

# Motivation and Learning in Singaporean Medical Students

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## Summary

In order to assess the impact of a new undergraduate curriculum on learning methods and motivation, a series of questionnaires was given to Singaporean medical undergraduates. Questionnaires were completed at the start and end of medical microbiology teaching, in the two years during which a remodelled curriculum was introduced. Despite a strengthened emphasis on clinical practice, changes to the curriculum in Singapore appear to have had little impact on undergraduate motivation and learning patterns. Throughout the survey period, the only self-directed learning method in common use was self-assessment questions. Other methods more typical of a deep learning style were restricted to a small number of clinically-motivated students in the first cohort of the new curriculum. Clinically-motivated students showed no other difference in learning methods compared to the examination motivated group. The surveyed population retained a stubborn attachment to reactive learning methods best supplied by a traditional style of didactic teaching.

*Key Words:* Medical curriculum, Microbiology, Problem-based learning

## Introduction

In many countries, medical schools have changed to a problem-based curriculum, integrating preclinical sciences and clinical tuition in an attempt to make their undergraduate teaching more relevant to medical practice<sup>1</sup>. After detailed consultation and careful planning, the Medical Faculty of the National University of Singapore decided to introduce a form of integrated curriculum starting with the session 1993-94.

## Traditional curriculum

Before the curriculum changes were implemented, Microbiology was taught to medical students in the second and third years of their course. Spreading over three terms, this was predominantly lecture based. Lectures were complemented by practical classes, demonstrations and occasional large group seminars. The course comprised a short general introduction, followed by immunology, virology, parasitology,

bacteriology, mycology and infectious disease tuition. Teaching was conducted by the department's medical and science staff and learning was assessed by a series of multiple choice and spotter tests, and an end-of-course examination. There were just under 150 students in each year.

## Reformed curriculum

The remodelled curriculum aimed to reduce the amount of factual information presented to students, simplify the course structure, and place greater emphasis on clinical problem-solving. The first year therefore dealt with human biology, the second year with human disease and the third with elementary clinical practice. Subject material was not presented in an organ systems based scheme, but increased integration across subjects and clinical/preclinical boundaries was established as an objective for future consideration. Year-3 Microbiology was moved to a second year ('preclinical') location, reducing competition with simultaneously examined "clinical"

subjects. As a result of these changes, the new Microbiology course overlapped with the old course during the 1994/95 session. The combined group was taught together during the transition year because no additional staff or teaching venues were available at that time

During a Faculty Teaching Methodology Workshop in 1993, Microbiology was cited as an example of obsolete, descriptive teaching that students found hard to relate to clinical practice. In view of this, the Department of Microbiology sought an information base for teaching reform. Previously, our understanding of student learning patterns and motivation was based on anecdotal reports of student opinion, teachers' classroom experience, and course-end student feedback on teacher performance. Learning styles among Singaporean medical students had not been formally analysed, but like many students in East Asia, showed emphasis on memorisation and rote learning. Recent use of the Lancaster Inventory in Indonesia revealed high scores in all learning categories<sup>2</sup> but cultural and other local factors prevent extrapolation to a Singaporean context.

A questionnaire was therefore designed to explore the impact of these curriculum changes on course acceptability, motivation and learning patterns among medical students while studying Microbiology.

## Methods

Self-rated questionnaire surveys were conducted on two batches of medical students during the 1993-94 and 1994-95 sessions.

## Questionnaire content

The questionnaire was based on a feedback *pro forma* previously used by the author at the University of Leeds, UK. The form was headed by a linear analogue acceptability scale ("dreadful" to "brilliant" on an unmarked, continuous scale), followed by three questions in multiple choice (tick box) format, along lines previously recommended<sup>3</sup>. The three multiple choice questions attempted to identify the students' principal motivation to learn, their perception of the course's aims, and their preferred learning methods. A final, variable question was used to address issues that arose during the course, and to emphasise the distinct nature of each questionnaire. There were thus 5 questions per questionnaire.

## Survey method

Questionnaires were distributed and completed at the beginning of a class and collected at the end of the same class. Students were reminded not to supply names or identifying marks to ensure confidentiality. The first precourse questionnaire was administered at the beginning of bacteriology teaching in October 1993, a further midcourse questionnaire was administered at the end of Bacteriology, and a postcourse questionnaire at the end of infectious disease teaching. During the next university session, precourse questionnaires were administered before the very first introductory lecture, and postcourse questionnaires at the very end of the course. In each case, a preliminary analysis was completed immediately after collection and the results presented to the Head of Department. A more detailed analysis was provided for consideration at the following departmental medical staff meeting.

Table 1  
Overall acceptability of medical microbiology course

	1993/4 session, year 3		94/5, year 3		94/5, year 2	
	mid-	postcourse	pre-	postcourse	pre-	postcourse
acceptability <sup>a</sup>	59	76	32	36	43	52
no. respondents	49	63	29	34	45	46

<sup>a</sup> average of linear acceptability scores for respective group

Table II  
Student perceptions of the primary aim of the course

primary aim	1993/4 session, year 3			94/5, year 3		94/5, year 2	
	pre-	mid-	postcourse	pre-	postcourse	pre-	postcourse
clinical knowledge <sup>a</sup>	79 (69) <sup>b</sup>	42 (84)	39 (61)	16 (47)	20 (69)	18 (40)	27 (58)
medical understanding	28 (25)	4 (8)	6 (9)	5 (15)	7 (24)	13 (29)	15 (32)
exam. preparation	23 (20)	5 (10)	5 (8)	1 (3)	2 (7)	2 (4)	2 (5)
biological science	11 (10)	2 (4)	0	3 (9)	0	3 (7)	0
don't know	0	0	0	0	0	1 (2)	2 (5)
Total respondents	114(100)	49(100)	64(100)	34(100)	29(100)	45(100)	46(100)

<sup>a</sup> some respondents gave more than one response to the question; <sup>b</sup> percentages given in brackets

Issues arising were addressed in the variable question in the subsequent questionnaire. The acceptability score was computed by measuring the distance between the point marked on the continuous scale and the "dreadful" end (mm) and calculating the percentage of the total scale length.

## Results

On each occasion all 150 questionnaires circulated per year were picked up, though numbers in attendance were often significantly less than the 143-148 in each year. As lectures in the Medical Faculty were not compulsory and no attendance record was kept during the period under review, the response of non-attenders or non-completers could not be analysed. The crude association between mean course acceptability score for the year group and number completing questionnaires (Table I) was interesting and possibly reflected the sensitivity of attendance at voluntary lectures as a measure of teaching effectiveness. However, neither measure provided any insight into motivation or learning methods.

In all seven surveys, students consistently saw the principal aim of the course as acquisition of clinically useful knowledge (Table II). Gaining an understanding of the discipline's contribution to medical practice was the second most commonly perceived aim in all but one survey population. The

pre-eminence of factual acquisition over understanding was noteworthy. While both decreased during the 1993/4 session, they increased in both year groups over the 1994/5 session.

Lectures were consistently cited as the most popular learning method, but it should be remembered that questionnaires were distributed in the lecture theatre (Table III). No question was asked on the use of lecture handouts as a learning strategy during the 1993/4 session, but classroom experience led to inclusion of this option during the 1994/5 session. In both second and third year groups, students used these and other teacher-structured learning materials heavily. Very few students admitted to using materials other than self-assessment questions for independent study (maximum = 7% in any group). Few cited tutorials as a useful learning method (6-24%), but this probably reflects the difficulty of providing effective small group teaching with very few staff. However, practical and demonstration classes were more widely used, particularly by the second year group in the 1994-95 session (i.e. the new curriculum cohort; 56 and 59%, respectively).

The simple method used in the present study to categorise students by their learning motivation group was not intended to identify the surface, strategic and deep learning styles recognised in the Lancaster learning inventory. Different terms have therefore been

**Table III**  
Learning methods used by students during microbiology course

learning method (%)	1993/4 session, year 3			94/5, year 3		94/5, year 2	
	pre-	mid-	postcourse	pre-	postcourse	pre-	postcourse
lectures	80 (70)	24 (49)	57 (89)	28 (82)	28 (96)	40 (89)	46 (100)
handouts	-	-	-	33 (97)	28 (96)	45 (100)	43 (93)
QRT <sup>a</sup>	36 (32)	7 (14)	22 (34)	20 (59)	16 (55)	43 (96)	39 (85)
SAQ <sup>b</sup>	27 (24)	5 (10)	15 (23)	11 (32)	8 (28)	26 (58)	23 (50)
tutorials	20 (18)	3 (6)	6 (9)	2 (6)	4 (14)	11 (24)	5 (11)
lab. demos	23 (20)	1 (2)	22 (34)	6 (18)	15 (52)	16 (36)	27 (59)
practicals	39 (34)	1 (2)	23 (36)	4 (12)	13 (45)	13 (29)	26 (56)
case prentn	15 (13)	1 (2)	34 (53)	4 (12)	4 (14)	2 (4)	8 (17)
CBT <sup>c</sup>	8 (7)	0	2 (3)	0	0	1 (2)	1 (2)
reviews	2 (2)	0	0	1 (3)	2 (7)	2 (4)	3 (6)
PGT <sup>d</sup>	5 (4)	0	0	0	2 (7)	1 (2)	1 (2)
papers	1 (1)	0	0	0	1 (3)	0	1 (2)
Total	114	49	64	34	29	45	46

<sup>a</sup> - quick revision textbook; <sup>b</sup> - self-assessment questions; <sup>c</sup> - computer-based tutorial;  
<sup>d</sup> - postgraduate textbooks

**Table IV**  
Motivation categories in students during microbiology course

motivation category (%)	1993/4 session, year 3			94/5, year 3		94/5, year 2	
	pre-	mid-	postcourse	pre-	postcourse	pre-	postcourse
minimal	19 (17) <sup>a</sup>	2 (4)	5 (8)	2 (6)	1 (3)	1 (2)	1 (2)
exam	44 (38)	21 (43)	22 (35)	7 (20)	5 (17)	8 (18)	10 (23)
clinical	40 (35)	25 (51)	31 (49)	2 (6)	22 (76)	33 (73)	25 (58)
maximal	2 (2)	1 (2)	0	1 (3)	0	4 (9)	1 (2)
Total respondents	114	49	63	34	29	45	46

<sup>a</sup> percentage in brackets

used to denote the claimed motivation, based on the statement the respondents felt most accurately reflected their feelings (Table IV). Very few students identified with the maximal group ("as much microbiology as I can get my hands on"), and the numbers fell in all

three year groups by the end of the course. In five of the seven survey groups the predominant motivation was clinical relevance ("only what microbiology I need for clinical practice"). However, a large minority (17-43%) appeared to be primarily examination motivated

**Table V**  
Self-assessed changes in motivation to learn during microbiology course

	initial motivation category					total
	forgot motivation (8)	minimal	remembered exam	initial motivation (42) clinical	maximal	
<b>final category</b>						
minimal	0	1	0	1	0	2
exam	2	2	15	5	0	24
clinical	4	5	2	9	1	21
maximal	2	0	1	0	0	3
<b>total</b>	<b>8</b>	<b>8</b>	<b>18</b>	<b>15</b>	<b>1</b>	<b>50</b>

**Table VI**  
Learning methods used by each student  
motivation group

	minimal (%)	exam (%)	clinical (%)
lectures	6 (86)	34 (92)	72 (91)
handouts	2 (28)	14 (38)	45 (57)
QRT <sup>a</sup>	4 (57)	21 (57)	43 (54)
SAQ <sup>b</sup>	1 (14)	13 (35)	29 (37)
tutorials	0	4 (11)	11 (14)
lab. demos	1 (14)	17 (46)	23 (29)
practicals	2 (28)	15 (40)	40 (51)
case presn.	3 (43)	17 (46)	23 (29)
CBT <sup>c</sup>	0	0	2 (2)
reviews	0	0	5 (6)
PGT <sup>d</sup>	0	0	3 (4)
papers	0	0	2 (2)
<b>total</b>	<b>7 (100)</b>	<b>37 (100)</b>	<b>79 (100)</b>

<sup>a</sup> - quick revision textbook; <sup>b</sup> - self-assessment questions;

<sup>c</sup> - computer-based tutorial; <sup>d</sup> - postgraduate textbooks

("only as much microbiology as I need for the exams"). The almost total disappearance of students stating "as little microbiology as I can get away with" (i.e. the

minimal group) after the first precourse questionnaire probably reflects a failure to motivate these students to do more than collect the course timetable and other introductory handouts.

The consistency of student motivation throughout their course was obtained in the postcourse questionnaire during session 1993-94. The results of this small analysis (Table V) suggest that the majority of students who claimed to be able to remember their start of course motivation had stayed in the same motivation category. There was no pattern of motivational shift among those students who believed their motivation had changed.

In view of the possible change in motivation during the course, the learning methods used by different motivation groups were analysed only on completed postcourse questionnaires, pooled into combined motivation groups. The maximal group was too small to analyse (1 student). The learning patterns were similar across all three groups as shown in Table VI, and the balance of learning methods was almost identical in the examination and clinically motivated groups, other than a small number of clinically-motivated students (not greater than 5) who used one or more independent learning methods (viz: computer-based tutorials, review articles, postgraduate textbooks, or peer-review papers). No other group appears to have used independent learning methods at all.

## Discussion

The undergraduate medical curriculum in Singapore is in the process of change through which an integrated, problem-based course is expected to evolve. The changes made to the Microbiology course have been modest, which is one possible reason why they may have had little impact on motivation to learn or learning patterns. It is also clear that other teaching innovations introduced to complement the reformed curriculum (computer gaming, a hypertext-based virtual textbook, debate, and role-play described elsewhere<sup>4,5</sup>) have had no impact.

The Department of Microbiology attempted to exploit feedback from early questionnaires, particularly the students' perception that the principal aim of the course was to impart clinically relevant knowledge. The Department responded by beginning lectures with case outlines, designing practical and demonstration classes around clinical problems or themes, and expanding the infectious disease component of the course. Clinical problems were introduced into practical, written and multiple choice examinations during the 1994/5 session to further promote the clinical emphasis among the large group of students primarily motivated by examination.

This shift to a more overtly clinical course required a greater input from teaching staff with postgraduate clinical experience of Medical Microbiology, and a correspondingly lesser input from non-medical scientists. In their review of medical undergraduate learning styles, Newble and Entwistle highlight the importance of motivation and warn of serious consequences should medical teachers fail to interest their students or convince them of their subject's vocational significance<sup>6</sup>. This should serve as a warning to departments that believe it possible to teach Microbiology to medical students without a day-to-day involvement in Clinical Microbiology and Infectious Disease practice. Unfortunately, only one member of teaching staff was employed in a hospital post in Singapore, reducing the clinical credibility of teaching by other microbiology staff and quite possibly the motivational impact of the whole group.

The heavy reliance many medical students placed on

detailed lecture handouts was seen throughout the period surveyed. Despite sustained attempts to wean students off handouts (e.g. by first providing lecture outlines, then learning objectives, and finally giving out none at all), the percentage preferring them as a learning method remained high throughout the 1994/5 session. Paradoxically, both provision of detailed handouts and withdrawal of handouts may have contributed to poor lecture attendance, since regular lecture attenders collected copies for their absent colleagues, and some students only turned up long enough to see if there were handouts or not.

Problem-based curricula have been shown to increase the internally motivated, deep learning style<sup>7</sup>, in comparison to conventional didactic teaching, in which superficial and strategic learning increase. If increased deep learning is an expected product of problem-based learning, our experience suggests that medical curriculum reform in Singapore has failed at a fundamental level, and the visible changes to the curriculum are merely cosmetic. It has already been noted that increased deep learning does not necessarily lead to improved examination performance<sup>8</sup>, a point that the large proportion of strategically-motivated, exam-orientated students may already be intuitively aware of. Perhaps the key to successful medical curriculum reform in Singapore lies in assessment methods that combine independent study with clinical problem-solving. Once again, the solution presumes on the existence of a staff with locally relevant clinical skills and insight.

In conclusion, this survey of student motivation to learn and learning methods during a time of curriculum change in Singapore found that:

- 1 curriculum reform has had little impact on motivation and learning patterns
- 2 most self-directed learning activities centre on exam preparation
- 3 curriculum reform has not produced any noticeable increase in deep learning
- 4 students are stubbornly passive recipients of sufficient factual information for their examinations and subsequent clinical practice.

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