Do medical students who claim to be using deep learning strategies perform better at the Forensic Medicine examination?

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Abstract

Literature reveals that frequent use of deep learning strategies and meaning orientation generally relates to academic performance positively, while the reproducing orientation is usually negatively associated with academic performance. The objective of this study was to investigate possible associations between reported learning strategies and performance at different components of the Forensic Medicine examination between two successive batches of medical students at the Faculty of Medicine, University of Peradeniya, Sri Lanka.

Reported learning strategies of two successive groups of medical students were measured using the adapted Sri Lankan version of the Inventory of Learning Styles, the *Adyayana Rata Prakasha Malawa* (ARPM). The inventory scale scores were computed for each student and entered into a data base. The scores for each component of the Forensic Medicine examination namely; essay, multiple choice questions and viva voce and the total score were added to the data base. The Spearman rank correlation test was performed to identify possible associations between learning strategy scores and performance at different components of the examination.

The number of respondents was 142 out of 173 of the 2003/2004 (82%) and 107 out of 188 students (57%) of the 2002/ 2003A batches of fourth year medical students having completed three terms of work in Forensic Medicine. Contrary to expectations, the results failed to show a significant association between academic performance and frequent use of deep processing strategies or self regulation. Since examinations drive the learning process it could be that the assessment demands promote the students to use both surface and deep learning strategies to the same extent.

Keywords: medical students' learning strategies, academic performance

Introduction

Deep and surface learning are two approaches to learning derived from the original empirical research by Marton and Saljo (1997), subsequently elaborated by Ramsden (1992) and Biggs (1993). The use of surface learning strategies such as memorizing and rehearsing subject content and analyzing subject matter in a stepwise manner enables the student to reproduce material without much integration, leading to low quality learning outcomes.

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Similarly, self regulation is thought to be associated with meaningful learning rather than external regulation. However, the goal of university education, irrespective of the field of study, is to promote knowledge synthesis and better organization of knowledge and self regulation of learning. Therefore, it is expected that university students are motivated to use deep learning strategies and self regulation more often, leading to knowledge construction.

Learning is seen as an active process in which the learner synthesises, modifies and utilises the concepts in a subject domain to interpret situations and act in them. Thus, it is assumed that the quality of the learning activities employed, determines to a large extent the quality of the learning results achieved.

Academic learning outcomes as measured by various examinations have been the focus of extensive research. A number of factors and

variables have been found to influence the achievement outcomes. Results of studies investigating the associations between students' learning strategies and examination performance indicate that greater use of deep learning strategies is generally positively related to academic performance, while frequent use of surface strategies is mostly negatively associated with academic performance (Arnold & Feighny, 1995; Leiden *et al.,* 1990; Lindblom-Ylänne & Lonka, 1999; Stiernborg & Bandaranayake, 1996).

Many inventories are used to measure learning strategies of university students. The current study uses the adapted Sri Lankan version of the Inventory of Learning Styles (*ILS*) (Vermunt, 2005), which has inventory items on cognitive processing and regulation strategies (Appendix).

Busato *et al.* (1998) used the *ILS* to investigate the correlation between factor scores (learning pattern scores) and study success in terms of a number of study points among Psychology students. They report that undirected learning (a learning pattern which demonstrates incoherent linkages between strategies, conception and orientation) was consistently negatively related to study success. Boyle *et al.* (2003) reported the same findings with the *ILS* in a British higher education setting while Meyer (2000) observed that 'dissonant' learning patterns (learning patterns defined by incoherent learning strategies, conceptions and orientations) were associated with low exam performance. Recently, Vermunt (2005) analysed the associations between learning patterns derived from the *ILS* and academic performance of undergraduates from seven academic disciplines, and shown that most elements of meaning directed learning were positively related to academic performance. He also reported that the pattern of relations between the mean examination score and elements of undirected learning remained consistently negative.

In 2005, van Mil revealed that a Chinese student group reported greater use of surface strategies than Dutch students, studying at the same Dutch University, and that the examination performance of the Chinese student group was found to be less satisfactory when compared to the Dutch students. On the other hand, a study conducted at a medical school in Pakistan demonstrated that there was a non-significant relationship between the learning approaches and academic performances and a weak statistical significance between achievement, orientation and performance in certifying examination (Naqvi & Ahmed, 2000).

In summary, although several researchers have shown that students reporting greater use of deep learning strategies perform better at examinations, some others have not been able to demonstrate a similar relationship.

However, students engage in different learning strategies depending on the requirements of the assessment task. The Forensic Medicine examination, which is held at the end of the fourth academic year of the medical course, consists of multiple choice questions, essay and viva voce components. The department staff thought it was apt to investigate these relationships between students' reported use of learning strategies and their performance at the different components of the examination, in order to identify the types of assessments that are more discriminatory.

It is hypothesized that those who engage in more constructive learning processes such as relating and structuring knowledge, critical processing, concrete processing and self regulation, perform better in the essay and viva voce components of the examination, which require knowledge synthesis compared to other components of the examination. Thus, the current study investigated the possible associations between reported use of different learning strategies by medical students and their performance in Forensic Medicine during the 4th academic year of the MBBS programme.

Research question
The research question of this study was to determine whether there is a correlation between reported learning and regulation strategies of students and their performance in different components of the Forensic Medicine examination.

Materials and Methods

Cognitive processing strategies and regulation strategies (together referred to as learning strategies) used by two successive batches of medical students were measured using the 55 item version of the *Adyayana Rata Prakasha Malawa* (ARPM). The ARPM (Marambe, 2007) is the validated Sinhala version of the Inventory of Learning styles (ILS), which has been used in many countries to measure aspects of learning. A description of the ILS scales is appended.

The scores of each student for the different components of the Forensic Medicine examination such as the MCQ paper, essay

paper and viva voce were considered as a measure of student performance. In addition to the total score for the essay paper, the authors specifically considered the scores of individual essay questions, which were selected on the basis of the demand on higher order thinking activities on the part of the student, to write a successful answer.

Procedure

Towards the end of the Forensic Medicine program (final week of term 3 of the 4th year) the ARPM was administered to students of the 2002/2003 and 2002/2003A batches respectively. Both groups completed the questionnaire after a scheduled lecture. Students were requested to complete the 55 item ARPM questionnaire during the allocated time. The respondents were instructed to reflect on how they studied Forensic Medicine while responding to the questionnaire and were requested to write the student registration

number for correlation purposes. However, student participation was on a voluntary basis.

Data analysis

The student responses were entered into a data base. A mean score for each learning strategy scale was computed for each student and a data base was constructed. Respective examination scores for each student were then entered.

Spearman's correlation test was used in order to identify possible correlations. Data was analysed using SPSS version 10.

Results

The percentages of students who participated in the study were; 82% for the 2002/2003 batch and 57% for the 2002/2003A batch.

Tables 1 and 2 depict the results of the Spearman's correlation test performed for the two batches of fourth year medical students.

Table 1: Correlations between the learning strategy scale scores and scores of examination components and total examination score of 2002/2003 batch of medical students

n=142	RELA	CRIT	MEMO	ANLY	CONC	SELF	EXTE	LACK
ESSAY (score of the full paper)	0.07	0.07	0.19	0.14	0.01	0.12	0.06	0.01
ESSAY (selected question1)	0.07	0.05	0.13	0.12	0.05	0.06	0.06	0.12
ESSAY (selected question 2)	0.12	0.12	0.05	0.16	0.07	0.08	0.03	0.06
VIVA	0.13	0.21	0.06	0.13	0.07	0.17	0.09	0.03
MCQ	0.12	0.11	0.08	0.04	0.01	0.12	0.07	0.02
Total	0.20*	0.09	-0.05	0.09	0.03	0.07	0.08	0.03

Note * $p < .05$
RELA = relating and structuring; CRIT = critically processing; MEMO = Memorizing; ANLY = Analyzing; CONC = Concretizing; SELF = self regulation; EXTE = External regulation; LACK=lack of regulation

Table 2: Correlations between learning strategy scale scores and scores of examination components and total examination score of 2002/2003A batch of medical students

n=107	RELA	CRIT	MEMO	ANLY	CONC	SELF	EXTE	LACK
ESSAY (selected question 1)	0.07	0.08	0.11	0.03	0.02	0.08	0.02	0.01
ESSAY (selected question 2)	0.07	0.08	0.06	0.11	0.16	0.05	0.04	0.03
VIVA	0.07	0.08	0.01	0.03	0.04	0.04	0.07	0.08
MCQ	0.06	0.03	0.01	0.05	0.11	0.06	0.04	0.07
Total	0.13	0.01	0.02	0.05	0.14	0.04	0.01	0.15

Note * $p < .05$
RELA = relating and structuring; CRIT = critically processing; MEMO = Memorizing; ANLY = Analyzing; CONC = Concretizing; SELF = self regulation; EXTE = External regulation; LACK=lack of regulation

Discussion

The use of learning activities leads to a change in the individual's knowledge base or repertory of skills and attitudes (Trigwell & Prosser, 1991; Vanderstoep et al., 1996). Thus, it is expected that the students who engage in deep learning strategies and self regulation perform better than others at summative examinations. This is particularly relevant in the components which require greater understanding of subject content such as essay and viva voce, which are based on clinical scenarios.

However, contrary to expectations a positive correlation between deep processing strategies and performance in selected essay questions and viva voce components was not evident for either batch of medical students (Table 1, 2). Although a weak correlation between frequent use of relating and structuring (a deep learning strategy) and overall performance at the Forensic Medicine summative examination is evident among one group of students, as shown in Table 1, the result is not consistent (Table 2).

The study conducted by Naqvi and Ahmed, (2000) at a medical school in Pakistan could not demonstrate a significant relationship between the learning approaches and academic performance. Similarly, the results of our study when taken as a whole, do not support the argument that the students' reported use of deep learning strategies and self regulation of learning has a positive effect on their performance at summative examination.

Traditional tests are often used to measure learning outcomes in students (Vermunt, 2005). However, one must bear in mind that exam achievements reflect a small portion of the learning results and that it is not always a true representation of the thinking activities undertaken by the learner. It could also be that a student may score well with memorising and rehearsing strategy alone depending on the way tests are constructed. A matter of concern has been to what extent the exams in the undergraduate courses capitalise on the various learning activities that students employ.

Conclusion

A positive association between frequent use of deep learning strategies and academic performance could not be demonstrated among fourth year medical students, with respect to learning Forensic Medicine.

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Appendix

Description of the scales of the Inventory of Learning styles (*ILS*), including a sample item for each scale (Based on Vermunt, 2005)

Parts and scales of the *ILS*	Description of content
Processing strategies	
Deep processing	
Relating & structuring	Relating elements of the subject matter dealt separately in the course to each other and to prior knowledge, structuring these elements into a whole. 'I try to relate new subject matter to knowledge I already have about the topic concerned'.
Critical processing	Forming one's own view on the subjects that are dealt with, drawing one's own conclusions, and being critical of the conclusions drawn by textbook authors and teachers. 'I draw my own conclusions on the basis of the data that are presented in a course'.
Stepwise processing	
Memorizing & Rehearsing	Learning facts, definitions, lists of characteristics by heart by rehearsing them. 'I make a list of the most important facts and learn them by heart.'
Analyzing	Studying the subject matter in a stepwise fashion, studying the separate elements thoroughly, in detail and one by one. 'I do not proceed to a subsequent chapter until I have mastered the current chapter in detail'.
Concrete processing	Applying the learnt subject matter by connecting the new knowledge to one's own experiences and by using in practice what one learns in a course leading to knowledge integration. 'I use what I learn from a course in my activities outside my studies'.
Regulation strategies	
Self regulation	
Learning process and Outcomes	Regulating one's own learning processes through regulation activities like planning learning activities, monitoring progress, diagnosing problems, testing one's outcomes, adjusting and reflecting. 'To test my learning progress when I have studied a textbook, I try to formulate the main points in my own words'.
Learning contents	Taking the initiative to consult literature and sources outside the syllabus. 'In addition to the syllabus, I study other literature related to the content of the course.'
External regulation	
Learning process	Letting one's own learning processes be regulated by external sources, such as introductions, learning objectives, directions, questions or assignments of teachers or textbooks authors. 'I learn everything exactly as I find it in the textbook'.
Learning outcomes	Testing one's learning results by external means, such as the tests and questions provided by teachers and text books. 'If I am able to complete all the assignments given in the study materials or by the teacher, I decide that I have a good command of the subject matter.'
Lack of regulation	Having problems with the regulation of one's own learning processes 'I notice that I have trouble processing a large amount of subject matter'.