this motion is discussed based on the status of PBL in medical education, the various types of PBL, the problem cases, cultural contexts, facilitators' skills, learning spaces and alternative teaching and learning methods.

Results and Conclusion: We conclude that educational strategies may be relooked and redesigned consistently to best suit the purpose. We do not suggest that all schools drop PBL, however, it is worthwhile to consider remediation or alternatives, if PBL is found to not effectively achieve the learning outcomes. The principles of constructive, contextual, collaborative and self-directed learning should continue to be the foundation for devising such educational strategies.

Keywords: Curriculum; problem-based learning; self-directed learning

Introduction

Most institutes of higher education aim to create active and meaningful learning environments for their students, and health professional schools are no different. There is a constant pressure to incorporate growing knowledge, specialized skills, professional and ethical attitudes, and patient and societal expectations into the curricula. Health professional schools adapt by introducing new learning methods that are professed to meet these demands.

Problem Based Learning (PBL) has become one of the widely accepted, innovative solutions due to its more student-cantered and non-didactic nature.

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Consequently, some medical and health professionals' schools have adopted PBL curricula to promote active and meaningful learning skills as PBL enables constructive, contextual, collaborative and self-directed learning (Dolmans *et al*., 2005).

Constructive learning allows processing of new knowledge based on activation of prior knowledge (Yew & Schmidt, 2009). Contextual learning uses cases or problems relevant to the practice that enhance the learners' awareness of their learning for better recall and application (Kassam *et al*., 2006). Collaborative learning fosters better communication, teamwork and helps to build knowledge as the learners' discussion acts as a scaffold to construct and add new knowledge (Dolmans & Schmidt, 2006). Collaborative learning also enhances shared situational awareness in a dynamic process. Self-directed, student-centred adult learning in PBL has a positive impact on life-long learning as it aids the learners to build up autonomy in acquiring the knowledge, practical skills and attitudes necessary for their professional career development. With many schools adopting the PBL curricula, it may be

appropriate to reflect on this widespread adoption of PBL.

The literature is replete with reviews on PBL, and although some have suggested common benefits, the heterogeneity in the working definition of the PBL based curricula makes the interpretation and comparison of the results across these studies difficult (Neville, 2009; Newman, 2003). A recent paper by Frambach *et al.* (2012), raises the timely question on whether PBL should be practiced worldwide. This is an important and relevant question, as literature has suggested that PBL may not be a one-stop solution for all the challenges of present day higher education. The suggested benefits of PBL are largely confined to knowledge application, inter-personal skills and student satisfaction, mostly related to the social domain in this method of learning (Dochy *et al*., 2003; Sanson-Fisher & Lynagh, 2005; Koh *et al.,* 2008). However, for training of future clinicians, some authors have suggested that these benefits alone would be insufficient and require re-examination. Instead, there have been recommendations that to develop strong clinical practice skills there needs to be an emphasis on fundamental knowledge delivered through content expert tutorials and bed-side teaching (Franklyn-Miller *et al*., 2009). While we acknowledge and recognize the various benefits of PBL based on personal experience and literature, there is equal concern about the problems which arise during execution. After several cycles of implementation or reviews, schools should be able to recognize whether PBL is effective for their institution, if not then it may be "time to reflect and consider alternatives". Some aspects in the rationalization of this motion are discussed in the paper.

The 'Superhero' status of PBL

PBL has been perceived as an improvement of traditional educational methods and as an innovative learning method representing real life problem situations and stimulating reasoning. Many schools were quick to join the PBL transformation, most likely out of a desire to be innovative and not to lag behind competitors (Camp, 1996). In this context, PBL can be viewed to have a 'superhero' or iconic status in health professionals' education. There is also an inherent flexibility in the design and delivery of PBL that has enabled educators to integrate findings from cognitive psychology and PBL literature over the past 2 to 3 decades (Neville & Norman, 2007). But this readiness for the schools to adopt PBL has been reported to be more out of the 'publicity and attention' gained, than of evidenced positive educational outcomes of the PBL approach (Sanson-Fisher & Lynagh, 2005). In some instances, there is a perception that the embracement of the paradigm shift to PBL results in decreased reliance on didactic teaching, resulting in gaps in core knowledge amongst medical students (Epstein, 2004). While a recent systematic review has shown that PBL has no significant negative impact on knowledge acquisition, the lack of appropriate tools or outcomes to determine the significant effects of PBL may cause continued skepticism amongst teachers (Hartling *et al*., 2010).

With globalization of PBL, the cross-cultural implications need to be evaluated too. Besides cultural challenges in self-directed learning, there are other factors such as teacher-centred secondary education where students are used to receiving information from teachers, which pose a problem in directly implementing PBL in the non-western cultures. Thus, it would be worthwhile to explore or create alternatives that best fit the local context (Frambach *et al*., 2012).

The various types of PBL

The implementation of PBL and its weightage in the curriculum varies widely. As a result, PBL has been categorized into 4 types from type I to IV (Lim, 2012; Kwan & Tam, 2009). Some schools that follow the traditional curriculum have only few PBL sessions for the entire academic year (type I). In such situations PBL can be perceived as a decorative component added to give a modern look or some variability to the conventional teaching techniques practiced by them. Some may adopt PBL to supplement other teaching and learning activities (type II), while some use it for the purpose of teaching the problem solving approach and skill (type III). However, there are few universities that rely entirely on PBL as the sole teaching method to achieve all components of learning (type IV). A recent review on deep and surface learning in PBL has reported that the context of the learning environment has an effect on deep learning. Programme with a curriculum wide application of PBL have reported favourable and positive effects (Dolmans *et al*., 2015). Some schools have modified it to meet their requirements instead of adopting the standard PBL (Lonka, 2013). The other types of PBL are inter-professional PBL (Lin *et al.,* 2013), E-PBL or online PBL (Kim & Kee, 2013), PBL without facilitators (Steele *et al*., 2000) and large group PBL (Kingsbury & Lymn, 2008). Unfortunately, the innovative types of PBL have been criticized

as disruptive to achieve the intended learning principles, and having uncertain evidence of positive congruence with standard PBL. The principle of constructive, contextual, collaborative and self-directed learning (Dolmans *et al*., 2005) in PBL should be ascertained in these newer formats and continuously evaluated for its impact on learning.

Problem first, patient second?

In contemporary medical education, patient-centred care is the prime focus for the graduating medical doctor. It is said that "a patient is more than his or her biology, symptoms or body" (MacLeod, 2011). Inter-professional care and inter-professional learning emphasize patient-centred approach. The PBL case is an important tool for enabling patient-centred education but not much is researched as to what extent PBL results in patient-centred care. The 'problem cases' in a PBL curriculum are chosen and written in order to cover different concepts and also revisited numerous times across the entire curriculum. However, the intended outcomes may not be achieved if the design of the problem case is inadequate and may even have a negative effect on student learning. MacLeod summarized how PBL cases can disrupt patient-centred clinical learning with examples such as, the detective case, the shape-shifting patient, the voiceless PBL person, the joke name, the disembodied PBL person and the stereotypical PBL person (MacLeod, 2011). The patients in such PBL cases are often a "list of biomedical symptoms and objects of derogatory humour rather than real life examples" (MacLeod, 2011). Hmelo-Silver (2004) mentions that "in order to foster flexible thinking, problems need to be complex, ill-structured, and open-ended; to support intrinsic motivation, they must also be realistic and resonate with the students' experiences". Considerable thought and resources have to be utilized to design a 'good problem case' that fully realizes the benefits of PBL which nurtures patient-centred, professional and thought-provoking discussions.

Lately, there have been many reports on the decline of bedside teaching and this has been attributed to various causes such as reforms in medical education introducing clinical scenarios into the preclinical curriculum, increasing responsibilities on academic clinicians, invasion by technology producing largely technology-dependent clinicians as well as the increasing use of simulated patients for teaching (Ahmed & El-Bagir, 2002; Franklyn-Miller *et al*., 2009; Salam *et al*., 2011). Franklyn–Miller *et al*., (2009) argue that a thorough understanding achieved through learning from content experts is essential and PBL based models may have driven the decline of clinical skills learning. Oslerian principles of eliciting history and examination of real patients are diminishing, causing the risk of a decline in the diagnostic skills of the student clinician. There are PBL-based curricula that incorporate elements of PBL during clinical attachments such as, by using real patient encounters, learning objectives related to pathophysiology of disease and clinical skills and management generated by students collaboratively (Macallan *et al*., 2009). Simulating a multi-professional clinical practice environment, some have taken PBL beyond training their own students by conducting PBL in inter-professional groups (Lin *et al*., 2013). Perhaps this continuity in providing real work-based scenarios for PBL is needed for students in a PBL curriculum, especially as they progress to the clinical years and start to interact within a multi-professional setting.

Is it every learner's cup of tea?

Depending on the preferred method of learning, some students may find it hard to adapt to PBL which demands more independent learning on the student compared to other learning methods. The adaptability and acceptability of PBL within the student population thereby shows incongruity. Papinczak (2009) highlighted that deep strategic learners have strong positive comments about PBL and they are less vulnerable to the stresses of a PBL curriculum. In a review comparing the effect of PBL on student approaches to learning, it is reported that deep learning is increased but with a small effect size while surface learning remained relatively unchanged (Dolmans *et al*., 2015). It is interesting to note that while PBL may have an effect on student learning approaches, the extent of this effect maybe enhanced or negated by the student's perception towards workload, assessments, academic achievement and traditions. These challenges can affect the outcome of learning (Frambach *et al*., 2012). Perhaps this is why some medical schools conduct PBL only for selective students depending on their ability to learn from this method (Bigsby *et al*., 2013).

Millennial learners and how they approach PBL needs consideration too. For example, millennial learners often have ready access to information in the internet but they may need guidance to be able to synthesize reason and apply the information for deeper learning

(Roberts *et al*., 2012). They also prefer wider engagement and instant feedback. As a result, hybrid PBL blended with web technology has been employed by some. Hence it is important for the institutions to have an understanding and appreciation of the learners' needs when selecting teaching and learning methods (DiLullo *et al*., 2011).

Are teachers ready to be facilitators?

The role of the facilitator is critical for PBL to function effectively. Faculties are often so used for the control of the learning process that they end up delivering a small group discussion based on a problem rather than encouraging a problem-based discussion, thus defeating the objective of a student-centred approach (Camp, 1996). Hence, one barrier to the use of PBL in varied educational settings is the shortage of skilled facilitators, namely PBL process experts. A recent randomized trial of content expertise versus process expertise shows that students' ratings of process experts was significantly higher, and students' performance in assessment was also higher in the group facilitated by process experts (Peets *et al*., 2010). However, acquiring good facilitation skills needs training and considerable resources. Poorly designed faculty development Programme usually employ didactic learning strategies which tend to be conducted once, and lack evaluation or feedback on actual performance after the training Programme (Steinert *et al*., 2006). Updating the faculty development Programme with more innovative learning strategies and hands-on training, periodic peer evaluation and feedback could help to improve the facilitation skills. But this inevitably requires considerable investment in faculty training and development. There are also subtle variations in the facilitation strategies for different learning group situations. To activate prior knowledge, elaboration is important. However, students tend to shirk this step under the notion of it being a common knowledge. The facilitator's intervention at such instances is crucial. The facilitator would then have to identify and prod such students and encourage elaboration and discussion for learning. In addition to being 'cognitively congruent' with students, good facilitators also need to provide a flexible frame and support students in their learning in a timely manner (Schmidt *et al*., 2011).

Is there a match of learning spaces and the PBL philosophy?

Some institutions consider PBL as resource heavy because it involves re-arrangement of learning spaces to suit the PBL philosophy. Some others who change to PBL due to pressure, may implement it without aligning learning spaces and this may affect the expected outcome adversely. Considering certain design features and themes, it is useful in bridging the gap between learning spaces and learning philosophies. Utilization of movable furniture and walls, raised flooring, horizontal and vertical writing features, multiple screens are some of the features that allow flexibility to match a defined space to teaching strategies, class or working group size (Lamb & Shraiky, 2013). Technological upgrading with computers or electrical hook-ups, screen sharing, Wi-Fi, use of microphones and cameras can augment and support the interaction within a group. Modifications in the environmental infrastructure such as lighting, temperature and noise control may also be useful in aligning learning spaces (Lamb & Shraiky, 2013). Other institutions argue about the cost effectiveness of resources demanded by PBL compared to most traditional methods. PBL has a high staff-student ratio and standard class rooms have more students than one person can easily facilitate.

Checklist

"Poor teaching is bad but poor PBL is worse" was stated by Kwan and Tam (2009). If medical educationists consider reflecting on and remediating PBL, they probably need to go through a check list. Concurrently, feedback from all stakeholders such as staff, students and experts have to be taken and backed with the evidence from literature.

Lim (2012) gives some useful guidance on preparation of a check list to ease the decision making of when and which type of PBL is to be dropped from the curriculum. The author recommends reviews to identify dysfunctions of the implemented PBL type. Presence of curriculum saboteurs and lapse in quality assurance and maintenance contribute to poor PBL. Learning outcomes overlapping with lectures, poorly written cases and triggers, and assessments not matching the learning outcomes covered in the PBL are the curriculum saboteurs. Less than satisfactory evaluation of PBL, recycling of cases, minimal staff training, curriculum reviews that ignore the faculty development process, lack or mismatched graduate competencies and poor external reviews are the results of absence of quality assurance and maintenance. Annual reviews with these components will be a helpful exercise and will yield the answer to when to move beyond PBL.

Alternatives to PBL?

There is now a general agreement on the need for evidence to strengthen teaching learning decisions. Furthermore, educational initiatives need to be feasible and acceptable to the local context. Without such evidence and pre-evaluation, educational funds will not be used in a rational and effective manner (Sanson-Fisher & Lynagh, 2005). The evidence available in the literature in support of PBL is limited to students' satisfaction and superior interpersonal skills. Perhaps, there is a need to look out for the other methods that promote constructive, contextual, collaborative and self-directed learning as described by Dolmans *et al*., (2005) to help to broaden the relevant student competencies. Traditional methods usually split teaching into multiple smaller sections creating a divided perspective of the learning issues to the learner. Whole task models such as PBL provide an integrated learning experience representing the whole domain covering multiple learning areas and can be made increasingly complex (Dolmans *et al*., 2013). This can be applied in other situations producing viable alternatives to PBL. For example, in the health professions' training, patient encounters play a central role in the development of clinical reasoning, communication skills, professional attitudes and empathy. It also encourages learning by promoting applicability and providing context (Spencer *et al.,* 2000). Providing such patient contacts progressively through the curriculum, supports the whole-task model (Yardley *et al.,* 2012). For senior students, experiential learning opportunities related to patient care may be enhanced through the inter-professional learning, whereby clinical ward rounds and management discussions are done with the students from various health professional Programme (Begley, 2009).

Disruptive innovations like the flipped classrooms can also be seen as alternatives. In the flipped classroom, students usually receive the learning content in advance and are required to learn before the face-to-face sessions with teachers. At the face-to-face sessions, teachers can conduct student-centred activities to further elaborate, clarify or assess students understanding of what has been learnt (McLaughlin *et al*., 2014). Structured service learning sessions can complement or replace PBL sessions, as it is shown to enhance clinical knowledge, professionalism and cross-cultural competency (Crotty *et al*., 2000). Students are also able to observe the quality of care and reflect upon best practices for the communities they are servicing.

The alternatives cited to complement or replace PBL are only a few of many other possible options. However, it is important for the curriculum planners to ensure that such alternative teaching-learning methods are fit to context with detailed planning with ample staff and student training opportunities, and are also appropriately assessed and evaluated.

Conclusion

Moving forward, it may be prudent to state that even PBL may need remediation in order to better suit the learning model of the institution. In trying to achieve the goal of educating good doctors, educational strategies may be relooked and redesigned to best suit the purpose. We are not suggesting that all schools should move beyond PBL, however, it is worthwhile to consider remediation, if PBL is found to be ineffective or not achieving the learning outcomes. Educators may need to rationalize and develop a checklist and look out for suitable alternatives before deciding to drop PBL. The principles of constructive, contextual, collaborative and self-directed learning should continue to be the foundation for devising such educational strategies.

Conflict of interest

No potential conflict of interest relevant to this article is reported.

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