Original Research Article

Undergraduate Medical Students' Preferred Choices of Learning Style, Teaching Pedagogies and Assessment methods in theOphthalmology Module at National Defence University of Malaysia

ABSTRACT

Objectives: The aims of this study were to identify the students' preferred choices of learning style and to determine their preferred teaching pedagogies and assessment methods in the Ophthalmology module of undergraduate medical course.

Material and Methods: This prospective study was conducted among 97 medical students of year 4 Ophthalmology posting in the Faculty of Medicine and Defense Health, National Defense University of Malaysia, over a period of two academic years. Each student was given a structured questionnaire, after completing their clinical rotation posting examination, for his/her responses to determine their preferred choices of learning style, teaching pedagogies and assessment methods in the Ophthalmology module.The students were asked to circle their preferred choice of the responses given for each question for the above mentioned three methods. The data was analyzedusing SPSS software and the frequency of variables were expressed as percentage.

Results: Out of 97 students in this study, females were slightly more (52.6%) than males, and the mean age was 23.5 years (range 23-24 years). A combination of various methods of learning style that included reading, hearing, seeing, and practicing of skills was used by 75.3% of students. Majority of the students preferred their method of learning by reading the lecture notes/handouts (68%). The most preferred method of students' learning by hearing was case discussion (53.6%); while for learning by vision (seeing) it was clinics session (60.8%). More than 3/4 of the students preferred to learn their practicing skills on real patients (83.5%). The most preferred teaching method by the students was bed side teaching (52.6%); and in lectures/seminars it wasusing both power point presentation and explaining on the board with marker pen (71.1%). In the end of posting theory examination, 45.4% of students preferred assessment method which was a combination of multiple choice (true/false)questions and single best answer questions, while in the objective structured clinical examination it was a combination of interactive station with patient and non-interactive stations without patients (48.5%).

Conclusion:It is possible to create an effective learning and teaching environment for the students during their two weeks duration Ophthalmology posting by the awareness of educators about the preferred choices of students learning style, teaching pedagogies and assessment methods.By matching the teaching and assessment methods, students will be encouraged for better performance in their end of posting examination as well as in the final professional examination.

Keywords: Learning styles; teaching pedagogies; assessment methods, ophthalmology module; clinical students

INTRODUCTION

The mission of medical education is to provide adequate learning experiences to medical students so that they become competent, safe and caring doctors. Fleming developed a VARK questionnaire to identify the sensory modalities adopted by the students through which they prefer to learn [1]. VARK is an acronym for the Visual (V), Auditory (A), Read/Write (R) and the Kinesthetic (K) sensory modalities. The visual learners process the information best if they can see it. The auditory learners like to hear information. The read-write learners prefer to see the written words. The kinesthetic learners like to acquire information through experience and practice. Most people learn best through a combination of all the above modalities.

Learning by medical students is influenced by several factors that include teaching methods, the quality of the curriculum, learning environment and support materials provided by a medical institution as well as by the characteristics of the students. The purpose of learning is to gain knowledge, skills, and attitudes. The purpose of teaching is to facilitate learning and encourage the students to learn more effectively. Learning is an active process in which the student and teacher have to work mutually to make the knowledge-sharing process enjoyable and easier for comprehension [2].

In medical education, particularly in clinical placement, there are various tools of teaching like lectures, tutorials, seminars, bedside teaching andclinical skill labs, self-directed learning, attending clinics, ward rounds, computer-based learning, and classes with interdisciplinary interaction. Bedside teaching is defined as teaching in the presence of a patient and is thought to be applicable only to the hospital setting [3]. Small groups of students are placed for bedside teachings for easy demonstration of clinical signs and practicing by students. Bedside teaching is a vital component of medical education and one of the most effective ways to learn clinical and communication skills.

Assessment in medical education is necessary to determine the students' competency as well as other attributes. Millers has described four steps of assessment in his pyramid beginning from the base as "knows" (test of factual recall of knowledge), "knows how" (test of knowledge application in problem solving and decision making), "shows" (test of clinical competency) and "does" (test of performance at the workplace) [4]. The knowledge of medical science and its application is assessed by written and clinical examinations.Examples of writtenclose-ended questions are multiple choice with true-false answers (MTF), single best answer (SBA) and extended matching questions (EMQ). Examples of open-ended questions include modified essay questions (MEQ), patient's problem managementquestions (PMP), short essay questions (SEQ) and key feature approach questions (KFQ). The clinical skills of dealing patients and other competencies are assessed by clinical examination. (long case, short case, and objective structured questions (OSCE) which may be interactive (examples are the student interacts with a standardized patient or performs a specified task on real patient or on the mannequins which are carried out in front of the assessor) and non-interactive (assessors do not remain standing beside the student for observation and judgement; examples are using clinical pictures, X-ray plates, investigations charts, ECG, instruments) [5].

The medical students' ophthalmology knowledge can be increased by optimizing various teaching methods available, and sharing the eye examination skills which will result in improved eye care of patients through timely diagnosis, referral and treatment. Ophthalmology education and training in undergraduate medical course is a corner stone for improving primary eye health care globally.

In our university, every year only 50 students are admitted in the first year. The Ophthalmology posting is for two weeks duration, similar to majority of medical schools in Malaysia. On the first day, small group of students (9- 11) in each rotation are refreshed with basics of anatomy and physiology of eye, and history taking and examination of the eye in lectures by the lecturer with power point slides in the morning; followed by demonstration and practice of clinical skills of eye examination in the afternoon. Later on, on other days in the week, they seethe patients in eye clinics in the morning hours/ see eye operations in the operation theatre. In the afternoon, the students participate in the seminars and present different eye diseases based on the common eye problems (red eye -painful and painless, loss of vision - gradual and sudden, swelling of the eyelids, watering of eye, injury to eye, child with eye symptoms, double vision and cranial nerve palsy in the eye, optic disc swelling and optic atrophy, and the eye in systemic diseases (diabetes, hypertension, thyroid disease, acquired immune deficiency syndrome). The lecturer highlights the practical points to be

remembered for each disease. They are assessed in the end of posting examination with continuous assessment (seminars, case write up, clinical slides quiz and logbook), multiple choice (true/false) questions, short answer questions, and objective structured clinical examination questions (non-interactive with clinical slides).

Although published papers are availablefrom Malaysia on the learning preferences, teaching methods and tools of assessment of exclusively clinical students in a medical institute [6-12], there was none on ophthalmology subject.Therefore, this study was conducted to identify the students' preferred learning style and to determine their preferred teaching methods and assessment methods in Ophthalmology module/course.

Comment [h1]: Revise this statement, avoid using double "and" in one sentence. "Therefore, this study was conducted to identify the students' preferred learning style, to determine their preferred teaching and assessment methods in Ophthalmology module/course."

MATERIAL AND METHODS

Year 4 students posted in the Ophthalmology departmentwere enrolled in this study. The questionnaires published earlier by Ahmad and Reddy [6,7,8] were used in this study with slight modification tosuit the teaching and assessment methods ofthe Ophthalmology module/course. A close ended questionnaire form was given to all the students after their end of posting examination to answer their responses to different questions. There were four sections (socio demography of students, learning styles, teaching methods and assessment methods) in the questionnaire. The students were explained about the aim of the study and verbal consent was taken. The participation to answer the questionnaire was on voluntary basis. They were told thatanonymity of students and confidentiality of their responses will be maintained. All the students participated in the study.

Comment [h2]: State when you did the research, what's your sampling technique. How did you validate the modified instruments?

Comment [h3]:

Comment [h4]: Too much spacing

This study was approved by the Research committee and ethics committee of National Defence University of Malaysia. The data was collected by the author and analyzed using SPSS programme. The frequency of the responses by the students for preferred methods of learning, teaching and assessment were expressed as percentages.

Comment [h5]: State the Ethical Number

RESULTS

All the year 4 students undergoing training in Ophthalmology posting in the academic years 2021-22 and 2022-23 (97 students) filled up the survey questionnaire form.Females (52.6%)were slightly more than males (47.4%), andthe mean age of students was 23.5 years (range 23-24 years)In this study. Majority of the students were Malays (73.2%) followed by Indians (18.6%) and Chinese (8.2%). Army reserve students were in the majority (45.4%) followed by civil students (38.1%), and military cadet students (16.5%) in this study.

Students' responses on preferred learning styles are shown in Table I. A combination of various methods of learning style that included reading, hearing, seeing (observing), and

practicing of skills (multi modal type) was preferred by 75.3% of students. Majority of students (68%)preferred their method of learning by reading/writing the lecture notes/handouts, followed by text books/e-books (27.8%). Most preferred method of students' learning by hearing was case discussion (53.6%), followed by lectures (35.1%); while for learning by vision (seeing) it wasclinics (60.8%), followed by bed side demonstration (25.8%). More than 3/4 of the students preferred to learn their practicing skills on real patients (83.5%) followed by on simulated patients and on peers (8.2% each).

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Table 1. Students' responses on preferred learning styles (n=97)

Question and response	No.	Percentage
Q. Which one is the most preferred method of your learning by reading?		
Printed text books/ e-books	27	27.8%
Reading lecture notes/ handouts	66	68.0 %
Internet (Google search)	4	4.1 %
Q. Do you make notes of important points during the class?		
Yes	91	93.8 %
No	6	6.2 %
Q. Do you use e-learning (online uploaded teachings/ lecture slides)?		
Yes	78	80.4 %
No	19	19.6 %
Q. Do you prefer to use e-learning for improving your knowledge?		
Yes	68	70.1 %
No	29	29.9 %
Q. Do you memorize the key features in learning?		
Yes	81	83.5 %
No	16	16.5 %
Q. Which one is your most preferred way of learning medical teachings?		
By reading	6	6.2 %
By hearing	3	3.1 %
By vision (seeing)	7	7.2 %
By practicing	8	8.2 %
All of the above	73	75.3 %
Q. Which one is the most preferred method of your learning by hearing?		
Lectures	34	35.1%
Seminars	11	11.3 %
Case discussion	52	53.6 %
Q. Which one is the most preferential method of your learning by vision (seeing)?		
Bed side demonstrations	25	25.8%
Video	32	33.1%
Clinics	59	60.8%
Ward rounds	10	10.3%
Q.Which one is the most preferential method of your learning by practicing a skill?		
On real patients	81	83.5 %
On simulated patients	8	8.2 %
On peers	8	8.2 %

The preferred responses of students on teaching methods are shown in Table 2. Bed side teaching (52.6%) was the most preferred method followed by lectures (21.6%). Students prefer the teaching by both power point presentation and use of board and marker pen (71.1%). Majority of the students preferred the teacher asking questions in the class (80.4%).

Table 2. Students' responses on preferred teaching methods (n=97)

Question and response	No.	Percentage
Q. Which one of the following teaching method, you prefer most?		
Bedside teachings	51	52.6 %
Tutorials	16	16.5 %
Lectures	21	21.6 %
Seminars	9	9.3 %
Q. During teaching in class which one is your most preference?		
Power point presentation	19	19.6 %
Use of board and marker pen	9	9.3 %
Both	69	71.1 %
Q. Do you like the teacher asking you questions to the students in the class?		
Yes	78	80.4 %
No	19	19.6 %

Students' responses on preferred assessment methods are shown in Table 3 In theory examination, most of the students preferred both multiple choice questions –true/false (MCQ-T/F) and single best answer questions (45.4%). In the objective structured clinical examination (OSCE), their preferred choice was both interactive with patient and non-interactive without patients (48.5%).

Table 3. Students' responses on preferred assessment methods (n=97)

Questionand response	No.	Percentage
Q. Which one of the following assessment method (theory) do you prefer?		
MCQ (T/F)	39	40.2 %
Single best answer	14	14.4 %
Combination of both questions	44	45.4%
Q. Which one of the following you prefer in clinical assessment of end of posting examination?		
Interactive OSCE with patient	13	13.4%
Non interactive OSCE	37	38.1%
Combination of both questions	47	48.5%

DISCUSSION

There are three learning domains categorized as a cognitive domain (e.g., knowledge), psychomotor domain (e.g., skills), and affective (e.g., attitudes) domain. Bloom et al [13]

developed the Bloom's taxonomy describing the learning domain in educational objectives. These domains have an impact on learning and are important for the preparation of learning objectives, learning outcomes and assessments in the medical curriculum.

In a study carried out exclusively among the clinical medical students in Malaysia, Sinha et al [9] showed that 56% of the students had a multimodal learning style. In the present study also, the multimodal learning mode was the preferred learning style in 75.3% of students. Majority of the students' preferred method of learning was by reading the printed lecture notes/handouts (68%) followed by text books/e-books(27.8%), and using the internet (4.1%).

Comment [h7]: Please discuss the reasons of this finding.

Swe et al [10] studied on the learning style preferences among all the academic years medical students in another institution in Malaysia and reported that majority of them preferred multiple modalities with kinesthetic learning being the most prevalent mode. There was no significant difference in VARK modalities in terms of the students' academic year.

A study conducted among the clinical students (3rd year -54 and 5th year- 36) at one of the medical college in Pakistan by Ahmad and Asif [14] revealed that the use of internet was low (3.7% and 11% respectively); the majority of medical students used text books rather than the information media.

In the present study, 93.8% of the students were making notes of important points during the class which is slightly lower than 98.9% reported for the same by Ahmad and Reddy [6] among internal medicine posting students of year 4 and year 5 from the same institution. Majority of students (83.5%) were memorizing the key features of the topic in their learning style in the present study while in the above study [6], it was practiced by a slightly lesser number (71.9%) of students from the same institution.

It was noted that the most preferred choice of other modes of learning were by hearing - case discussion in 53.6%,by vision - observing and seeing patients in the clinic in 60.8%, and by practicing skills on real patients in 83.5% of students in the present study. The most preferred choice of the same modes of learning the internal medicine subject reported by Ahmad andReddy [6] from the same institution were hearing- case discussion in 44.9%; vision- bed side demonstration in 77.5%, and practice of skills- on real patients in 99.4% of students.

The delivery of lecture is one of the oldest methods of medical teachings. Traditional lecture-based teachings are teacher centered, and are gradually being phased out [15]. It is thought that students often become passive learners; the traditional lectures encourage rote learning and notes taking as the means of assimilating knowledge. Often the student loses attention quickly and an unengaged student does not learn, meaning that learning is never passive [16].

Seminar-based teachings are small group classes under the guidance of a teacher. Here some of the students take on the teaching roles with preparing and presenting the topics in the class

followed by question and answer sessions. A recent research has shown that seminar-based teaching is a more effective method for medical education compared with lecture-based teaching [17].

Current worldwide trends in medical education reflect major shifts in educational paradigms by global reforms from didactic teacher-cantered teaching to the use of student-cantered, interactive, and integrated interdisciplinary teaching curriculum thatfacilitates self-directed learning. Student-cantered teaching approaches are most effective in small groups [18]. It is the learner who is at the centre of the educational process and the teacher acts as a moderator or facilitator [19].

Hence, the teaching and learning activities should include a blend and filled with a variety that stimulates all the four sensory modalities. It is essential for the teachers to include more images, diagrams, flow charts, algorithms, graphs, and video clips in their PowerPoint presentations (PPT) to enhance the interest and learning of the students.

In the present study, among the various teaching methods adopted in our institute, bed side teaching was preferred by majority of students (52.6%); and it has been reported to be the same preferred choice (76.4%) by Ahmad and Reddy among internal medicine posting students in year 4 and 5 students in the same institution [7].

In a medical college in India, Holambe et al [20], also found that the majority of the students (85%) preferred bedside teachings.In bedside teachings, the group of students is small, and there is a direct face to face interaction among the students and the teacher.Clinical and communication skills are better developed in bedside teachings. It appears that face-to-face bedside teachings have a great impact on clinical learnings by the medical students. It should comprise the bulk of the schedules of the teaching methods for clinical students.

Comment [h8]: Good explanation.

During face-to-face classroom-based learning sessions, 71.1% of students in this study preferred both using whiteboard and marker pen combined with PPT; and this was slightly higher number than 68.5% reported by Ahmad and Reddy [7] in their study of internal medicine posting in the same institution.

Hew and Lo suggested that the flipped classroom approach in health professions education can bring significant improvement in student learning in comparison to traditional teaching methods.In this method, the students is having unrestricted access to lecture notes before class enabling them to learn anywhere and at any time, at their own pace; and this has been stated as one of the advantages of flipped class technique as it promote active learning [21].

In multiple true /false answers (MTF) question, a statement is given as a stem and five answers are written below that. The student has to write each answer true or false in relation to the statement given. The short answer question (SAQ) is an open ended, semi-structured

question format. A structured predetermined marking scheme improves objectivity. The questions can incorporate clinical scenarios. SAQs have a better content coverage as compared to long essay question [22].

Traditional MTF questions are useful where it is important to assess factual recall of essential knowledge, for example, in management protocols for emergency situations. However, this style of question does not allow facts to be placed in context or lend it to testing the application of knowledge and problem solving that is so essential in clinical practice. This is where SBAs can be invaluable; they allow the candidate to demonstrate that they 'know how' rather than simply 'know', and this is a fundamental principle of the assessment of clinical skill" [23].

Simbak et al. [11] from Malaysia examined students' performance between MTF and SBA evaluation techniques and correlated them with other assessment outcomes. They pointed out that the students got higher marks in SBA questions than MTF. SBA test results were found to be well correlated with OSCE marks, long case examination and modified essay question (MEQ). The findings of this study encourage the use of SBA in place of MTF test format for examinations. However, the diverse teaching techniques, variation of competency of lecturers, dissimilar marking systems and different question difficulty indexes between these two different subjects may contribute unequal scores and can lead to bias in comparison of MTF and one best answer formats.

Comment [h9]: Every model of test, has its own limitation. Teacher should choose the right format of test based on the goals, not based on the student choices. Re-think this statement.

Almothafar and Chee [12] from Malaysia studied the performance of final year medical students in the end of the surgical posting examination and reported that the students appear to be weaker in their MCQs, demonstrating a decline in theoretical knowledge; there is a poor positive correlation between theoretical knowledge, clinical skills and/or continuous assessments, demonstrating the importance of emphasis in these three areas amongst medical students.

Farooqui et al. [24] from Pakistan conducted a study to see the correlation between MCQs and SAQs in the end-of-clerkship examinations in different subjects for 481 final-year medical students over a period of five years, and found a statistically significant overall correlation between students' performance on MCQ and SAQ in all the four major subjects (surgery, medicine, pediatrics and obstetrics & gynecology).

Therefore, it appears that during summative assessment, the students prefer those methods of assessments which have already been practiced by them in their formative and continuous evaluations. This indicates that whatever methods and tools of assessments used during the final evaluation, the students need to practice them during the course especially at their formative and continuous assessments.

LIMITATIONS

The main limitation is that the sample size of students is small because the study was conducted in only one medical institution in Kuala Lumpur. Hence, the findings of this study may not reflect the actual preference of all students of other medical institutions in the country about their learning styles, teaching methods and assessment methods in ophthalmology module/course.

CONCLUSION

A combination of various learning styles were preferred by the majority of students for their multimodal learning. The preference of the student learning style and their choice should be taken into account for constructing teaching methods that will enhance their interest in learning and achieve a better academic outcome. Adequate teaching materials uploaded in the e-learning system provide one of the best resources for learnings by the students.Every tool of assessment used in the medical course should be made clear to the students and the students should practice them before they proceed for evaluation in the examination,

Comment [h10]: The conclusion, answer the aim of the research.
1 to identify the students' preferred choices of learning style
2 to determine their preferred teaching pedagogies and 3 to determine their preferredassessment methods in the Ophthalmology module of undergraduate medical course.
State that in your conclusion, and in your abstract.

Comment [h11]: Shift this statement in discussion

Comment [h12]: How you can conclude this? From this research or your opinion?

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