

APPLICATION OF MAASTRICHT UNIVERSITY PBL MODEL IN YEAR-5 MBBS STUDENTS

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ABSTRACT

Objective: To apply Maastricht University PBL model to Year-5 MBBS students.

Method: MU PBL model was applied to two groups of Year-5 MBBS students. The trigger of PBL was based on the theme of reading the CT-scan brain.

Results: A total of 38 students with 24 females participated in the study. The overwhelming majority of students supported the PBL and considered it to promote self-formulated learning objectives, self-directed learning, analytic skills, motivation, collaboration and lifelong learning.

Conclusion: PBL promotes cognitive as well as generic skills. It should be given its due place in a community-oriented medical education curriculum.

Keywords:

Analytic Skills, PBL, Self Directed Learning

INTRODUCTION

Problem-based Learning (PBL) was first introduced by McMaster University Canada in 1969¹. Maastricht University (MU) Netherland developed their own model of PBL in 1974². The latter became the world-recognized MU PBL model that promoted four aspects of learning: constructive, contextual, collaborative, and self-directed. The Edinburgh Declaration of WFME in 1988 changed the medical curriculum all over the world. It proposed Community-Oriented Medical Education (COME) curriculum and recommended PBL to make the students a lifelong self-learner³. Pakistan, with assistance from WHO launched a pilot "COME Project" in 1994 in its 4 public medical colleges. These colleges developed an MBBS COME curriculum distributed in three phases: Phase-I (Year-1 & 2), Phase-II (Year-3), and Phase-III (Year-4 & 5)⁴. Despite these initial efforts, the PBL system is not being followed in the majority of medical colleges. The reasons quoted include students lacking prior PBL exposure, deficiency of communication skills, and paucity of resources to conduct PBL⁵.

Comparing PBL with Case-based learning (CBL), both have small-group case-discussion. PBL does not need prior preparation; CBL does. The number of sessions in PBL is usually two; CBL has a single session. Limited guidance is needed in PBL; active guidance in CBL. Learning objectives are written by the students in PBL but provided by the facilitator in CBL. The learning method in PBL is independent self-directed learning (SDL) while it is a shared facilitator: self-learning in CBL. The learning style of PBL is an open inquiry; in CBL it is a guided inquiry. The end-of-session in PBL includes students' presentations while in CBL its a wrap-up by the facilitator. PBL boosts critical thinking and collaboration better than CBL. PBL fosters independent lifelong learning while CBL does not promote it.^{6,7}

Thus, for a practical application of PBL, we hypothesized that MU PBL would be well-taken by and beneficial to the students having no previous exposure to the PBL. To confirm it, the present study was designed to be conducted on Year-5 medical students and to complete the PBL in one session rather than the usual practice of two sessions.

Objective:

To apply the MU PBL model to the Year-5 MBBS students using a single session of PBL.

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METHOD:

Design: Observational analytic study with a non-probability convenient sample.

Settings: Department of Neurology, HITEC Institute of Medical Sciences, Taxila Cantt, Taxila.

Subjects: Two groups of Year-5 MBBS students posted in the department of medicine. Other MBBS groups of the lower classes posted in the same department were excluded.

Learning Method of MU PBL: This is a short group (10-15 participants) learning activity. The main components are brainstorming, SDL, and discussion.

The Facilitator's Role in MU PBL: it includes preparing a Trigger (clinical scenario) for sharing with the group, outlining learning objectives for own reference (not for sharing), watching the students going on the right track of learning, and facilitating them if needed. For the present study, the facilitator provided an opportunity for self-evaluation for the students.

Seven Jumps (Steps) of MU PBL: it includes:

1. After reading the trigger (clinical scenario), understand the problem; define difficult words or terms.
2. Identify the questions to be answered.
3. Brainstorming on previous knowledge and identifying potential solutions.
4. Analyze and structure the results of the brainstorming session.
5. Formulate Learning Objectives.
6. Undertake SDL, individually or in smaller groups.
7. Discuss the findings.

Deviation from the convention: MU PBL usually includes a moderator, a time-keeper and a scribe among the students. The PBL is completed in two sessions separated by SDL. In the present study, the facilitator took the roles of moderator and time-keeper; there was no scribe. The PBL was completed in a single session that included SDL. For discussion and presentations, the participants were divided into subgroups of 3-4 students. In the end, a self-evaluation opportunity was provided.

The Trigger (Clinical Scenario) for sharing with the students:

You are appearing in the table-viva of Medicine, the examiner asks you the following three questions:

1. What is a CT scan Brain?

2. Read the CT scan brain displayed and give the findings.

3. What are contraindications of a CT scan?

Material prepared for facilitator's own reference (not for sharing with the students):

1. Learning objectives:

- a. To identify normal brain parts and vascular territory.
- b. To identify infarction, hemorrhage, tumor, and ring-enhancing lesion.
- c. Reading approach – CSF spaces, brain, skull, and soft tissues.
- d. Contraindications of CT scan.

2. Learning resources needed:

- a. Books
- b. Internet facility
- c. CT-scan brain images with normal findings
- d. CT-scan brain images with abnormal findings

Tasks completed after brainstorming and analysis: the students were able to present a definition of a CT-scan Brain, formulate learning objectives for this PBL and list learning resources needed for this PBL.

Task completed during SDL: To achieve the learning objectives through independent self-directed learning, students searched for the relevant information.

Task completed during the discussion and self-evaluation opportunity: The facilitator showed the images of normal and abnormal CT scans of the brain and students did the interpretation. Students' queries and misconceptions were cleared.

The resources available for the SDL: It included internet facility, multimedia, students' own smartphones, books and CT-scan images.

Students' Feedback on the PBL: After completing PBL, the students gave their feedback through a Likert scale questionnaire with 7 items.

RESULTS:

Out of a total of 38 students of 5th Year MBBS, 18 participated in the First PBL and 20 in the Second PBL. There were 14 Males and 24 Females. Their ages ranged from 22 to 25 years.

During brainstorming and analysis, the students answered the question “what is a CT-scan brain?” with the following definition:

CT scan is a set of X-ray images of the brain taken from different angles and planes combined together and then processed by a computer to create cross-sectional images.

After brainstorming and analysis the students formulated the following Learning Objectives:

- a. To identify brain anatomy and normal parts on a CT-scan brain
- b. To identify different densities on a CT-scan brain
- c. To interpret abnormal CT-scan and make differential diagnoses
- d. To have a systematic reading approach
- e. To find Indications of CT-scan brain (this was out of the trigger)
- f. To find contraindications of CT-scan

For the list of resources needed for this PBL, the students' response was:

- a. Books, b. Internet facility, c. CT-scan films, d. The CT-scanning facility, e. Instructor.

During discussion and self-evaluation, the students were able to interpret the following findings on CT-scan Brain:

- a. Normal anatomical structures including CSF ventricles, basal ganglia, thalamus, lobes of the cerebrum, and cerebellum.
- b. Communicating Hydrocephalus.
- c. Infarction in the territory of the middle cerebral artery.
- d. Intra-cerebral hematoma.
- e. Meningioma tumor.
- f. Extradural hematoma.

Students had difficulty in recognizing:

- a. Ring-enhancing lesions of tuberculous meningitis.
- b. Subdural hematoma.

Regarding contraindications of CT-scan Brain, the students proposed the following list:

- a. Pregnancy
- b. Hypersensitivity to contrast agent
- c. Claustrophobia
- d. Young age

The students' feedback in terms of percentage of favor to

each statement of the questionnaire is given below:

- a. The self-directed Learning is an integral part of PBL: 94.7%.
- b. This group study exhibited collaboration and interdependence: 89.5%.
- c. Identifying Self-learning Needs and formulating Learning Objectives were possible by being methodical and disciplined: 73.7%.
- d. After a self-directed Learning activity and using a logical & analytic approach, it was easy to read a CT-scan Brain and answer the questions asked by the facilitator: 81.6%.
- e. Feedback from the peers and the facilitator cleared many learning concepts: 86.8%.
- f. This PBL created curiosity and internal motivation and made us confident and competent in Self-Directed Learning: 81.6%.
- g. Overall the PBL was a successful activity in terms of self-learning: 86.8%.

DISCUSSION:

The main finding in this study was that the Year-5 MBBS students strongly favored the PBL and declared it a successful activity despite having no previous exposure to the same. It also showed that the PBL can be completed in a single session rather than the usual practice of two sessions. And, this can be completed with the existing resources in a medical college. The limitation in the study included restricted time for SDL because the PBL was completed in a single session.

The students preferred PBL to lecture-based learning (LBL) in their verbal comments. One of the students commented that "Despite the hectic morning schedule in summer, the afternoon PBL activity enhanced our motivation because of discussion-based SDL." Faisal et al divided Year-3 MBBS students into PBL and LBL groups and evaluated them with MCQs. The PBL group showed better academic performance⁸. Haseeb et al included Year-4 & 5 MBBS students from a PBL-supported college and an LBL-supported college and evaluated them with the same assessment. The PBL group achieved significantly higher scores including better knowledge and healthier attitudes toward health sciences research⁹.

In this study, because of COVID-19 epidemic-related time constraints, the PBL was completed in one session rather than recommended two sessions. Khan et al

applied a PBL-variant in a large-group discussion of 140 students and compared it with LBL in the subject of biochemistry. He found similar MCQ test scores in both modalities, but the former was more conducive to enthusiastic self-study¹⁰.

The present activity was carried out after a brief explanation to the participants, who did not have prior PBL experience. Huda et al had a better approach to introducing student-centered PBL to the entrants in a medical university by offering a 10-hour course in 6 sessions. She acquainted them with the small group dynamics in order to make them lifelong learners¹¹.

Each PBL starts with a trigger, which is prepared by the facilitator. Bangash stated that the most fascinating aspect of PBL is the ability to make an association between an external stimulus or situation and the concepts stored in memory. It is also reflected by the fact that PBL activity leads to higher performance in USMLE scores and promotes research and innovation¹².

In the present study, the facilitator's main role during the PBL was the creation of an environment for problem-oriented self-directed learning and the provision of self-evaluation opportunities to the students. Wang et al highlighted the importance of PBL coaching in comparison to PBL tutoring. Through cognitive scaffolding, PBL tutoring facilitates a learning environment, encourages the active participation of members, and continuously monitors the quality of learning. In addition to this and through emotional scaffolding, PBL coaching promotes empathy and medical humanity as the learning goals and pays particular attention to the emotional and motivational aspects of the learners. It is accomplished through establishing rapport, trust, and a nurturing relationship with the learners¹³.

The students' feedback supported the statement "The self-directed learning is an integral part of PBL" by 94.7%. Yadav et al assessed the Attitude and Perception of the 1st year MBBS students. PBL sessions were effective in improving students' professional knowledge, refining problem-solving, promoting self-directed learning, and enriching teamwork experience¹⁴.

A total of 89.5% of the participants agreed that "This group study exhibited collaboration and interdependence." Mughal et al analyzed seven PBL groups and found that the development of social dimension skills was facilitated to a greater extent than the cognitive dimension skills.¹⁵

The students had a consensus of 73.7% that "Identifying

self-learning Needs and formulating Learning Objectives were possible by being methodical and disciplined." MU PBL is based on a disciplined and methodical approach to formulating learning objectives, seeking relevant information through independent research, and sharing information for problem-solving.²

The participants had 81.6% agreement that "After a self-directed learning activity and using a logical & analytic approach, it was easy to read a CT-scan Brain and answer the questions asked by the facilitator." The Harvard Business Review defines the set of 21st-century skills as the ability to "Compete on Analytics." These skills include communication, collaboration and critical thinking (including creativity). Talat et al found that PBL supports 21st-century skills along with personal and social development. The 21st-century skills influence students' creativity more than competitiveness. The study's key finding is that social development is the strongest influencing factor on creativity and competitiveness. Personal development, on the other hand, has a weak but positive impact.¹⁶

A total of 86.8% of the students favored the statement "Feedback from the peers and the facilitator cleared many learning concepts." In a qualitative study by Mubuuke et al, students suggested that the facilitators need to give comprehensive feedback on their knowledge construction process as well as on generic skills.¹⁷ A systematic review by Lerchenfeldt et al indicates that peer feedback in a collaborative learning environment (PBL and Team-Based Learning) may be a reliable assessment of professionalism and may promote professional behavior¹⁸.

A total of 81.6% of the participants agreed that "This PBL created curiosity and internal motivation and made us confident and competent in Self-Directed Learning." The assessment of a temporomandibular joint PBL showed that the knowledge increased immensely following PBL sessions. Students attributed this success to PBL being interactive, collaborative, goal-directed, and research-oriented. Their increased motivation to learn a new topic was attributed to the self-formulated learning objectives and self-directed learning skills. It will possibly make them lifelong learners¹⁹.

A total of 86.8% of the students declared that "Overall PBL was a successful activity in terms of self-learning." In describing the history of the PBL explosion, Camp considered it a paradigm shift that fits with the tenets of adult learning theory. Student autonomy, building on previous knowledge and experiences, and the

opportunity for immediate application are all well-known to facilitate learning in adults. These, therefore, should foster the success of a PBL approach with medical students who are adult learners²⁰.

CONCLUSION:

PBL is a world-recognized instruction method, which promotes problem-solving cognitive skills as well as the 21st-century generic skills. It is considered a paradigm shift in medical education. In line with the vision of the Edinburgh Declaration; PBL promotes lifelong learning in students. It should be given its due place in community-oriented medical education curriculum.

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