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Curricular Impact on Learning Approaches and Critical Thinking Skills of Medical Students

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ABSTRACT

Objectives: This investigation focused on finding the changes in learning approaches of students' while experiencing physiology curriculum and to explore the reflection of changes if any, on their critical thinking skills. **Methods:** In this longitudinal study, information on students' learning approaches was obtained using the revised two factor study process questionnaire (R-SPQ-2F) at the commencement (pre-test) and completion (post-test) of first year MBBS course. The total score and the scores obtained in the critical thinking questions in four physiology assessments were analysed. Pre and post-tests scores in R-SPQ-2F and assessment scores were compared using independent samples *t*-test and one way repeated measure ANOVA respectively. Correlation of scores between assessments was done using Pearson correlation. A p value < 0.05 was taken as significant. **Results:** A significant increase in students' deep learning approach at the completion of the physiology curriculum when compared to commencement ($p < 0.001$) was observed. A progressive improvement in their scores as they experienced the curriculum was also noticed. A moderate correlation among critical thinking questions scores and a strong correlation between critical thinking questions and total essay scores were also recorded. **Conclusion:** The study revealed improvement in students' deep approach to learning in physiology which was reflected in their performance in critical thinking questions.

Keywords: *Curriculum, Impact, Learning approach, Critical thinking*

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INTRODUCTION

The idea of learning approach was developed by Marton and Saljo by studying students' perception about a particular reading task and then by finding how they learn the content (1, 2). Students adopting a surface approach are usually rote learners. They memorise and reproduce the material which results in a superficial level of understanding. They are generally driven either by a worry of failure or a wish to complete the course. Students who adopt deep approach to learning are motivated

by their interest in the topic (3, 4). These students exhibit an ability to relate their previous knowledge to the new knowledge and application of acquired theoretical concepts to everyday experience (4). Quality of teaching and assessment methods influence students' learning approaches (4). It is essential that medical curricula encourage students to adopt deep learning approach (5) as it is linked to critical thinking (6) and life-long learning (7). A deep learning approach can be attributed to the facilitation of learning by the teacher (8). On the other hand, the assessment methods that focus only on recall of information encourage surface learning approach (9).

Some of the previous studies reported that students exhibited increasing surface learning approach and decreasing deep learning approach in undergraduate courses (3, 10, 11). Newble and Clarke found that students studied in traditional medical curriculum preferred more surface approach when compared to problem-based medical curriculum (12). A study conducted on second year medical students showed a positive correlation of assessment scores with deep approach and negative correlation with surface approach (13). A research conducted on American Program students of International Education College (INTEC) reported that there was no relationship between deep approach and students' cumulative grade point average (CGPA). The findings also revealed inverse relationship between surface approach and CGPA (14). Research in the past mainly focused on the learning approach and its correlation with the academic performance on a cross sectional basis. Also, those studies did not investigate the influence of medical students' learning approach on their critical thinking ability. The current longitudinal study aimed at exploring the change in students' learning approaches while they experienced physiology curriculum and whether such change if any, reflected on their critical thinking skills.

METHODS

Educational Context

Melaka Manipal Medical College, Manipal University, India offers five years MBBS course. Students learn physiology, anatomy and biochemistry in their first year of the course. Curriculum followed at the institution is of hybrid type which utilises varieties of teaching learning methods such as didactic lecture classes, self-directed learning, problem-based learning (PBL) and laboratory exercises. Students' learning is assessed through four assessments (A1, A2, A3 and A4) in the first year and the time interval between the assessments being 10 weeks. A summative examination is also conducted at the end of the year.

Instrument

Students' learning approaches were assessed using revised two factor study process questionnaire (R-SPQ-2F) (15). The questionnaire has 20 items grouped under 2 subscales: surface approach (10 items) and deep approach (10 items). Response was obtained in the Likert scale (where, 1 = only rarely or never, 2 = sometimes, 3 = half of the time, 4 = frequently, and 5 = always). Biggs et al. (15), administered the questionnaire to 495 undergraduate students from different disciplines from Hong Kong University. Internal consistency was calculated and Cronbach alpha values were 0.64 for surface approach and 0.73 for deep approach. This questionnaire was also used to find medical students' learning approaches (16). Permission from the author was obtained before the conduct of this study.

Study Design

The study design was longitudinal, conducted during the period of September 2012 to July 2013 after obtaining permission from the Institutional Ethics Committee. R-SPQ-2F was administered to the first year MBBS students (n = 229) at the beginning (pre-test) and at the end (post-test) of first year to measure the change in learning approaches over the course. Questions on physiological basis for a particular phenomenon were designed to test students' critical thinking ability (e.g. [a] Why goiter is seen in primary hypothyroidism?; [b] Why pulmonary congestion is found in congestive cardiac failure?). The scores obtained by the students in these critical thinking questions as well as the total score in the essay component of four assessments in physiology (A1, A2, A3 and A4) were compiled.

Statistical Analysis

Analysis was done using Statistical Package for the Social Sciences (SPSS) version 16. Data generated through R-SPQ-2F were summarised using mean and standard deviation (SD). Pre- and post-tests scores in subscales of R-SPQ-2F were compared using independent samples *t*-test. Scores in the critical thinking questions in four assessments was compared using one-way repeated measures ANOVA and the same analysis was performed for total essay scores. Correlation of scores between assessments was done using Pearson correlation. Total essay score and scores in critical thinking questions were also correlated using Pearson correlation. A p value < 0.05 was taken as significant.

RESULTS

A total of 209 students completed the questionnaire in both pre- and post-tests. Table 1 shows students' learning approaches at the beginning and end of first year of the course. It also depicts percentage of students adopting deep and superficial approach at the beginning and end of the course. The total mean score for deep approach was found to be higher when compared to surface approach in both pre- and post-tests. Comparison of the subscales between pre- and post-test showed a significant increase in students' deep learning approach ($p < 0.001$). Moreover, percentage of students adopting deep approach to learning increased from pre-test to post-test and percentage of students using surface approach decreased from pre-test to post-test.

Table 2 shows comparison between the scores of critical thinking questions obtained by students in four assessments. Moreover, the table also represents correlation between scores obtained in critical thinking questions in four assessments and critical thinking questions with the total essay score of the same assessment. Furthermore, comparison of mean total essay scores between the four assessments as well as correlation between the total essay scores were also depicted in this table. There was significant increase in students' scores in critical thinking questions in A2, A3 and A4 when compared to A1, as well as in A3 and A4 when compared to A2 ($p < 0.001$). However, significant decrease ($p < 0.001$) in mean score was observed in A4 when compared to A3. Students' total essay score increased in A2 when compared to A1, but in A3 and A4 it decreased. However, compared to A3, total essay score increased significantly in A4 ($p < 0.05$). There was a moderate correlation between the scores of critical thinking questions in four assessments, while, a strong correlation was observed between total essay scores. Moreover, a strong correlation was noticed between scores of critical thinking questions and total essay scores of each assessment.

Table 1: Total mean score and percentage of students adopting deep and superficial approach at the commencement and end of the MBBS course

	pre-test		post-test	
Subscales	DA	SA	DA	SA
Mean total score	32.5	27.6	35.1*	28.1
SD	6.9	7.5	7.4	8.3
Percentage of students	69	27	75	22

Subscale DA: deep learning approach, SA: superficial learning approach.

* post-test vs pre-test, $p < 0.05$

Table 2: Comparison of student scores in critical thinking questions (CTQ) and total essay scores in A1, A2, A3 and A4 assessments and correlation of these scores

Assessment	Mean score of CTQ	CTQ correlation coefficient (*r*) with	*p* value of correlation of scores in CTQ	Mean of essay total score	Total essay score correlation coefficient (*r*) with	Correlation coefficient (*r*) of CTQ with essay total score	*p* value of correlation of CTQ with essay total score
A1	4.6*	A2: 0.55 A3: 0.45	< 0.001	72.8$	A2: 0.82 A3: 0.70	0.76	< 0.001
A2	6**	A3: 0.48 A4: 0.48	< 0.001	75.6$$	A3: 0.75 A4: 0.78	0.85	< 0.001
A3	7.6***	A4: 0.6	< 0.001	66.2$$$	A4: 0.86	0.81	< 0.001
A4	6.7	A1: 0.48	< 0.001	67.8	A1: 0.71	0.81	< 0.001

Comparison of CTQ scores:

*A1 vs A2, $p < 0.001$; A1 vs A3, $p < 0.001$; A1 vs A4, $p < 0.001$

** A2 vs A3, $p < 0.001$; A2 vs A4, $p < 0.001$

***A3 vs A4, $p < 0.001$

Comparison of total essay scores:

$A1 vs A2, $p < 0.001$; A1 vs A3, $p < 0.001$; A1 vs A4, $p < 0.001$

$$ A2 vs A3, $p < 0.001$; A2 vs A4, $p < 0.001$

$$$A3 vs A4, $p < 0.017$

DISCUSSION

The current study focused on the analysis of students' change in learning approaches and critical thinking skills from beginning to the end of an academic year. Study revealed that the learning approach adopted by students was predominantly deep approach throughout the academic year. As they experienced the curriculum, they showed an improvement in their deep approach towards learning. Deep approach involves critical analysis of new ideas, relating them to the known concepts, and using such knowledge for problem solving in a different context (17, 4). This is further evidenced in the study by the increase in scores of students in critical thinking questions as they experienced the curriculum. If we consider, scores of critical thinking questions as indicators of deep approach, then it could also be implied that the students who scored well in critical thinking questions, perform better in the exam. This is endorsed by the finding of a strong relation between total essay score and score in the critical thinking questions.

A medical curriculum aiming at promoting deep learning approach among students (5), the teaching-learning methods and assessments should be planned in such a way that it can motivate students to develop critical thinking ability. Good

teaching methodology involves techniques to encourage students to prefer deep learning approach instead of surface approach (15). Studies have shown that PBL curriculum helps in developing critical thinking skills (18, 19) and deep approach (20). The curriculum at our institute has PBL component to augment students' critical thinking and problem solving abilities, which, might be one of the reasons for improvement in the critical thinking skills and deep learning approach. At our institute, students are encouraged to learn by themselves through self-directed learning sessions and students are given opportunity to manage their own learning which could result in deep learning (21). Analysis of the scores revealed that students' ability to answer the critical thinking questions in assessments improved as they progressed through the curriculum (Table 2). As assessment drives student learning (4), our pattern of assessment including questions on real life scenarios and other type of critical thinking questions also might be a probable reason for improvement in critical thinking and deep approach towards learning. A deep approach also results when the subject is relevant and interesting to students (22). As physiology deals with functions of the body relating physiological concepts to the real life, students might have developed interest in the content and understood its relevance to medical practice.

Students' academic performance CTQ in assessment A4 was found to be lower compared to third assessment, probably due to the vastness of the content and perceived difficulty of the topics as expressed by the students generally. The students responses to post-test questionnaire was taken at the end of first year, where students in general, were engaged in studying for the final assessment besides involved in preparation for the university examination. Hence, vast syllabus and heavy workload could have directed students to adopt surface approach and superficial learning (23), which could be the reason for the finding that the surface approach for learning had not decreased at the end of the first year course.

The correlation between the learning approaches and assessment scores could also have been explored in the study. This was not done as students' responses were anonymous. The study findings could only be generalised when data is collected from more batches of students and from medical students of other institutions. Further, focus group discussions can be conducted to explore the influence other factors, including the learning of other subjects in the first year on critical thinking skills and learning approaches of students.

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