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REVIEW

Problem-based learning: A Review

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ABSTRACT

Problem-based learning (PBL) uses patient problems as a context for students to learn problem-solving skills and acquire knowledge about basic and clinical sciences. PBL is based on the principles of adult learning. PBL takes place in small groups and learning depends on the effectiveness of the small group process. There is lack of agreement on what constitutes PBL. PBL is active, adult-oriented, problem-centred, student centred, collaborative, integrated and interdisciplinary and it operates in a clinical context. There are a number of advantages of PBL. However, PBL is demanding in terms of time, teaching materials and physical resources. A PBL facilitator should be comfortable with relinquishing authority and exerting indirect control. According to some authors, Asian cultures have an authoritarian student-teacher relationship. There is a high degree of acceptance of authority and knowledge is seen as something which is transmitted by the teacher. However, most Asian schools and students seem to be positive about adapting to PBL. The effectiveness of PBL is being seriously studied. Newer learning approaches are also under development.

Key words: Adult learning, Asia, facilitator, problem-based learning,

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Problem-based learning (PBL) is becoming increasingly popular and more acceptable and it has been found to be effective in a variety of disciplines in the field of higher education.[1],[2]

What is PBL?

PBL has been defined as 'an educational method which is characterized by the use of patient problems as a context for students to learn problem-solving skills and to acquire knowledge about the basic and clinical sciences'.[1],[3] The 'Teacher's guide to good prescribing' states that facilitators should define a single objective for the teaching session and formulate the objective clearly to the students.[4]

Characteristics of PBL:

PBL is based on the principles of adult learning. Knowles, the father of adult learning theory, proposed that a learning environment which is characterized by physical comfort, mutual respect and freedom of expression is conducive for adult learning.[5] Differences are accepted, the learners perceive learning goals as their own and accept partial responsibility for planning and conducting the learning sessions and their active participation in the learning process is encouraged.

PBL is usually carried out in small groups of 5 to 10 students each, who meet two or three times a week for PBL tutorials.[6] The groups are presented with a clinical problem and in a series of steps, they discuss the possible mechanisms and causes, develop hypotheses and methods to

test them, are presented with further information, use this new information to refine their hypotheses and finally, reach a conclusion.[6]

Skills required for PBL:

PBL is based on a foundation of collaboration and integration within a small group context.[7] The small groups are guided by a tutor or a facilitator. At the beginning of the PBL sessions, tutor effectiveness is a crucial item in the learning process, but by the end, learning is dependent on the effectiveness of the small group process.[8]

To take advantage of PBL, the facilitators and the students should be familiar with the skills which are necessary to work effectively in small groups. These are consensual decision making skills, dialogue and discussion skills, team maintenance skills, conflict management skills and team leadership skills.[9] Consensual decision making requires that every student participates in the team process, has an equal opportunity to be heard and that their ideas are incorporated into the team's database.[10]

To minimize conflict, ground rules should be elicited from the team members and they must be implemented. Conflict can be minimized by defining the roles, space and behaviour of each team member through a structured process. The role of leadership should be shared among the members (role-sharing). A recent article states that the small group provides more than a cognitive learning experience.[11] The group provides a conducive and collaborative learning experience, facilitates the students' adaptation to a new and unfamiliar learning environment, fosters integration and socialization and promotes individual development.

The role of the facilitator:

The facilitator should define clear objectives for the learning session and inform the students about them. Before starting the session, s/he should define the problem. H/she should not interfere with the group process during the first ten minutes when the group is settling down and its roles and responsibilities are getting delineated. This time can be used by the facilitator to define the roles which are being played by the different group members. Interventions should be directed only at the group process and should not influence the content. The facilitator should address the group in general and not pick on specific individuals, unless it is really necessary. All group members should be encouraged to participate. When planning to intervene on the content of the discussion, the facilitator should wait and count slowly to ten. Most of the times, s/he may not need to intervene.[4] A recent article looks at the principles of successful interaction in PBL groups.[12] These are applicable to both the students and the facilitators. Some of these are, creating a group environment which encourages everyone to participate, ground rules being continuously enforced by members, tutors being well trained in facilitating PBLs, the group always having a scribe at the whiteboard, the PBL cases being authentic and well written, students using the tutor's feedback to improve group function, students reflecting on their performances in the tutorials and their proficiency in English, among others.

Advantages of PBL:

PBL is compatible with the modern theories of adult learning. Students enjoy active participation and consider the process to be relevant, stimulating and fun.[3],[13] The teachers tend to enjoy the increased student contact and the traditional barriers between the teachers and the taught are lowered.[14]

Preliminary evidence shows that PBL students may be better able to transfer concepts to new problems.[15] PBL fosters self-directed learning skills which are becoming increasingly important in today's competitive world.[16] PBL activities bring together faculties from different disciplines and promote greater interaction between basic scientists and clinicians, thus leading to important benefits. PBL students score higher in clinically oriented examinations [17] and they do better in long-term retention as compared to students from conventional curricula.

A recent study conducted by Katinka Prince and coworkers at the University of Maastricht in the

Netherlands had shown that more PBL graduates indicated that profession-specific skills, communication skills and the ability to work in a team had been learned at medical school.[18] In South Africa, PBL has been shown to reduce attrition rates and to improve course completion rates among students from an economically disadvantaged background.[19] PBL learners feel that they are treated as mature professionals who are developing effective and clinically relevant study skills, as well as skills which will be important for their future careers.[20]

Disadvantages of PBL:

PBL is demanding in terms of time, teaching materials and other physical resources. Compared to lecture-based curricula, the costs of PBL-based curricula increase with increasing class size.[7] PBL can be relatively inefficient and research has suggested that PBL curricula cover only about 80% of what might be covered in a conventional curriculum in a corresponding time period.[3]

PBL can be stressful to both the students and the faculty unless they are familiar with the process.[21] Some teachers may find that PBL is unduly demanding of their time and they may be uncomfortable in their role as facilitators. A recent study in England found that PBL tutoring was a frustrating drain on time for some teachers, did not suit their educational style and distracted them from clinical learning.[22] The author of a recent review has stated that PBL could worsen the problems of information management.[23] PBL can create an impression that defined core knowledge is enough for clinical competence despite an ongoing knowledge expansion, which can discourage the teachers from refining didactic modalities. This can also reduce faculty time which is required for developing newer teaching modalities and resources which can more efficiently deliver factual knowledge.

Why do teachers have problems with PBL?

A good PBL teacher must be comfortable with giving up the authority which is traditionally associated with a teacher and should exert indirect control. H/she should observe closely and skillfully and attend to both social and intellectual interactions. The facilitator should sit among the students or in a corner of the classroom, but not in front of the class.[24] PBL is application oriented and the stress on the practical goes against the grain of academia.[24] In general studies, certain subjects and disciplines have more power and authority than others. This is true even for various medical disciplines, with certain disciplines having more power and prestige. PBL implies respect for the particular and the concrete and stresses on the application of knowledge, rather than just the theory. Its goal is to help the students grasp the theoretical better. The PBL teacher must mute or even give up his/her authority. The faculty metamorphoses from being experts in their specialty to being facilitators of a small group of students. Handling group dynamics may be a new and unfamiliar area for the teachers, thus leading to high anxiety levels.[1] Teachers favour didactic teaching because they need to justify being paid for their lectures as teachers.

PBL is interdisciplinary and student-centred. However, most medical specialists are in love with their disciplines and may have devoted years of study to their particular discipline. They have a depth of passion for what they are studying and will find it very difficult to be student-centred, rather than content-centred.[24]

PBL in Asian medical schools:

In Asia the student-teacher relationship is stiff and formal and teachers are seen as authority figures.[25] The Asian culture values loyalty and deference toward the teacher. Teachers may be authoritarian and expect the students to have a quiescent attitude.

In Southeast Asia, medical schools are undergoing changes, adopting educational innovations and realigning curricula with national priorities and needs. A curricular survey had shown that 50% of the responding schools reported the presence of PBL in their curricula.[26] The study carried out by Zubair Amin and coworkers from the National University of Singapore (NUS), Singapore,

surveyed 30 medical schools in the Southeast Asia region. The ten countries which were studied were Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand and Vietnam. PBL was commonly a part of a hybrid curriculum and constituted 20-40% of the curricular time.[27] Most Asian medical schools and their students appeared to be positive about adapting to PBL in their curricula.

In Karachi, Pakistani students supported PBL as an effective method of learning.[28] The students were of the opinion that PBL helped in developing communication skills and interpersonal relationships and improved their problem-solving capacity. In China, the undergraduate medical education system is being streamlined and innovations including PBL are being encouraged and supported.[29]

The Arabian Gulf University College of Medicine and Medical Sciences in Bahrain have adopted the educational philosophy of PBL and self-directed, student-centred education.[30] At MCOMS, Pokhara, Nepal, the Department of Pharmacology uses a mixture of didactic lectures and problem-stimulated learning (PSL) sessions to teach pharmacology.[31] PSL in small groups, has been carried out by the department for over six years.

In Karamsad, India, an integrated learning program for the central nervous system was developed and implemented.[32] The basic science faculty participated actively in case based learning and hospital visits, along with the clinical experts. Students rated the program positively. PBL was first introduced into the Kaohsiung Medical University in 1997.[33] A PBL curriculum with 14 blocks was developed and conducted. Certain problems were noted, which are being addressed. A near full PBL curriculum has been adopted in a new Taiwanese medical school from 2002.[34] The students claimed that they were more active in learning and had better learning skills as compared to the students under traditional curricula. They also however, thought that PBL had limited breadth and depth in clinical medicine and they were not confident of facing the national licensure examination.

Future perspectives:

Interdisciplinary learning teams consisting of nursing students, medical students, pharmacy students and others could be another possibility. Virtual groups consisting of geographically separated students who are linked through the internet can be considered.

A review done in Australia in 1998 predicted that resource limitations and other constraints may force some medical schools with PBL-based curricula to revert to traditional learning approaches.[6] Advances in technology have the potential to lessen the resource demand for PBL. Technology never-the-less may have a negative side as well. A recent study has raised the possibility that obtaining immediate answers to case scenarios via internet searches may circumvent the hypothesis generation process.[35] Data gathering can occur within the tutorial and this may interrupt the potential and stimulus for student-directed learning.

A recent editorial by Ferguson states that PBL has fallen short of the initial expectations.[36] PBL can be incorporated in a traditional curriculum and students might benefit from some of the best elements of PBL. Team learning, a promising new strategy, incorporates student-led small group learning within a lecture environment and requires that the learners rely on each other for a component of the course grade. The approach has the potential to achieve the benefits of PBL with the use of fewer resources.[37] Other learning approaches are also under development. TBL resembles PBL by providing a small group experience with faculty guidance. Paul Koles and colleagues have used TBL in a year 2 pathology curriculum at the Wright State University School of Medicine in the United States.[38]

Peer assisted learning (PAL) has been used in the United Kingdom (UK) to encourage students to develop their teaching, learning and assessment skills and to help them engage in cooperative learning.[39]

Recommendations regarding PBL:

PBL can initially be started in individual subjects and then can be extended across subjects. PBL does not require expensive resources and the latest technology. In many medical schools, problem-based pharmacotherapy teaching can lead to a full fledged PBL curriculum later.

Training sessions for faculty members to act as facilitators during PBLs are required. Postgraduate students can be trained to act as facilitators. Each medical school has to work out an individual approach to PBL, keeping in mind the number of students, the nature of the student body and the curricular and assessment requirements.

Conclusions:

PBL is a new learning strategy in some parts of the world, while it has been used for over two decades in others. PBL employs adult learning strategies and emphasizes self-directed learning by the students. The students are expected to assume greater responsibility for their own learning. PBL has advantages and disadvantages.

Asian students are hard working and work well in a group, but also tend to be shy and regard the teacher as a figure of authority. PBL has been successfully implemented in many Asian medical schools. Modifications of PBL have been used in different schools. Other learning approaches are also under development.

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