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Interdisciplinary and inter-institutional differences in learning preferences among Malaysian medical and health sciences students

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Introduction: The learner-centred approach in medical and health sciences education makes the study of learning preferences relevant and important. This study aimed to investigate the interdisciplinary, inter-institutional, gender and racial differences in the preferred learning styles among Malaysian medical and health sciences students in three Malaysian universities, namely SEGi University (SEGi), University of Malaya (UM) and Universiti Tunku Abdul Rahman (UTAR). It also investigated the differences in the preferred learning styles of these students between high achievers and non-high achievers.

Methods: This cross-sectional study was carried out on medical and health sciences students from three Malaysian universities following the approval of the Research and Ethics Committee, SEGi University. Purposive sampling was used and the preferred learning styles were assessed using the VARK questionnaire. The questionnaire was validated prior to its use. Three disciplines (medicine, pharmacy and dentistry) were chosen based on their entry criteria and some similarities in their course structure. The three participating universities were Malaysian universities with a home-grown undergraduate entry medical program and students from a diverse cultural and socioeconomic background. The data were analysed using the Statistical Package for the Social Sciences (SPSS) software, version 22. VARK subscale scores were expressed as mean±standard deviation. Comparisons of the means were carried out using t-test or ANOVA. A p value of ≤ 0.05 was considered as statistically significant, and ≤ 0.001 as highly significant.

Results: Both statistically significant interdisciplinary and inter-institutional differences in learning preferences were observed. Out of the 337 students, a majority of the participants were unimodal learners (n=263, 78.04%). The most common type of learners was the reading/writing type (n=92, 27.30%) while the kinesthetic subscale (M=6.98, SD=2.85) had the highest mean score. Female students (M=6.86, SD=2.86) scored significantly higher than male students (M=6.08, SD=2.41; t(249), p=0.014) in the auditory subscale, whereas Chinese students (M=5.87, SD=2.65) scored significantly higher than Malay students (M=4.70, SD=2.87; p=0.04) in the visual subscale. However, the mean VARK subscale scores did not differ significantly between high achievers and non-high achievers (p>0.05).

Conclusion: This study gives an insight into the learner characteristics of more than one medical school in Malaysia. Such multi-institutional studies are lacking in the published literature and this study gives a better representation of the current situation in the learning preferences among medical students in Malaysia.

Keywords: Learning; Medical students; Health sciences

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Introduction

Medical and health sciences education plays an important role in the training of doctors and healthcare professionals of tomorrow. Due to the ever-changing context of medical and health sciences education, there is a shift of the traditional teacher-centred approach to the newer learner-centred approach (1). Hence, the term "learner-centred learning" has become very common in the past few decades. As its name implies, the main focus of "learner-centred learning" is on the students, whereas the teachers are to play the role of a facilitator (2). Different methods of learning have been used in medical and health sciences education to encourage learner-centred learning. One classic example is the popular application of problem-based learning (PBL) in medical and health sciences education (3, 4).

The VARK learning style model categorises learning styles into visual, auditory (or aural), reading/writing or kinesthetic preferences (5) and it can be assessed using a simple questionnaire consisting of merely sixteen questions. Visual learners prefer to learn by seeing the information presented (e.g. pictures, charts and graphs) to them, while learners of the auditory type learn best by hearing the information presented to them (e.g. via didactic lectures). On the other hand, the reading/writing type prefers to learn via printed or text-based information (e.g. reading textbooks or lecture notes). Last but not the least, the kinesthetic learners prefer learning through "actions" such as experiments, hands-on experience, discussions, or field trips.

To this end, some studies have looked into the learning styles of medical (6-9), pharmacy (10, 11), and dental (12, 13) students in various parts of the world, while comparative studies on the learning styles of medical and health sciences students are relatively fewer in the published literature with only some sporadic reports (14-16).

The present study is different from those in which the learning styles of different disciplines within a university and learning styles among medical students from three different universities have been compared, making it the first multi-institutional study in the country. The multi-racial and multicultural context of Malaysia and the different characteristics of the participating universities further added to the diverse backgrounds of students who took part in this study. Comparison of the preferred learning styles was made among medical, pharmacy and dental students from SEGi University (a private university). The study also compared the preferred learning styles of medical students from SEGi University (a for-profit private university) and those from two other Malaysian medical schools, namely University of Malaya (a public university) and Universiti Tunku Abdul Rahman (a not-for-profit private university). Gender and racial differences in the mean VARK subscale scores and the effect of learning preferences on academic achievement were also explored.

Methods

This was a cross-sectional study conducted between April 2015 and October 2015. The study was divided into two parts. Part one of the study aimed to compare the learning preferences between three different disciplines (medicine, pharmacy and dentistry) in SEGi University, while part two was an attempt to compare medical students from SEGi, UM and UTAR.

Purposive sampling was used in this study. A total of 337 students participated in this study; they included 98 Year 1 medical, 33 Year 1 pharmacy and 49 Year 1 dental students from SEGi University (SEGi), 115 Year 1 medical students from University of Malaya (UM) as well as 42 Year 1 medical students from Universiti Tunku Abdul Rahman (UTAR).

Inclusion and exclusion criteria

The inclusion and exclusion criteria for the selection of courses and universities in this study are summarised in Table 1.

Instrument

The VARK questionnaire (Version 7.3, © 2001 Neil Fleming, Christchurch, New Zealand) was used to analyse the preferred learning styles of the subjects. The questionnaire has been validated in the published literature (17). There are a total of 16 questions in the questionnaire, each with four options (a, b, c, and d). Each option represents one category of learning style, i.e. visual (V), auditory (or aural, A), reading/writing (R), or kinesthetic (K). At the end of the questionnaire, the subjects circled their answer for each question in the scoring chart where each category (VARK) was randomly arranged and the score for each one was calculated.

The internal consistency of an instrument is a measure of its reliability. The internal consistency of the VARK questionnaire was analysed using the Cronbach's α coefficient in a pilot study before the commencement of the study. The questionnaire was found to have an overall Cronbach's α coefficient of 0.721 for the four modalities (i.e. visual, auditory, reading/writing and kinesthetic).

Ethical consideration

The study was conducted after seeking

Table 1: Inclusion and exclusion criteria for course and university selection

	Inclusion criteria	Exclusion criteria
Criteria for selection of courses	• Courses with entry requirement of a minimum Cumulative Grade Point Average (CGPA) of 3.0 • Bachelor program • Programs related to health sciences and medical education • First year students	• Courses with entry requirement less than CGPA 3.0 (e.g. Bachelor of Optometry) or alternative requirements such as a previous diploma degree (e.g. Bachelor of Nursing) • Diploma program (e.g. Diploma of Nursing, Diploma of Pharmacy, Diploma in Physiotherapy etc.) • Programs that do not fall into the field of medicine or health sciences
Criteria for selection of universities	• Bachelor medical program with undergraduate entry • Home grown medical schools (i.e. not part of a foreign university) • First year medical students • Medical programs with at least a five-year curriculum • Medical programs fully completed in Malaysia	• Medical program with graduate entry • Medical schools that are part of a foreign university • Medical programs with a curriculum less than five years (e.g. programs with graduate entry) • Twinning programs that are conducted partially in Malaysia

approval from the Research and Ethics Committee of SEGi University and the respective deans of the participating universities. Prior to the use of the questionnaire, permission was obtained from its author,Neil Fleming via email. Informed consent was obtained from the participants before they attempted the questionnaire.

Statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS) software, version 22. The score for each VARK subscale was expressed as mean±standard deviation. Comparison of means was carried out using t-test or ANOVA. A p value of ≤0.05 was considered as statistically significant, and ≤0.001 as highly significant.

Results

The minimum, maximum and mean age of the students were 18, 29 and 20.46 (SD=1.19), respectively. Other demographic data of the participants are summarised in Table 2.

VARK subscale scores and VARK learner types of medical and health sciences students

The VARK learner type of each cohort of student is summarized in Table 3 and the mean VARK subscale scores in Tables 4 and 5. SEGi Year 1 medical students had the highest score in the kinesthetic subscale (M=7.55, SD=2.88) with the most common type of learners being the reading/writing type (n=28 (28.57%). SEGi

Table 2: Demographic characteristics of the participants

Demographic factor		Number	Percentage
Gender	Male	113	33.5
	Female	219	65.0
	Unspecified	5	1.50
Race	Malay	132	39.2
	Chinese	145	43.0
	Indian	33	9.80
	Others	23	6.80
	Unspecified	4	1.20
Academic achievement	High achievers	62	18.40
	Non-high achievers	254	75.37
	Not specified	21	6.23

Table 3: VARK learner types of Medical and Health Sciences students from SEGi, UM and UTAR

VARK type	SEGi medical	SEGi Pharmacy	SEGi Dental	UM Medical	UTAR medical	All
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Visual	11 (11.22)	3 (9.09)	6 (12.24)	8 (6.96)	2 (4.76)	30 (8.90)
Auditory	14 (14.29)	6 (18.18)	11 (22.45)	28 (24.35)	7 (16.67)	66 (19.58)
Read/write	28 (28.57)	10 (30.30	17 (34.69)	31 (26.96)	6 (14.29)	92 (27.30)
Kinesthetic	25 (25.51)	2 (6.06)	10 (20.41)	23 (20.00)	15 (35.71)	75 (22.26)
Bimodal	19 (19.39)	8 (24.24)	3 (6.12)	19 (16.52)	10 (23.81)	59 (17.51)
Trimodal	1 (1.02)	4 (12.12)	2 (4.08)	6 (5.22)	2 (4.76)	15 (4.45)
Quadrimodal	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)	0 (0.00)
Total	98 (100)	33 (100)	49 (100)	115 (100)	42 (100)	337 (100)

Year 1 pharmacy students scored the highest in the reading/writing subscale (M=6.39, SD=2.89) and the most common VARK type was the reading/writing type (n=10, 30.30%). Also, SEGi Year 1 dental students scored the highest in the kinesthetic subscale (M=7.00, SD=2.68). Like the SEGi Year 1, the medical and dental students had the highest number of reading/writing type of learners (*n*=17, 34.69%).

For UM Year 1 medical students, the VARK subscale with the highest mean score was the kinesthetic subscale (M=6.51, SD=2.78) and the most common VARK type was the reading/writing type (n=31, 26.96%). UTAR Year 1 medical students scored the highest in the kinesthetic subscale (M=7.76, SD=2.75) and the most abundant type of learners among the UTAR year 1 medical students was the kinesthetic type (n=15, 35.71%).

Overall, when combining all students from all universities, the kinesthetic subscale had the highest mean score of 6.98 (SD=2.85) and the most common learner type was the reading/writing type (n=92, 27.30%) with a majority of the learners being unimodal learners (n=263, 78.04%).

Interdisciplinary differences in VARK subscale scores among SEGi University medical and health sciences students

When comparing the VARK subscale scores of SEGi Year 1 medical, pharmacy and dental students, only the analysis of variance (ANOVA) for the kinesthetic subscale was significant [F(2,177)=4.21; p=0.016] (Table 4). Post-hoc analysis showed that the mean kinesthetic subscale score of the medical students (M=7.55, SD=2.88) was significantly higher than that of the pharmacy students (M=5.91, SD=2.87; p=0.013).

Inter-institutional differences in VARK subscale scores

When comparing the VARK subscale scores among SEGi, UM and UTAR Year 1 medical students, ANOVA was significant for the visual [F(2,252=8.69, p<0.001), reading/writing [F(2,252)=3.18; p=0.043] and kinaesthetic [F(2,252)=4.91; p=0.008] subscales, and marginally significant for the auditory subscale [F(2,252)=2.93; p=0.055] (Table 5). Post-hoc analysis showed that the mean visual subscale score of SEGi Year 1 medical students (M=6.09, SD=3.23) was significantly higher than that of UM Year 1 medical students (M=4.45, SD=2.65; p=0.000). The SEGi students (M=7.08. SD=2.77) also scored significantly higher in the auditory subscale when compared to the UM students (M=6.19, SD=2.42; p=0.048). For the mean kinesthetic subscale score, the UM students (M=6.51, SD=2.78) scored significantly lower than both the SEGi (M=7.55, SD=2.88, p=0.023) and UTAR (M=7.76, SD=2.75; p=0.043) students. There were no statistically significant pair-wise comparisons for the reading/writing subscale (p>0.05).

Gender differences in mean VARK subscale scores

When combining the data of all students, female students scored higher in all four subscales as compared to male students. A statistically significant gender difference was observed only in the mean auditory subscale score, with the female students (M=6.86, SD=2.86) scoring significantly higher than the male students (M=6.08, SD=2.41; t(249), p=0.014). For the other three subscales (visual, reading/reading and kinesthetic), the differences in mean scores were statistically not significant (p>0.05) (Table 6).

Racial differences in mean VARK subscale scores

When comparing the mean VARK subscale scores according to race among all students from SEGi, UM and UTAR, ANOVA was only significant for the visual subscale [F(3,329)=4.61;

Table 4: Differences in mean VARK subscale scores among SEGi Year 1 Medical, Pharmacy and Dental students

Subscale	Medical (Mean±SD)	Pharmacy (Mean±SD)	Dental (Mean±SD)	F	p
Visual	6.09±3.23	5.64±2.38	6.08±2.53	0.32	0.723
Auditory	7.08±2.77	6.03±2.80	6.92±2.81	1.78	0.171
Read/write	7.26±3.24	6.39±2.89	6.96±2.72	1.00	0.371
Kinesthetic	7.55±2.88	5.91±2.87	7.00±2.68	4.21	0.013

Table 5: Differences in mean VARK subscale scores among SEGi University, UM and UTAR Year 1 Medical students

VARK subscale	SEGi (Mean±SD)	UM (Mean±SD)	UTAR (Mean±SD)	F	p
Visual	6.09±3.23	4.45±2.65	5.40±2.56	8.69	<0.001
Auditory	7.08±2.77	6.19±2.42	6.55±3.12	2.93	0.055
Reading/ writing	7.26±3.24	6.48±2.63	6.02±3.07	3.18	0.043
Kinesthetic	7.55±2.88	6.51±2.78	7.76±2.75	4.91	0.008

Table 6: Gender differences in mean VARK subscale scores among Medical and Health Sciences students

VARK subscale	Male (Mean±SD)	Female (Mean±SD)	p
Visual	5.00±2.70	5.58±2.92	0.082
Auditory	6.08±2.41	6.86±2.86	0.014
Reading/ writing	6.36±2.70	6.94±3.02	0.090
Kinesthetic	6.90±2.82	7.00±2.86	0.779

p=0.004]. Post-hoc analysis demonstrated that the Chinese students (M=5.87, SD=2.65) scored significantly higher than the Malay students (M=4.70, SD=2.87; p=0.04) in the visual subscale. All other pair-wise comparisons were statistically not significant (p>0.05).

Differences in the mean VARK subscale scores between high achievers and non-high achievers

There were no statistical significant differences in the mean VARK subscale scores according to academic achievement among the medical and health sciences students (p>0.05) for all VARK subscales (Table 7).

Discussion

Using the VARK questionnaire, we observed that medical and health sciences students from SEGi, UM and UTAR had the highest mean VARK subscale score in either the reading/ writing (SEGi Year 1 pharmacy students) or the kinesthetic (SEGi Year 1 medical and dental, UM Year 1 medical and UTAR Year 1 medical) subscale. Overall, for the 337 students combined, the kinesthetic subscale had the highest mean score of 6.98 (SD=2.85). On the other hand, the most common learner type for SEGi Year 1 medical (28.57%), pharmacy (30.30%) and dental (34.69%) students as well as UM year 1 medical (26.96%) students was the reading/writing type of learners. For UTAR Year 1 medical students, the most common type was the kinesthetic type (35.71%). These findings coincided with those of other studies carried out on medical and health sciences students, in which the kinesthetic (6, 16) or reading/writing (7, 18) learner types were the most common among unimodal learners or the kinesthetic subscale having the highest mean score (18-20).

Overall the majority of medical and health sciences students (n=263, 78.04%) in this study were unimodal learners whereas 59 were bimodal learners (17.51%) and 15 (4.45%) were trimodal learners. None of them was a quadrimodal learner. The learner type with the most number of students was the reading/writing type (n=92, 27.30%) for medical and health sciences students from all three universities overall. In a review, Khanal *et al* compared the VARK learner type of medical students from 20 universities (including one Malaysian university); it was reported that medical students from all 20 universities were mostly (>50%) multimodal learners, which was contradicted by the finding of this study. In the present study, each cohort of students, whether on its own or in combination with other cohorts, consisted of unimodal learners (21). Other studies also reported that more medical or health sciences students preferred the multi-modal approach rather than the unimodal approach in learning (7, 20, 22). Comparatively, there are fewer studies that reported a predominance of unimodal learners among medical and health sciences students (16, 18, 19, 23). However, there is no fixed pattern in the preferred learning styles of medical and health sciences students.

There was little interdisciplinary difference when comparing SEGi Year 1 medical, pharmacy and dental students. The distribution of unimodal and non-unimodal learners was very similar across the three disciplines. The most common type of learners for all three disciplines was the kinesthetic type. When comparing the VARK subscale scores, only the mean kinesthetic subscale score of the medical students was significantly higher than that of the pharmacy students. In one study, Kumar *et al.* (2011) demonstrated fewer interdisciplinary differences in the learner type distribution among medical, pharmacy and dental students (16). This was supported by the finding of the present study. Like the present study, Kumar *et al.* also demonstrated

Table 7: Differences in the mean VARK subscale scores between high achievers and non-high achievers among SEGi Year 1 Medical, Pharmacy and Dental students

VARK subscale	High achievers (Mean±SD)	Non-high achiever (Mean±SD)	p
Visual	5.68±2.73	5.30±2.91	0.359
Auditory	6.84±2.82	6.59±2.67	0.517
Reading/ writing	6.69±2.76	6.76±2.93	0.880
Kinesthetic	7.26±2.33	6.91±2.96	0.326

a predominance of unimodal learners over non-unimodal learners for each discipline. However, the study did not compare the mean VARK subscale scores. This similarity in distribution may be explained by the fact that these courses share some similarities (e.g. entry requirement, being health-related and students were all from the same university). Another study by Sarabi-Asiaber *et al.* demonstrated no significant differences in the VARK learning preferences for students studying medicine, pharmacy, dentistry, health services management and nursing (7).

However, there were obvious inter-university differences in the mean VARK subscale scores when comparing Year 1 medical students from SEGi, UM and UTAR. The mean visual subscale score of SEGi Year 1 medical students was significantly higher than that of the UM Year 1 medical students. The SEGi students also scored significantly higher in the auditory subscale when compared to the UM students whereas the UM students scored significantly lower than both the SEGi and UTAR students in the kinesthetic subscale.

There is a scarcity of literature on multi-institutional studies. A study by Thomas *et al.* was carried out on medical students from two medical colleges in South India (20). However, the study did not compare the differences in mean VARK subscale scores between the two colleges. Inter-institutional differences in mean VARK subscale scores may be explained by the fact that all three universities recruit students from different backgrounds with different learner characteristics. UM is a government university whereas UTAR and SEGi are private ones. The financial backgrounds, racial distribution and geographical location vary greatly among the three universities.

A statistically significant gender difference was observed in the auditory subscale in this study, with female students (M=6.86, SD=2.86) scoring significantly higher than male ones (M=6.08, SD=2.41; t(249), p=0.014). Previous studies showed that gender differences in VARK learning styles are common (7, 24, 25). For example, a Western Nigerian study demonstrated a statistically significant difference between the preferred learning style of male students (48% kinesthetic) when compared to that of female students (34.3% read/write) (24). Sarabi-Asiabar *et al.*, on the other hand, reported a significant relationship between gender and unimodal learning styles with more males (56.5%) preferring unimodal learning approach when compared to females (44.3%, p=0.009) (7). The finding of this study, however, contradicted that of Thomas *et al.*, which showed no statistical gender differences in the mean VARK subscale scores of medicals students from two medical colleges in South India (20).

A statistically significant racial difference in the mean visual subscale score was observed among medical and health sciences students from the three participating Malaysian universities. The influence of cultural background on learning preferences has been reported in one study. Instead of comparing the differences in learning preferences among different races, the study had compared Malaysian with non-Malaysian students and observed a statistical difference in the auditory and kinesthetic subscales (26). This was supported by the finding of the present study.

The mean VARK subscale scores were also observed to have very little effect on the academic performance of medical and health sciences students from all three universities. There were no statistically significant differences in the mean VARK subscale scores according to academic achievement. This finding is not surprising as it coincided with the findings of other studies (6, 25). Even though some studies reported a relationship between academic performance and the preferred learning styles, a different instrument was used and this may not be comparable to the VARK questionnaire (27, 28).

In a nutshell, what do all these findings mean? Firstly, one has to bear in mind that the VARK results are indicative rather than diagnostic, as pointed out by Fleming in an article entitled "Facts, Fallacies and Myths: VARK and Learning Preferences" (29). Secondly, just because most students had a strong unimodal preference did not mean that the other modalities were totally absent. They may still have some scores in other modalities. Thirdly, certain factors such as gender and race played a role in VARK because, as pointed out by Fleming, "VARK preferences are probably formed during the first 12 to 20 years of life and will be modified or built from all those learning experiences and contexts that family, teachers, colleagues, peers, and caregivers provide for each individual." (29). Finally, a preference is not the same as a skill. Liking a certain way of learning is not the same as being good at something (29, 30). Therefore, it is not surprising that VARK did not have an effect on the academic achievement of the students in this study.

Conclusions

Several important points can be concluded on the preferred learning styles of medical and health sciences students who took part in this

study. Overall, medical and health sciences students from SEGi, UM and UTAR were mostly unimodal learners, with the most common learner type being the reading/writing type. The VARK subscale with the highest score was the kinesthetic subscale. There were few inter-disciplinary differences in VARK among SEGi students, but there were obvious statistically significant inter-institutional differences in VARK among SEGi, UM and UTAR students. Statistically significant gender and racial differences in the mean VARK subscale scores were also observed. Lastly, the mean VARK subscale scores did not differ statistically between the high-achievers and non-high achievers.

Findings of this study implicate that in practice, educators in the field cannot use a one-size-fit-all curriculum for medical and health sciences students from different backgrounds. Mixed teaching and learning activities will enhance the learning experience of students from a diverse background, and these activities have to be tailor-made for individual courses and institutions. Given that the majority of students were unimodal learners, it is also indicated that the teachers may make efforts in the future to encourage a wider variety of learning methods. It is important to note that memory retention rates of reading (20%), hearing (30%), seeing (40%), saying (50%) and doing (60%) something alone are not as good as that of a combination of hearing, seeing and doing (90%) something. Multi-sensory learning may help improve information recall.

As this study mainly involved the Year 1 medical and health sciences students, future studies can focus on students from different levels. In addition, follow up studies in the future may help trace changes in the learning styles from the beginning to the end of the course. A larger sample size and the participation of more universities are also recommended in future studies.

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