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Learning approaches and performance of medical students

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Abstract

Objective: To identify the best assessment method for medical students with different learning approaches.

Methods: The cross-sectional questionnaire-based study was conducted at Bahria University Medical and Dental College, Karachi, from March 2010 to April 2011, and comprised first year medical students. The questionnaire was tailored from the Approaches and Study Skills Inventory for Students on a five-point scale Deep approach, Surface apathetic approach and Strategic approach were assessed through relevant sub-scales. Response to questions was summed for the subscales and main scales for a learning approach. Mean scores for aggregate marks obtained by multiple choice questions, short answer questions, problem-based learning and objective structured physical examination were derived. Coefficient of variation was estimated to find the most reliable assessment method.

Results: Of the 100 students enrolled, 98(98%) completed the study. Of them, 51(52%) were girls and 47(48%) were boys. Overall, 70(71.4%) students displayed Strategic approach, and 13(13.3%) showed Surface apathetic approach. Objective structured physical examination had the least variation (12.27) for all approaches whereas maximum variation (14.92) was observed by problem-based learning scores.

Conclusion: Assessment by problem-based learning scores was able to demarcate deep learners whereas consistent scores were obtained by objective structured physical examination which failed to discriminate variance in performance by different learners.

Keywords: Learning approaches, Surface apathetic learners, Deep learners, Strategic learners, Learning environment, ASSIST. (JPMA 66: 198; 2016)

Introduction

It has been shown that students choose to use deep learning approach or a superficial learning approach depending upon their perception and understanding of how they would be assessed.¹

A majority of undergraduate medical curricula are contemplating and proposing inculcating critical thinking skills in students. One of the major teaching and learning strategy has been proposed to be the Problem-based learning (PBL). In this model, the assessment of the students is challenging as well as complex. This study was planned at a teaching institute where PBL techniques have been incorporated into an existing traditional undergraduate medical education system and we wanted to know its impact on medical students with different learning approaches (LAs).²

In order to introduce various teaching and learning methodologies, we need to understand student learning styles and approaches towards learning.³ In professional institutions, students make use of a number of LAs in

order to complete study assignments. LA defines the desired ways in which a student organises the learned knowledge for the purpose of understanding and learning.³ Rote memorisation is used by Surface apathetic approach (SAA); in contrast, understanding of the content is valued by learners with Deep approach (DA). In addition, in Strategic approach (SA), learners employ and emphasise the productiveness of what they have been studying. Such learners place special emphasis on the type of the assessment system under which they would be evaluated.⁴

Majority of medical institutions in the country have adopted the traditional lecturer-centred approach, in which the content and teaching strategies are determined by the teaching style of the lecturer. In contrast, in PBL, teaching and learning techniques place emphasis on the student, i.e. a student-focused approach.⁵ In this context, PBL is a process in which learning and teaching is centred on the interactive case-solving approach. Various studies have demonstrated the significance of conceptual learning in upgrading students' competence in critical reasoning, problem-solving and self-directed learning.²

Students face challenges in hybrid curricula, i.e. traditional medical curriculum and PBL curriculum when there are less clearly defined student learning

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preferences. This problem is especially acute in educational institutions that have undertaken transition from traditional to PBL curriculum.⁶ Attempts have been made to inculcate deep learning habits in the students with the focus on student-centred teaching and learning methods.^{7,8} These innovative approaches have to be properly associated with proper assessment methods to benefit the students the most,⁹ and it has been noted to be one of the most effective ways to motivate the students to use 'deep' approaches to learning with the help of assessment methods.¹⁰

Bahria University Medical and Dental College (BUMDC) had recently adopted a modular, hybrid system in which PBL methodologies and techniques were introduced. The students are exposed to PBL case discussions in addition to large group discussions, demonstrations, lab skills, case-based sessions, anatomical models' study, seminars and interactive tutorials.¹¹ The summative assessment included module examinations which are composed of a written paper of multiple choice questions (MCQs) and short essay questions (SAQs), and practical assessment by objective structured practical examination (OSPE). In addition, the effectiveness of PBL case-based discussions were evaluated by internal evaluation by PBL facilitators and marks were allocated to the students.

Since the assessment pattern is driving learning, we planned to look at how summative assessments affected the learning styles and approaches of the students and vice versa. In this respect, this is the continuation of our previous study¹² in which we had studied and defined the various LAs being used by our students. It was of special interest as to how the performance of medical students in their summative exams was affected by LA. Studies have been conducted to evaluate the impact of PBL on LA of medical students and to see if scoring by PBL can be used for assessment of students with different LAs.^{13,14} The current study was planned to assess similar parameters in our setting by assessment of medical students with different LAs, including MCQs, SAQs, OSPE and PBL.

Subjects and Methods

The cross-sectional questionnaire-based study was conducted at BUM&DC, Karachi, from March 2010 to April 2011, and comprised first year medical students who were enrolled using convenience sampling. After approval from the institutional review board, all the students were briefed about the survey and were invited to fill in a close-ended questionnaire. The questionnaire was adopted and modified from the Approaches and Study Skills Inventory for Students (ASSIST).¹⁵⁻¹⁷ It was administered with the assistance of the researchers/facilitators. The questions

Appendix: Problem-Based Learning.

Group	Assessment Forms		Problem Title
	Date of Tutorial	Name of Tutor	
Session One			
Initial of Student			
Attendance (5)			Marks Obtained
Comes on time		5	
Comes in 5 minutes		3	
Leaves during discussion		0	
Group dynamics (10)			
Raises hands to participate		1-4	
Listens attentively to others comments		2	
Speaks to all members of group		1-4	
Responds only when addresses		-1	
Does not participate at all		0	
Distracts discussion		-2	
Attacks or defends		-1	
Total (15)			
Session Three			
Initial of Student			
Attendance (5)			Marks Obtained
Comes on time		5	
Comes in 5 minutes		3	
Leaves during discussion		0	
Group dynamics (5)			
Raises hands to participate		1	
Listens attentively to others comments		2	
Speaks to all members of group		2	
Responds only when addresses		-1	
Does not participate at all		0	
Distracts discussion		-2	
Attacks or defends		-1	
Knowledge of topics (5)			
Provides with relevant explanation		3	
Explains with relevant examples		1	
Explains with references		1	
Total (15)			

(items) consisted of statements describing what the students usually do when they learn, on a five-point scale (1 = disagree, 2= somewhat disagree, 3=unsure, 4=agree somewhat, 5 = agree). The items were summed up to form subscales and each of the LAs had four or five subscales. DA was obtained by a total of five subscales (20 Items), including those on: Seeking Meaning (SM), Relating Ideas (RI), Use of Evidence (UE), Interest in Ideas (II) and Supporting Understanding (SU) for teaching preferences. Sub-scales of SAA, which included Lack of Purpose (LP), Unrelated Memorizing (UM), Syllabus Boundedness (SB), Fear of Failure (FF), were combined with Transmitting Information (TI) in preference of learning environment (LE). SA comprised five sub-scales (20 items); Organised

Studying (OS), Time Management (TM), Alertness to Assessment (AA), Achievement to Motivation (AM) and Monitoring Effectiveness (ME) (Appendix).

The theory paper (MCQs and SAQs) and practical OSPE both comprised 100 marks for Anatomy, Physiology and Biochemistry in Module I; Cell Biology, Module II; Cardiovascular and Respiratory Physiology, Module III; as well as Renal and Gastrointestinal Physiology. PBL was conducted in sessions I and III of 15 marks each with a self-study period in between. Following procedure was adopted for calculation: aggregate marks acquired in theory paper in Anatomy, Physiology and Biochemistry was taken in module I, II and III; mean of all three module theory papers was taken; aggregate marks obtained in PBLs of all modules were taken and mean values were computed; aggregate marks obtained in OSPE of all three subjects in each module were computed for mean value. Mean scores on the given items for each approach were estimated, after getting three different mean values of each approach, and respondents were labelled as having deep, strategic or superficial approach.

Only fully completed questionnaire data was included and analyzed using SPSS 15. Scoring of LA was carried out with a raw total of item responses of all subscales. The comparison of the scales, subscales and item scores were done by application of chi square test, and results were considered significant at $p < 0.05$.

Results

Of the 100 students enrolled, 98(98%) completed the study. Of them, 51(52%) were girls and 47(48%) were boys. Overall, 70(71.4%) students displayed SA, and

13(13.3%) showed SAA. DA was practised by 15(15.3%) students. PBL results could be obtained for only 95(97%) students. Means scores of three different assessment methods were compared and there was no significant changes for the mean scores of assessment methods with approach ($p > 0.05$ each) (Table). On the basis of coefficient of variation, maximum variation of LA was observed by PBL scoring (14.92), while the least was seen by assessment through OSPE (12.27).

Discussion

Higher education calls for elaboration and execution of learning and teaching practices that aim at nurturing skills, critical thinking, analysis, synthesis and making inferences. Approaches to learning describe what students do when they go about learning and why they do it. Differences in approach to learning correlate with variations and discrepancy in assessment preferences in various institutions.

Students who are SA learners (SALs) are focused on superficial details to pass through the module examination and it was observed that they performed most effectively in MCQs and SAQs. The emphasis on the rote memorisation by this particular group of students undermines their learning and acquisition of transferable skills.¹⁸ The satisfactory performance of SL in SAQ and MCQs can be explained on the basis of the focussed factual recall of testable facts and figures.

It is well known that PBL fosters deep learning approach which helps in the development of knowledge representations and clinical reasoning skills. Students who are deep learners dig deep into the textbooks and

Table: Learning approaches and assessment methods of medical students.

System	Approach	N	Mean	Standard Deviation	p-value	C.V=(σ/χ) X 100
MCQ & SAQ	Deep	15	63.58	9.30	0.448	14.63
	Strategic	70	66.64	8.11		12.17
	Surface	13	65.54	10.0		15.26
	Total	98	66.02	8.53		12.93
PBL	Deep	15	25.10	2.27	0.237	9.05
	Strategic	67	23.79	3.92		16.48
	Surface	13	25.1	2.97		11.77
	Total	95	24.20	3.61		14.92
OSPE	Deep	15	66.31	6.44	0.981	9.72
	Strategic	70	66.77	8.64		12.94
	Surface	13	66.66	7.91		11.87
	Total	98	66.68	8.18		12.27

p-value obtained using one way analysis of variance (ANOVA).

MCQ: Multiple choice question

SAQ: Short Answer question

OSPE: Objective structured practical examination

PBL: Problem-based learning (results of 95 students).

use more reflection in their self-study time.¹⁹ Moreover, the knowledge acquired is then discussed with PBL group so as to proactively study and understand by exchanging questions and answers. In PBL sessions students can also modify and review their approaches to learning after hands-on experience with a formative mode of assessment and imposition.²⁰

This in-depth processing of knowledge skills are very useful in their clinical years to formulate rational hypotheses and management plans for their patients.²¹ In contrast to the previous studies that have shown that SALs and DALs perform better in their studies²² we observed better performance of SAAL in PBL sessions. This discrepancy may be explained on the fact that students face challenges to their learning approaches, especially when there are no clearly defined learning preferences and the issues in the learning environment, specially in the transition phase from traditional to PBL curriculum.⁶

OSPE is a version of objective structured clinical examination (OSCE) introduced in Dundee University in 1975 to judge psychomotor and communication skills of clinical students.²³ OSPE is an assessment tool which evaluates practical knowledge and performance of students in laboratory exercises with respect to learning objectives.²⁴ We found least variation in the OSPE assessment part, vis-à-vis various LAs. This can be explained by the fact that OSPE examinations for the most part test the knowledge recall and practical skills, which seemed to have been achieved by the all learners in our study. The consistent performance by all learner simply that either OSPE administered was so easy and flawed that every group scored high or the assessment method was not capable of assessing LA of students.

The processes of learning which require students to be actively involved are useful for physicians in their practice, because those transferable skills are heavily used in the PBL sessions.^{25,26}

In our study the assessment method for surface, strategic and deep learners with least variation was found to be OSPE. DL obtained better scores by PBL, but results were not significant which can be explained on the basis of lack of fully functional PBL curriculum at our institution, dearth of training of facilitators and other teething problems which appear as a result of transition in curriculum. Keeping in mind the importance of orientation of clinical cases (problems) for practising physicians, a transition from traditional to PBL curriculum is recommended.

The scoring of PBL is a subject of debate by number of

institutions and was a limitation of our study, but since it was used at BUMDC, we availed of the opportunity of scoring system to assess all approaches. It is argued that assessment of students' attainment is an important factor in promising students to enfold these kinds of deep learning methodologies. The studies on students' learning strategies indicates that 'deep' approaches to learning are promoted more actively by using assessment strategies and teaching exercises which aim at deep learning and conceptual or metaphysical perception and analysis, rather than by trying to demoralise a 'surface' approach to learning.

The score of MCQs, SAQs and OSPE represented outcome or performance, whereas 2/3 scores on PBL represented processes involved in PBL which is a limitation of our study as far as comparability of PBL sores with other assessment methods is concerned. We had a very small sample size of first year students and did not have national or international comparable studies. Still, this is the first study conducted in the region that emphasises the need of selection of assessment methods on the basis of LA.

Studies are required to emphasise the context-dependent nature of LA as well as the importance of assessment as a driver of student learning. We suggest continuation of the study for second year students and further work to determine factors that influence LA in medical students.

Conclusion

The good performance of DLs in PBL emphasised the need of improvement of deep learning skills in these sessions to make it the most reliable approach for all types of learners in undergraduate medical education. OSPE on the basis of coefficient of variation turned out to be a consistent outcome which failed to differentiate students on the basis of LA.

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