

REVIEW ARTICLE 

What really is Hybrid Problem-Based Learning Curriculum? A review

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ABSTRACT

The elusive definition of PBL as an educational concept, dissatisfaction with variable methods of its implementation, perceived lack of depth of knowledge in basic sciences of PBL students and the ease, familiarity and economical teaching through large group teaching formats such as lectures has given birth to “Hybrid Problem-based Learning” (*hPBL*) curriculum.

The idea of *hPBL* has attracted many educationists and medical schools. The *hPBL* curriculum can be identified with various aspects of a true PBL such as the SPICES model of the range of educational strategies and concept of PBL as a continuum rather than one immutable process. However, the definition of *hPBL* is equally vague and there are a vast number of variations in its comprehension and implementation.

In this article we have attempted to determine (a) what really is *hPBL* curriculum and how does it differ from the “pure PBL” curriculum (b) why institutions felt the need for a *hPBL* curriculum? Using the *hPBL* curriculum of Faculties of Medicine at Universiti Teknologi MARA and Quest International University Perak, Malaysia as an example we have elaborated the different aspects and effects of this approach on teaching and learning. Finally, we have formulated a comprehensive definition of *hPBL* curriculum.

Keywords

Educational effects, hybrid, Problem-based Learning, traditional curriculum.

Introduction

The concept of Problem-based Learning (PBL) was first introduced at McMaster University in the late 1960s and was subsequently accepted widely by the medical schools throughout the world. The initial lack of evidence of its efficacy led to the calls for it to be abandoned [1-3]; however, based on curriculum outcomes a number of benefits were also reported. [4] Simultaneously a number of schools suggested modifications in the original format of PBL and advocated alternative approaches which led to the birth of “hybrid” PBL (*hPBL*) curriculum.

Harvard’s New Pathway curriculum altered the scope, frequency, and format of its existing didactic lectures and laboratory sessions and hybridised it with active problem-based discussions. [5] This description, however, created confusion and led to different interpretations of PBL by medical schools “flying the flag of PBL curriculum”. [6]

Lim [7] proposed the term ‘standard PBL’ to describe PBL curricula where lectures and other didactic sessions are judiciously used to support the active, self-directed and student-centred learning triggered by problem scenarios. “Hybrid PBL”, he further elaborated “would then refer to all curricula incorporating PBL-style tutorials but not fitting the criteria for standard PBL”.

Walton and Matthews [8] in their summary of PBL essentials argued that some traditional teaching methods such as lectures, seminars, and laboratory exercises cannot be abandoned; however, these sessions can be modified and integrated into PBL curriculum at appropriate junctures to achieve specific objectives. Albanese and Mitchell’s [9] review of PBL implementation identified self-directed learning and small-group interactions as the main instructional activities of PBL curriculum and recommend that traditional teaching methods may still be used but must be aligned with patient problems and kept to a minimum.

New Mexico, one of the early champions of “pure” PBL, after introducing structured tutorials in the curriculum described its course as “hybrid”. [10] The pioneers of PBL, McMaster, have consolidated their PBL system in the light of students’ expectations. [11] Variations of PBL curricula have also been implemented at institutions such as the University of Sherbrook and Michigan State University. [9] A survey in 2003 showed that US medical schools are mostly following a *hPBL* curriculum with curricular inputs and teaching/learning methods not recommended in the original concept of PBL. [12] In a comprehensive review on the issue of ‘hybrid PBL’, Kwan and Tam [13] concluded that a ‘pure’ form of PBL is now practically non-existent.

Faculty of Medicine (FoM), Universiti Teknologi MARA (UiTM), Malaysia opted to follow *hPBL* curriculum since its first intake of students in 2003. Faculty of Medicine, Quest International University Perak (QIUP), Malaysia developed its own *hPBL* curriculum before admitting its first batch of students in 2012.

In this article, we would attempt to determine (a) what really is *hPBL* curriculum and how it differs from ‘pure PBL curriculum’ (b) why institutions felt the need for a *hPBL* curriculum. Using the *hPBL* curriculum of Faculties of Medicine at UiTM and QIUP Malaysia as an example we would elaborate on the different aspects and effects of this approach on teaching and learning. Finally, we would formulate a comprehensive definition of *hPBL* curriculum.

What is *hPBL* curriculum and how does it differ from pure PBL curriculum?

Following statements in the literature describe the most commonly accepted perception of *hPBL* curriculum i.e. a curriculum that uses PBL sessions along with traditional didactic lectures for teaching.

- *hPBL* has been intuitively viewed by many as a cocktail curriculum of McMaster style of small group discussion PBL (generally referred to as “pure PBL”) with the blending of variable amounts of traditional lectures, practical sessions and case-studies. [13]
- “By incorporating this idea (that adult learners teach themselves) as its first principle and augmenting it with an acknowledgement of the range of adult learning styles born of modern cognitive psychology, the New Pathway curriculum at the Harvard Medical School displays what might be considered its most characteristic quality: hybridization. The New Pathway aims to innovate without sacrificing the best of the old, to stimulate individual initiative without inefficiency, and to balance the latest developments in medical science with the age-old values of healing. In every sense, our goals and implementation of those goals are hybrids – with, we hope, the strength and adaptability that hybrids usually display”. [5]
- The “pure” PBL model is implemented in fully problem-based methodology and based on McMaster medical school PBL model. The implementation is generally without any lectures or tutorial sessions and students are typically working in small groups. The hybrid model is in turn embedded with lectures and tutorial sessions to support students’ learning. [14]
- The pre-clinical curriculum at the University of New Mexico School of Medicine is a hybrid model that includes small group, problem-based learning tutorials and didactic lectures. [10]
- The hybrid curriculum at Queen’s University Faculty of Health Sciences consists of weekly problem-based learning sessions and daily lectures throughout the pre-clerkship years. Additionally, students are introduced to the principles of PBL in a one-hour session. [15]
- A fairly common variation of PBL in older medical schools, especially those with school

leaver entry, is of the type where PBL is described as “an adjunct to more traditional lecture and laboratory-based instruction” [16] or a combination of problem-based learning and information-based learning. [17]

- Southern Illinois University School of Medicine (in the year 2000) consolidated two long-running (ten years) but independent curricular tracts: a strictly PBL tract and a more traditional lecture-and laboratory-based tract. Combining the myriad of lessons learned in both long-running tracts, the newly developed hybrid curriculum attempted to combine the positive and eliminate the negative attributed of both. [18]
- A study of best practices used in the delivery of the first two years of medical education, the basic science years, led to the recommendation that the Florida State University College of Medicine uses a combination of lecture and small-group, case-based instruction. [19]
- “Over the past seven years, the University of Texas Medical Branch implemented stepwise pre-clinical curricular reform. In 1995, a PBL track featuring self-directed learning in small groups and early clinical experiences opened to 24 students chosen by lottery from approximately twice that number of volunteer students per class, running parallel to the traditional didactic curriculum. In 1998, the “Traditional Curriculum” was replaced with the “Integrated Medical Curriculum”, a hybrid curriculum combining the problem-based, small-group, self-directed aspects of the PBL track with some didactic teaching”. [20]
- The teaching methods in the *hPBL* curriculum for pre-clinical years at FoM, UiTM include PBL tutorials, lectures, symposia, small group sessions, laboratory sessions and student-led seminars.

Following description highlights another facet of the *hPBL* curriculum where teaching approaches not only include the didactic lectures and other faculty-directed methods but even the PBL sessions are faculty directed.

- PBL, as used at College of Human Medicine at Michigan State University, is more structured and faculty centred than is the prototypical PBL described by Barrows, emphasizing independent learning but not self-directed learning. In addition, the students are given sets of learning objectives that help them to prepare for examinations that are given at three- to four-week intervals. [21]
- “Our curriculum is hybrid in that it allows for the complementary educational components----. Additionally, we have designed a PBL curriculum that is faculty-directed in that the faculty defines the learning objectives for each case in each unit.

The students receive these learning objectives at the end of each case”. [22]

Following is another conception of *hPBL*

- In the fall of 1991, the College of Human Medicine at Michigan State University implemented a new pre-clinical curriculum that blended traditional discipline-oriented, lecture-based instruction in year one with small-group, problem-based learning in year two. [21]
- The Sungkyunkwan University School of Medicine in Korea has its first 2-year curriculum carried out in comprehensive lectures and in the other curricular years, a large component of PBL (50% or more) is employed. [13]
- Saga Medical School in Japan implemented “Full PBL Curriculum” based on the University of Hawaii version of the McMaster model. However, PBL was implemented only for the 3rd and 4th year (Phase III curriculum). [13]
- The Year 1 curriculum at FoM, QIUP Malaysia consists of 15 elements such as “cells and tissues” and Year 2 is divided into 9 systems-based modules such as “cardiovascular system” and “renal system”. The elements are taught mostly by using didactic lectures whereas PBL sessions are used in all modules of Year 2.

Kwan & Tam [13] identified four other forms of PBL significantly deviating from the PBL philosophy due to their content planning. They described them as discipline-based, symptom-based, disease-based, and organ system-based PBL. The discipline-based PBL, they explained, is based on the distinctly specific disciplines such as Anatomy, Pharmacology, and Microbiology etc. thus ignoring the integration among the disciplines which is a hallmark of PBL curriculum.

What is the need of *hPBL* curriculum?

In medical education literature, a number of reasons have been given for retention of didactic lectures along with small group learning sessions in the *hPBL* curriculum.

- College of Human Medicine at Michigan State University (CHM) was among the first medical schools to develop and implement a problem-based learning track. [23] In the fall of 1991, the CHM implemented a new pre-clinical curriculum. There were a number of reasons for this change but addressing the students’ and faculty’s dissatisfaction with the level of basic science knowledge of graduates was the most important objective. [21]
- Faculty of Health Sciences, Linkoping University, Sweden, when implementing PBL curriculum in 1986 retained traditional lectures mainly to explain the difficult concepts and phenomena and to cover

latest research findings which may not have been reported yet in students' literature. [24]

- In addition to above reasons, FoM, UiTM, Malaysia, while implementing *hPBL* curriculum retained lectures to facilitate the transition from the traditional lecture-based teaching of schools to self-directed learning in university for new entrants. The number of lectures decreased drastically as the students moved to higher classes.
- Allowing a minimal number of traditional teaching methods in *hPBL* curriculum helps undergraduate students to organise and structure the management of their studies while providing them the flexibility of focusing in depth on areas of relevance. In addition, this approach appreciates and supports different learning styles among students and eases the concerns of faculty with regard to regulating and monitoring of student learning activities. [22]
- Sharing his personal experience in Australia and New Zealand, Miflin [25] suggested that while adopting PBL curriculum, the traditional medical schools are influenced by the existing structures and facilities in medical education and the views and approaches of teaching staff including PBL facilitators.
- Miller et al. [26] referring to the statements by Abrahamson [27] detailed that their own along with some other medical schools could not get the agreement of their faculties to an across-the-board implementation of PBL. In order to acquire the benefits of PBL and acceptance of teachers, who held traditional philosophies of medical education, they decided to follow *hPBL*.
- The reason of adopting a pre-clinical curriculum that used both lecture-based and problem-based components at College of Human Medicine, Michigan State University was the faculty's belief that foundation of basic sciences education should be shared by all students before implementation of PBL. [21]
- FoM, QIUP Malaysia admits students from very diverse backgrounds and variable qualifications. Having a lecture-based teaching approach in the first year brings students to the same level field before starting PBL sessions in the second year of the course.

Faculty dissatisfaction is an important element in the evolution of *hPBL* (Table 1). To satisfy the faculty, *hPBL* has taken many shapes such as retention of didactic lectures; dictation of learning needs and reinforcement and revision sessions. Another indicator of faculty's lack of confidence in adequate learning through the process of PBL tutorials is an 'additional' or 'wrap-up' or 'review session' – on day one of the following week (after completing the cycle of PBL tutorials), and before starting a new problem, a review

session on the finished problem is conducted. It is interdisciplinary and based on students' questions and answers. [6]

The reasons given for retaining or introducing lectures in the *hPBL* curriculum are summarised in Table 1.

Table I: Reasons for retaining or introducing lectures in *hPBL* curriculum

1. To avoid expected gaps in knowledge - cited as a weakness in PBL. [9]
2. To make it acceptable to teachers who hold traditional philosophies of medical education. [26]
3. To lay a sound foundation of basic science education that would be shared by all students prior to the beginning of PBL. [21]
4. To support different learning styles. [5, 22]
5. To ease the anxiety of faculty with regard to control of students' learning. [22]
6. To provide "structure" to undergraduate students' learning while allowing them the flexibility of focusing in depth on areas of pertinence. [22]
7. To update students with research findings that were not available in students' literature. [24]
8. To introduce difficult concepts and phenomena. [24]
9. To cover the transition from the traditional lecture-based teaching of schools to student-centred learning in university. [28]

Discussion

In spite of the efforts of many educationists [8, 17, 29-40]; and excellent reviews [9, 41] to explain, clarify and justify PBL in theory and practice, a 'conceptual fog' continues to surround PBL. [41] This confusion might have contributed to the birth of "hybrid PBL" curriculum.

As medical schools around the globe incorporated PBL into their existing curricula, a number of variations appeared. The factors that caused these variations included staff preference, local constraints and the institution that was modeled upon. The resultant PBL models were described as full [42] to near-full [43], partial [44], standard [7] or hybrid. [15] Taylor and Miflin [41] concluded that after 40 years of dissemination and evolution, PBL was a genus with many species, many of which "have been found wanting in terms of the initial promise".

Among the leading debates on what constitutes PBL has been the implementation approach (method or philosophy) and the basic type (pure or hybrid) [7].

Medical schools chose different approaches to adopt PBL curriculum. Some completely revamped their curricula to incorporate the PBL methods and philosophy while others just added PBL sessions without changing their traditional curriculum. However, PBL's inventors had declared it as "a whole curriculum, not a teaching method that can be used alongside other methods". [29] While describing the "true" PBL, Maudsley [45] stressed that it is both "method and philosophy". He declared it as a comprehensive curricular strategy to be followed, and not dented by mixing it with other curricular elements.

However educational ideas (like PBL) are neither static nor are they the preserve of the few. [46] It is natural and should be accepted that the ideas would be interpreted differently. We may disagree but the difference in opinions must be respected. [41] Based on their own study and literature review Albanese and Mitchell [9] and Thompson [47] cautioned medical schools not to convert their entire curricula to a problem-based format and concluded that both students and teachers at traditional medical schools will enthusiastically accept teaching programmes that incorporate many of the advantages of problem-based learning without wholesale conversion of the curriculum.

Before deciding on a comprehensive definition of *hPBL*, one must first determine the purpose of PBL and its philosophy in relation to higher education. If one regards PBL as being just another different method in teaching, his/her answer to a question would be very much different from the one who treats PBL as a paradigm shift in the attitude of learning. [13]

hPBL, in most instances, indicates a partial change from traditional to PBL curriculum. Learning sessions in small groups facilitated by a PBL tutor is a common feature in these curricula; however, the time allocated for these sessions varies widely in different institutions. One of the critical issues regarding the definition of *hPBL* is the need to place PBL's significance and context within the rest of the curriculum. It is essential to consider how much time will be dedicated to the PBL within the curriculum and how adequate resources will be provided to support the PBL.

The extent of the hybrid curriculum can be estimated by the proportion of the amount of the contact hours used in the small group activities over the entire contact hours in the curriculum. [13]

In 1993 the University of New Mexico adopted a hybrid curriculum with PBL of six hours per week for 18 months. [10] FoM, UiTM, on an average, allocates 2 hours per week for PBL tutorials for first 18 months of the 5 years course. The Queen's University Faculty of Health Sciences conducts PBL sessions on a weekly basis along with daily lectures throughout the pre-clerkship years. [15] FoM, QIUP conducts three sessions of two hours each in each of its nine system-based modules in year two of the 5-year programme. According to a survey in 2003, some 70% of North American medical schools used PBL in their pre-clinical years, but 45% of these schools used it for only 10% or less of their formal teaching time. [12]

At the University of Hong Kong, 30% of the lecture-based curriculum was top-sliced and replaced with PBL; the National University of Singapore limited its PBL component to no more than 20% of the curriculum [48], whereas in Malaysia, considerably large proportion of curriculum is based on PBL especially at the International Medical University and University Sains Malaysia. [13]

A medical school can choose to give less dedicated time to PBL but, "from my experience and from discussions with colleagues, decreasing the dedicated time for PBL decreases

the chance for students to engage meaningfully in and learn from PBL" was the conclusion of discussion by Chan [49] and others. "To give due recognition to PBL as an important teaching component, about 30% of the time in the scheduled curriculum should be devoted to PBL. For our students in years 1 and 2, this translates, on average, to two tutorials a week, i.e. a minimum of 4 hours of PBL contact time". [49] However, the definition of hybrid PBL curriculum based on the quantity of PBL and lecture hours maybe of limited value in assessing the advantages or disadvantages of hybrid PBL. [13]

The saying "assessment drives the learning" also applies to PBL. If PBL contents and attributes do not make the part of the assessment it is likely to be valued low by students. The cardinal features of PBL such as small group learning sessions and early clinical exposure are likely to impact non-cognitive aspects of students' competencies as well. The knowledge-based examination results do not necessarily represent the students' readiness for non-cognitive attributes of clinical clerkships such as teamwork within and cross disciplines and communication skills which requires the application of procedural knowledge in clinical responsibilities. [20]

The above review of literature identifies five components that might help to distinguish *hPBL* curriculum from other curricula i.e. (1) usage of lectures for teaching, (2) conducting of PBL tutorials including identification of learning needs, (3) adoption of PBL both as a method and a philosophy, (4) allocation of time for small group student-centred sessions in relation to other teaching methods, (5) the choice of methods for student assessment.

hPBL can be defined as a curriculum which motivates students to take the initiative of self-directed learning with "faculty-guided" (and not "faculty-dictated") identification of learning needs, through small group discussions (occupying a significant portion of the curriculum) and large group teaching formats (lectures) and uses assessment methods that apart from recall of information evaluate the deep learning and reasoning skills of students.

Learning needs and PBL as both method & philosophy

The sense of students' pursuing self-identified learning objectives (needs) is central to the concept and implementation of PBL curriculum. [25] Learning issues (needs) are identified by the faculty – for each PBL trigger the expected learning needs are identified by the author of the trigger (or triggers are written to fulfill the pre-identified learning needs) and are communicated to the facilitators. However, this information is withheld from the students and they are expected to identify same or similar learning needs (defining an attribute of a good trigger). However, if students fail to identify these issues, the facilitators are encouraged to introduce these learning needs tactfully by moving the discussion in the right direction and not by dictating the issues to the students.

Some curricula such as the New Mexico Primary Care track are highly student centred, in that student-generated objectives are the key focus for both learning and evaluation; faculty-generated objectives are not available to students. [9]

However many schools are sceptical about students' ability to identify appropriate learning needs on their own. The College of Pharmacy, Dalhousie University decided that the faculty rather than students should define the learning needs for each PBL session. [22] The curriculum of the Michigan State PBL track is also faculty-centred. Students use faculty-generated learning objectives through reading assignments to guide the learning of basic science concepts. At some other PBL schools, students are able to see faculty-identified objectives after they have generated at their own, or their tutors may have a handbook listing the objectives that they may use in guiding discussion. [9]

At FoM, UiTM and QIUP Malaysia the facilitators are expected to tactfully guide the students to identify the missing learning needs by subtly redirecting the discussion to the desired learning outcomes.

Barrows and Tamblyn [29] were explicit about the necessity for guidance to identify learning needs. They asserted that students need a structure and outline to guarantee that the learning needs are suitable and relevant for any given phase of the curriculum. To achieve this goal, McMaster (MD Programme, McMaster University 1993) used a series of booklets which provided a synopsis of each Unit consisting of objectives, required resources and assessment methods, strategies for 'troubleshooting', feedback process, and the location of the Unit in the overall structure of the curriculum. This approach in the earlier Units was expected to help students to develop confidence in their own ability to define appropriate learning needs in the subsequent Units.

The students may not be aware of the depth of learning required at any given time and need guidance. The easiest way is to provide a list of intended learning outcomes; however, students may be prompted to use indications such as formative assessments, senior students and a list of recommended articles to identify the learning outcomes. [50] Davis and Harden [39] agree with this 'external' support and suggest that it should come from the PBL facilitators or a study guides.

All PBL curricula are student-centred to the extent that during the course of discussing the problem, students identify knowledge deficiencies of their own. Each time they hit an obstacle to their progress due to lack of knowledge, they make note of what they need to learn and continue with the problem until progress is stopped. They choose their own resources and convenient time and environment to learn the identified deficiencies.

At the same time, all PBL curricula are teacher-centred to the extent that faculty designs and sometimes choose the problem to be used, presumably with some idea of what content areas they expect the problems to encompass.

Lectures in a *h*PBL curriculum

The most common reason for using the term "*h*PBL curriculum" is retaining or introducing lectures as a mode of teaching along with PBL tutorials. The term "structured teaching" also refers to using lectures for teaching.

Hamdy [6] stated that the teaching sessions like lecture are not prohibited in PBL curriculum. A number of other investigators declared that the proponents of pure PBL never advocated that structured educational sessions and directions should not be given. [51-53] All medical schools that have a long history in implementing PBL have used lectures and laboratory sessions for teaching. The key is that how much and when the guidance should be provided.

Elastin et al., [54] narrated the flagship characteristics of PBL as described by Barrows and Tamblyn i.e. student-centeredness, facilitation of learning, self-directed and life-long learning and research into clinical reasoning. These characteristics can also be applied to other teaching methods such as lectures. [28]

Many people wrongly believe that McMaster University does not offer lectures and uses only PBL sessions. The fact is that McMaster University, along with 6 hours of PBL tutorials also offers 5-6 hours of lectures per week. However, these lectures are used to support PBL and are interactive and student-centered in nature. They are not discipline-based, are optional for students to attend and the content covered is not necessarily to be examined. [13]

Barrows, one of the pioneers in PBL approach, wanted students to be taught by experts. However, he did not support the traditional lectures which were disjointed with rest of the concurrent teaching activities. He also demanded the students to be involved in deciding what needs to be learnt / taught. [41]

Albanese & Mitchell [9] explained that while small group sessions and independent study constitute the main learning activities in PBL; other teaching methods such as laboratory demonstrations; clinical skill sessions and lectures should be retained but kept to a minimum and be synchronized with the patient problems under discussion.

Barrows while implementing the PBL curriculum at the University of Illinois offered same lectures to both the students of PBL as well as traditional curriculum at the School of Medicine. All the students were allowed to attend seminars, lectures, special laboratory session and a variety of other scheduled activities. [41]

Explaining the role of lectures in PBL curriculum, Taylor and Mifflin [41] pointed out that as the basic sciences knowledge is expanding rapidly and old information is becoming obsolete in increasingly short times, these changes may not be readily available in the textbooks for students to study. To conduct sessions to provide up-to-date information flowing from the research to students is vital for the training of new graduates.

It is not the lectures but how one plans and delivers the lectures distinguishes the PBL curriculum from the traditional curriculum. The PBL approach advocates

interactive rather than didactic lectures so that students are motivated to learn and find answers to the questions which interactive lectures have aroused in their mind. Lectures and other learning resources should be relevant to the problem of the week. [55] The lecturers should initiate discussion among student, simplify the difficult concepts and encourage active learning. The Lecture should end with some unanswered question for students to explore and discover the information.

In PBL curriculum the students are focused and attend the lectures to address their specific learning needs whereas in a traditional curriculum they attend the lectures without much anticipation or expectations. The staff members who design problem scenarios are expected to guide the students regarding the relevant learning resources. They must monitor the lectures that are being delivered and communicate with the lecturers to inform them the specific areas that need to be addressed in relation to the concurrent problems under discussion. [41]

Taylor and Mifflin [41] further elaborate that lectures are not prohibited in the PBL curriculum and they can be even more useful if they are optional to attend. Even with lectures, the students have to be responsible for their own learning; they have to comprehend and relate the information to the problem on which they are working at any given time. If the attendance is not compulsory, the students will attend only if they need to according to their academic requirement. It may well be that a student with an advanced knowledge in Physiology would devote his/her time to other areas of required learning while his colleagues (with inadequate knowledge in Physiology) are attending a lecture on the functions of the lungs.

In FoM, UiTM attendance is compulsory in PBL tutorials but not in lectures. Students themselves choose which lecture to attend. This approach encourages lecturers to make their sessions more relevant and interesting to attract students.

Lectures in a PBL curriculum help students to organise their learning and guide them to use additional learning resources appropriately and effectively. Lectures also help them to identify the breadth and depth of the topic they need to learn at their level of study thus avoiding overload in their own learning – the problem that is so often associated with the traditional curriculum. In *hPBL* curriculum, lectures become an economically efficient learning resource for large classes thus easing the anxiety related to the provision of resources that practicing of PBL is often blamed for.

Kwan and Tam [13] described four different types of *hPBL* curricula. Type I is largely superficial with 2-3 PBL sessions in an academic year, while the bulk of teaching is still through didactic lectures. Type II is to use PBL tutorials to enrich students' comprehension of the contents of the lectures. Type III relates to the usage of lectures to boost the effectiveness of PBL sessions. In Type IV the PBL is the foremost learning approach along with some

non-traditional lectures to promote self-directed learning among students. Type III and IV of this classification would be in line with our definition of hybrid PBL curriculum.

Assessment of students in *hPBL* curriculum

Apart from the specific assessment procedures designed to assess students' learning through PBL approach, the general principles of assessment can also be employed for this purpose. However, a combination of assessment methods needs to be applied to achieve valid and reliable results. [39]

Assessment during a PBL session

A formative and/or summative form of assessment is carried out during the PBL sessions. More attention is paid to the PBL process while students and tutors assess their own performance, which directly or indirectly allows for improvement in the quality of PBL sessions.

At the University of Hong Kong, each PBL module includes assessment of students by the tutor using a form in which specific attributes expected for PBL are scored. These attributes fall under the following five headings: Participation, Preparation, Critical Thinking, Communication, and Group Skills. [49] Both the Faculties of Medicine at UiTM and QIUP Malaysia use a similar approach.

Summative assessment

Frequent and fact-based assessments promote cramming of information by the students to achieve high grades rather than encouraging deep learning among them; a situation which PBL curriculum is intended to avoid. If the assessment questions are only lecture-based, students do not need to use any other learning resources to pass the examinations. If the PBL sessions make only a small contribution to the overall grades, students would not be motivated to put in necessary effort into PBL apart from attending the lecture sessions. Such a *hPBL* curriculum is essentially a traditional lecture-based curriculum except that unwilling students are forced to go through the routine steps of PBL tutorials. [7]

The original McMaster curriculum was laid out as a series of sets of PBL triggers with student-centred group activities along with some "unconventional lectures". However, the assessment was focused on PBL tutorial and other group functional activities, but not on the lectures. [13]

The hybrid Integrated Medical Curriculum at University of Texas Medical Branch retained the traditional curriculum's heavy reliance on MCQs for cognitive assessment with some Standardised Patient-based examinations and simply added on the PBL track's small-group assessment. [20]

In FoM, UiTM, the assessment methods include Multiple Choice Questions (MCQs - mainly recall of knowledge), Problem-Based Questions (PBQs - application of

knowledge, interpretation of data, problem solving, higher order thinking), Structured Essay Questions (SEQs - higher order thinking, application of knowledge), Objective Structured Practical Examination (OSPE - data interpretation) and Objective Structured Clinical Examination (OSCE - communication skills, ethics, attitudes, health promotion and disease prevention).

College of Pharmacy, Dalhousie University uses MCQs, SEQs, written assignments and laboratory demonstrations for the assessment of students. The more the students progress up through the curriculum the more complex assessment questions are used and assessment aims at testing the higher levels of analysis, synthesis, and evaluation. [22]

The contents of assessment and the methods and tools used for assessment play a pivotal role in deciding what is going to be learnt by the students [56] and how it is learned. Having discordance between teaching/learning approaches and assessment methods would surely lead to the failure of implementation of any curriculum. [55] The approach to student assessment should be reviewed at the same time as PBL is introduced as a learning strategy. There are not many papers in the literature describing specific assessment methods in the *hPBL* curriculum. It is, however, understandable that *hPBL* curriculum being a “marriage” of information gathering and problem-based learning, should have assessment methods that reflect the “union” i.e. recall and recognition of knowledge along with problem-solving including critical thinking, decision making, data interpretation and other intellectual activities.

***hPBL* and the continuum of PBL**

In an effort to answer the frequently asked question “What is PBL?” Harden and Davis [17] described PBL as a continuum rather than one immutable process. Here we explore the concept of *hPBL* in relation to this continuum of 11 steps.

Which place on this continuum spanning from Theoretical learning to Task-based Learning is occupied by *hPBL*?

The continuum of PBL relates to three (i.e. conduct of PBL tutorials, identification of learning needs and usage of lectures in teaching) of the five components we identified to define *hPBL*. Based on the variations between the institutions the *hPBL* may be placed at one of the following three steps of the continuum of PBL.

Step 1 (7/11): Problem-initiated learning

In problem-initiated learning, the students are presented with a problem at the outset. The problem is meant to provoke students’ interest in the topic to be addressed. It may also be used to give an overview of the area to be studied. However, the problem is not meant to be the main focus for students’ learning.

Step 2 (8/11): Problem-centred learning

At this level, the problem becomes the main focus for the students’ learning. The problem is used to make students learn the principles and rules required to solve that problem. The students are given access to the required information either by providing the resource materials, through literature or formal teaching sessions such as lectures. At this step, the emphasis is on learning the rules and principles rather than on identifying the learning needs and finding the answers. Many authors take it as a “compromise” of the description given by Barrows. [32]

Step 3 (9/11): Problem-centred discovery learning

At this step, the students work out for themselves the principles and the rules needed to comprehend and sort out the problem presented to them. The students work in groups for identifying the learning needs and use different resources to find out the answers and solutions to the learning needs - a process called discovery learning.

***hPBL* pre-clerkship curriculum at FoM, UiTM (▼) and FoM, QIUP (X) in relation to SPICES model**

The SPICES model [57] identifies a range of educational strategies and provides educators with an instrument for analysis of curriculum. Application of this instrument qualitatively to the *hPBL* curriculum of FoM, UiTM and FoM, QIUP resulted in figure 1.

Figure 1: SPICES model and *hPBL* curriculum of FoM, UiTM Malaysia

Student-centred	▼ X	Teacher-centred
Problem-based	▼ X	Information gathering
Integrated	▼ X	Discipline-based
Community orientated	X ▼	Hospital-based
Core curriculum	▼ X	Standard course
Systematic	▼ X	Apprenticeship

In this *hPBL* curriculum, the students identify their own learning needs during the PBL tutorials. However, they may be tactfully guided by the facilitators to identify the missing learning needs of those listed by the faculty.

Apart from PBL tutorials, the other teaching/learning activities include interactive lectures, symposia, student-led seminars, laboratory sessions (Anatomy lab, Clinical skill lab) and computer-aided learning. [55] During the clerkship years, students are posted to district hospitals for clinical teaching. They also spend considerable length of time in the community during rural health and population and preventive medicine postings (UiTM) and public health and primary care medicine postings (QIUP).

Conclusion

The original concept of PBL curriculum has evolved over the years; however, the changes are mainly related to methodology and implementation without much deviating from the original philosophy. In standard PBL curricula, the learning is triggered by problem scenarios and unconventional lectures and other teaching/learning sessions are judiciously used to support the active, self-directed and student-centred learning. The assessment is directed toward higher analytic and decision-making skills.

hPBL can be defined as a curriculum which motivates students to take the initiative of self-directed learning with “faculty-guided” (and not “faculty-dictated”) identification of learning needs, through small group discussions (occupying a significant portion of the curriculum) and large group teaching formats (lectures) and uses assessment methods that apart from recall of information evaluate the deep learning and reasoning skills of students.

The above review of literature identifies five components that might help to distinguish *hPBL* curriculum from other curricula i.e. (1) usage of lectures for teaching, (2) conduct of PBL tutorials including identification of learning needs, (3) adoption of PBL both as a method and a philosophy, (4) allocation of time for small group student-centred sessions in relation to other teaching methods, (5) the choice of methods for student assessment.

Abbreviations

Hybrid Problem-based Learning (*hPBL*)

Authors' contribution

All authors contributed equally.

Competing interests

None declared.

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