
Predominant Learning styles adopted by AIMST University students in Malaysia

Latha Rajendra Kumar¹, K.Voralu¹, S.P. Pani¹, K.R. Sethuraman¹

Abstract

Introduction: An assortment of learning styles is adopted by medical students. Some like to learn by seeing, some by hearing and some by demonstration. Understanding their preferred learning styles as visual, auditory, read-write or kinesthetic learners will help improve the teaching methods adopted.

Objective and Goal: role of the educator necessitates making the most of each teaching opportunity by understanding the characteristics of the learning audience and incorporating demonstrated principles of adult educational design, with a focus on collaborative learning and variety in presentation techniques. The goal is to provide student oriented education, producing efficient doctors.

Design and participants: A cross-sectional study among 214 medical students of the AIMST University, conducted in 2008. Main outcome measures were: 1. Learning style {visual (V), auditory (A), read-write(R), kinesthetic (K)} 2. Preferred study practice (alone, in pairs or in groups).

Results and Discussion: Preference for different learning styles were, visual (V) 9%, auditory (A) 28%, reading/writing (R) 38% and kinesthetic (K) 35%. 51.4 % of the total 214 students preferred a single mode of information presentation (either V, A, R, or K). Of the 104 students (48.6 % of the total 214) who preferred multiple modes of information presentation, some preferred two modes (bimodal, 25%), some preferred three modes (tri-modal, 12%), and some preferred four modes (quadri-modal, 67%).

Practical implications: With growing interest in learning styles, an awareness of students' preferences will be of particular value in designing course delivery strategies which combine an appropriate mix of lectures, Problem based learning (PBL) sessions and practical hours.

Originality/value: Multiplicity exists in the learning styles of students and the accomplishment of teaching goals is based on the ability to understand the complexity and to use the knowledge of these differences to balance these disparities among the students in a class.

Key words: Study Practice

Introduction

Learning results in gain of knowledge, skills and attitudes. Learning is done using different learning styles. Students are known to have preferences for the modes in which they receive information. There are certain learning/study practices (studying alone, in pairs or in groups) which may affect learning styles.

Learning Strategy is developed using a combination of learning styles and study practices (learning practice).

Learning Styles

Educators need to assist students to know how they learn, to operate in a metacognitive fashion, and to make adjustments to their learning behaviour when necessary. Facilitating a raise in students' awareness of how they learn, through an investigation of learning strategies, the 'critical incidents' in their prior learning, their learning styles, their multiple intelligences and strengths will aid students in becoming more efficient learners. Brunton and Jordan (2004) report that students who focus on their studies are adaptable and flexible in a new situation and

¹Faculty of Medicine
Asian Institute of Medical Science and Technology
Bedon, 08100, Kedah Darul Aman, Malaysia

Correspondence: Latha Rajendra Kumar
Email: latha.rajendrakumar@gmail.com
latha@aimst.edu.my

are self-aware and therefore have a higher chance of success in the college environment. Bertolami (2001) has suggested that one of the focal points of student frustration with the curriculum is the disparity between learning (content) and the delivery of instruction (form).

A substantial number of medical students have a preference for several learning styles, yet medical faculties teach overwhelmingly in a single mode: the lecture. For the students, listening to lectures is essentially a passive learning method that encourages rote memorization and note-taking as the means of assimilating knowledge (Endorf & McNeff, 1991). It is important for medical educators to recognize that students have different learning styles and learning practices to reflect on the effectiveness of their methods of instruction, and to consider accommodating other learning modalities. Adult students are generally aware of their learning strengths and weaknesses, and want relevant, useful information presented in a way that is comfortable, intellectually challenging and time efficient. In addition, they seek a collaborative learning process with their instructors.

Keefe (1987) defines learning style as the "composite of characteristic cognitive, affective and physiological characters that serve as relatively stable indicators of how a learner perceives, interacts with and responds to the learning environment." Keefe also notes that a better understanding of learning styles by the faculty can help reduce the students' level of frustration and improve instructional delivery methods. Suskie (2004) suggests that instructors should attempt to alter their methods of teaching to give students with different learning styles an opportunity to learn in an environment more conducive to their preferences.

Bruner and Piaget describe how humans assimilate knowledge about their environment through four sensory modalities: visual (observing pictures, symbols, or diagrams), auditory (listening, discussing instructional material), visual/iconic (reading and writing), and kinesthetic (using tactile sensory abilities such as smell and touch) (Bruner, 1967; Piaget, 1990). Similarly Fleming and Mills (1992) have suggested four categories that seemed to reflect the experiences of their students. The Visual, Aural, Read/Write, and Kinesthetic (VARK) questionnaire which is based on these classifications is a tool that can be employed to assess the learning styles of university students (Fleming, 2004).

Suskie (2004) urges students and educators to be wary of the predictive ability of learning style inventory measurements and cautions that while sensory preferences are useful as a launching point for inquiry, they should not be used as the sole source of information for creating learning improvement.

The purpose of this study is to measure the distribution of the mean scores of learning style preferences of the medical students at AIMST University and note any significant differences among ethnic groups, gender and study practice (as each learning style may be associated with different study practice) in a sample population of 214 participants (medical students). The outcome may offer educators insight into using alternate lecture delivery strategies that may appeal to particular groups or to a wider range of learning preferences and probably augment student contentment with lesson content.

Objectives

To assess the predominant learning styles of medical students using the VARK questionnaire. To assess the predominant study practices (individually, pairs, groups, or combination) of medical students at AIMST University using a general questionnaire.

Data collection and analysis:

Method

The survey was conducted at the AIMST University School of Medicine, Kedah, Malaysia (246 students, mean age 22.5 years) in March 2008.

Instruments

A general questionnaire was used to obtain the name, age and gender of the students. The students were asked whether they preferred to study individually, in pairs or in groups (to determine the study type).

The second questionnaire was the VARK questionnaire to assess the preferred cognitive strategy of the students.

The VARK questionnaire was selected because it is a simple 16-question survey. In addition, this tool offers both students and instructors a method to enhance students' learning by understanding the preferred modes of information transfer better.

This study was reviewed and approved by the human investigation Committee of the Institutional Review Board (IRB) at AIMST University (project approved in May 2008).

Participants

Batches 10 (year 2, term 2), batch 11 (year 2, term 1), batch 12 (year1, term 2) and batch 13 (year 1, term 1) of the AIMST University School of Medicine took part in the study. All belonged to preclinical years.

The questionnaire included a covering letter explaining the purpose of the survey as well as supplemental reference materials suggesting optimal study strategies based on the learning preference scores. The consent forms and questionnaires were given to students who indicated interest in taking part in the study. Completed questionnaires were collected at subsequent lectures over the following week. Out of 246 questionnaires, 214 (87%) were completed and returned. Student questionnaires were scored and tabulated to determine the distribution of learning styles and practice.

Statistical analysis and Results

Data entry and analysis were performed with SPSS (Version 11.0, Chicago, United States of America). Mean and standard deviations were obtained for all the VARK scores. Number of observations and percentages were obtained for gender, ethnicity, and study practice type. Statistically significant differences between the gender (female and male), ethnicity (Indian, Chinese, Malay and others) and study practice (individually, pair, group, multimodal and combination of all) were determined by Chi-Square Test. Chi-Square values (χ^2) and *P* values were obtained. Comparison of the mean scores with gender was done by Independent *t*-

test and comparison of the mean scores with ethnicity and study types were done by ANOVA. Cross tabulations were done with Cramer's *V* analysis to determine if there is any association between study practice with gender and study type with ethnicity. Cramer's *V* measures were obtained.

In the analysis, the test of assumption for Chi-Square Test, Independent *t*-test, ANOVA, Pearson's Correlation and Cramer's *V* Test have not been violated.

Results

The mean and standard deviation for all scores are presented in Table 1, and the number of observations and percentages of gender, ethnicity and study practice are presented in Table 2. The results indicated that there was a significant difference in ethnicity (*p* = 0.000) and study practice (*p* = 0.000) (Table 2). In this study, the number of Indian students (62.62%) and students with independent study practice (70.56%) were significantly more than the other subgroups.

The percentage distribution of single learners was as follows: single visual learner (10%), single auditory learner (27%), single read/write learner (38%) and single kinesthetic learner (35%). The representation of multimodal learners were as follows: Bimodal (25%), Tri-modal (12%) and Quadri-modal (67%).

Taking single and multimodal learners together for consideration as 100%, the results revealed: single visual learner (4.7%), single auditory learner (12.6%), single read write learner (17.8%), single kinesthetic learner (16.4%), bimodal (11.7%), tri-modal (5.6%) and quadri-modal (31.3%).

Table 1: Mean and standard deviation of Continuous Assessment marks and VARK scores of 214 students of AIMST University.

Variable	Mean (standard deviation)
VARK scores	
Visual learners	3.07 (1.92)
Auditory learners	4.71 (2.15)
Read/write learners	4.93 (2.15)
Kinesthetic learners	5.00 (2.32)

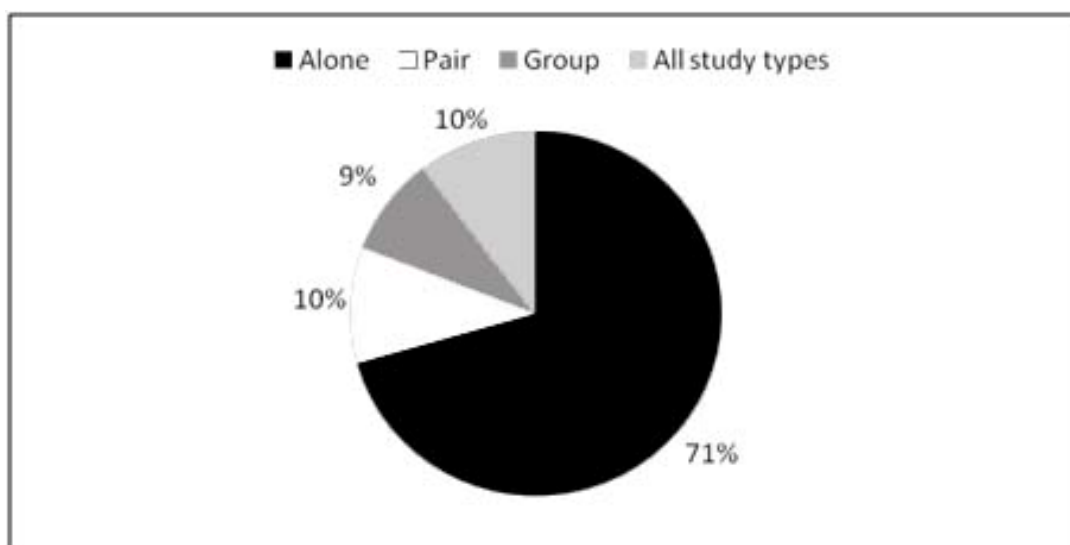
Table 2: Characteristics of 214 students of AIMST

Variable	n (%)	χ^2	p-value
Gender		2.692	0.101
Female	119		
Male	(55.61)		
	95 (44.39)		
Ethnic		227.01	0.000
Indians	134		
Chinese	(62.62)		
Malay	75 (35.05)		
Others	2 (0.95)		
	3 (1.40)		
Study Practice		237.03	0.000
Individually	151		
Pair	(70.56)		
Multimodal	22 (10.28)		
Combination of all	19 (8.87)		
	22 (10.28)		

Cross tabulation indicated a significant association between study practice and gender (Cramer's V measure=10.74, $p=0.013$) and between gender and ethnicity (Cramer's V measure=12.83, $p=0.005$). There was no significant association between study practice and learning styles.

In the present study, 71% of the students preferred to study alone, 10% preferred to study in pairs, 9% preferred to study in groups and 10% preferred a combination of study practice (individually/pair/group) (Figure 1).

Figure 1: Study type/Practice of 214 students considered for this study in AIMST



Discussion

Studying alone has its advantages. The student can keep to his/her own pace and there may be some topics the students know better than others which they can skip when studying alone. Studying in pairs or groups may hamper the progression of learning. Concentration may be greater when studying alone. The smaller group (29%) liking to study in pairs or groups may prefer to discuss and get their friends' advice in difficult lessons. Problem solving and analytical reasoning would be better in study groups. Ultimately this depends on the student's intellectual capabilities and mind set, the occasion of studying, and the purpose of studying.

The main objective of the 1st year programme is to deliver content in basic medical sciences. This is based on the following two themes: MCBM (Molecular and Cellular Basis of Medicine) and HBM (Human Basis of Medicine). The basics of Anatomy, Physiology, Biochemistry, Microbiology, Pharmacology and Community Medicine are dealt with here. The objective of the 2nd year programme is to ensure the learning of structure and functions of various organ systems.

Clinical skill training includes the recently revised curriculum in the four system courses (cardiovascular system, respiratory system, gastro intestinal, and central nervous system). A 3-week clinical attachment is also included to acquaint the students about communication skills with patients and health care professionals. There are 263 hours of lectures, 120 hours of clinical skills lab postings, 117 hours of PBL sessions, 60 hours of interactive review sessions (tutorials), 28 hours of practicals, 25 hours of dissections and 6 hours of student presentations. Independent, self-directed study practice by 71% of the students may also be to accommodate the AIMST University curricular strategy as a hybrid variety, which accommodates lectures, PBL and self-directed learning.

Knowledge of learning styles may help educators identify and solve learning problems among students, thus helping their students to become more effective learners (Cooper, 2007). Validated inventories that have been reported from previous studies are the learning style inventory of Kolb (Gyeong & Myung, 2008), Vermunt's Inventory of Learning Styles (Van der Veken, *et al.*, 2008), Index of Learning Styles (Zhang & Lambert, 2008), Verbalizer-Visualizer Questionnaire (Kraemer, 2009). The VARK

questionnaire was chosen for its simplicity and for its relevance in the determination of learning styles in undergraduate curriculum.

Administration of the VARK questionnaire to pre-clinical medical students to determine their preferred modes of learning styles revealed the following (Figure 2): of 214 respondents, 51.5% preferred a single mode of information presentation (visual, auditory, reading/writing or kinesthetic). Only 10% of the students preferred the visual mode of learning. These students preferred information to arrive in the form of graphs, charts and flow diagrams. They were sensitive to different or changing spatial arrangements and could work easily with symbols. Of the students who preferred a single mode of information presentation, 27% of the students preferred receiving information by speech, which arrives to learners' ear and is therefore coded as auditory by the questionnaire. Similarly, 38% revealed a preference for accessing information from printed words; these students are coded as reading/writing learners. There were 35% kinesthetic learners. These students prefer concrete, multisensory experiences in their learning. Although learning by doing matches their needs, they can learn easily from conceptual and abstract material provided it arrives with suitable analogies, real-life examples or metaphors (Fleming, 1995).

Multiple modes of information presentation were preferred by 48.6% (Figure 3). These students had a balanced set of preferences, which meant they preferred information to arrive in a variety of modes. Thus, most students may benefit from active learning strategies over the traditional lecture format. Active learning strategies reach all types of learners in the visual, auditory, reading/writing and kinesthetic schemes. In contrast, the traditional lecture format assumes that all students are auditory learners, and that all students acquire the same information presented orally at the same pace without dialogue of the presenter.

When analyzing their learning styles, 25% were categorized as bimodal and 12% as tri-modal learners. A majority of AIMST University students preferred a quadri-modal (67%) mode of instruction. Students are able to learn effectively as long as the teacher provides a blend of visual, auditory, reading/writing and kinesthetic activities. However, some students prefer one of the modalities over the other three. They struggle to understand the subject matter unless special care is taken to present it in their preference mode. To meet these needs,

teaching should be multisensory and filled with variety. To achieve this goal, it becomes important to use active learning strategies (Rao & Dicarolo, 2001).

Auditory learning is achieved from discussions during collaborative learning events such as peer learning, debates, games and answering questions (DiCarlo & Collins, 2001). Manipulating models (Chan, *et al.*, 1991) and role playing (Kuipers & Clemens, 1998) satisfies kinesthetic and tactile learners. Cooperative learning exercises, role playing, simulations, models, debates and games are active learning strategies that can be used effectively in large classrooms. These activities also promote working in groups and generate high levels of motivation and enthusiasm. Furthermore, investigators have reported an increase in students' achievement with the use of simulations and games, and students usually express positive feelings from their experiences (Lujan & Dicarolo, 2006). For all these reasons, active learning strategies may be superior to the traditional lecture format in promoting thinking, reasoning, problem-solving and decision-making skills.

Tierney and Brunton (2005) reported that science and engineering students were kinesthetic learners while business students were predominantly read/write learners when cognitive modalities were examined. Baykan and Naçar (2007) have reported that 23.3% of 155 first year medical students were kinesthetic learners. The knowledge of students' preferred learning styles is vital if educators are to provide tailored strategies for individual students (Armstrong & Parsa-Parsi, 2005). It also helps to

overcome the predisposition of many educators to treat all students in a similar way as well as to motivate teachers to move from their preferred mode(s) to using others. In so doing, they can reach more students because of the better match between teacher and learner styles (Bergman & Fors, 2005).

In some cases, it may be difficult to tailor coursework to the individual learning style of each student. However, in these situations, by being aware of their learning styles, students may contribute to their academic success by promoting self-awareness and their use of learning strategies that work for their learning style (Tanner & Allen, 2004). The key to retaining a broad group students interested in science is a differentiated instruction, a teaching style that derives from multiple pedagogical approaches and not a singular approach. Not all educators agree that matching teaching methods to a preference or style improves learning.

The mean average scores of kinesthetic and read/write students were more than auditory and visual learners (Figure 4). Most of the students preferred learning by using all their senses, including touch, hearing, smell, taste and sight. These students prefer information to arrive in a variety of modes and they do not learn by simply sitting in a classroom listening to the educator or memorizing assignments. To achieve meaningful learning, these students must talk about what they are learning, write about it, relate it to past experiences and knowledge, and apply it to their daily lives (Lujan & Dicarolo, 2006).

Figure 2: Breakdown of students (n=110) preferring a single mode of information presentation (either V, A, R, or K)

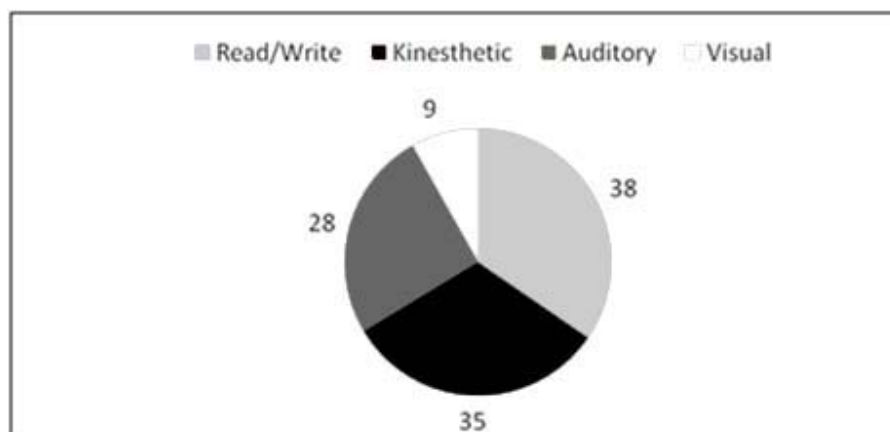


Figure 3: Percentages of students (n=104) who preferred two, three, or four modes of information presentation

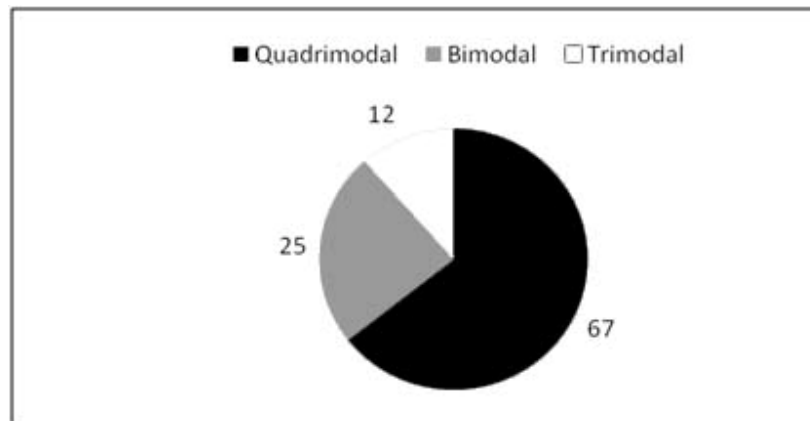
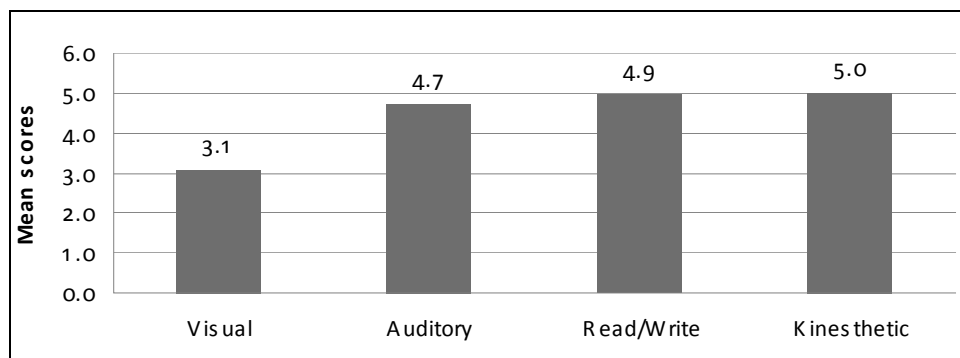


Figure : Mean VARK scores of 214 students considered for this study



In a passive lecture format, the method generally used in our faculty, all students are assumed to be auditory learners, although in the present study all our students did not employ this method. It is important to emphasize that students will only remember 20% of what they read, 30% of what they hear, 40% of what they see, 50% of what they say, and 60% of what they do.

Gender differences were as follows: 56% of the study population was female. Importantly, more female students preferred to study individually or independently. (In this study sample there are significantly more female Indian students (Figure 5). In contrast to females, the majority of males preferred to study in pairs or groups or both. It has been reported that males have a preference for rational evaluation and logic; but females use

"elaborative" processing in which they tend to seek personal relevance or individual connections with the material being taught (Lie *et al.*, 2004). In addition, males tend to be more achievement oriented; however, females are more socially and performance oriented (Chang, 2004). The genders also differ in their beliefs about what is most important to student learning. Females rank social interaction with other students and self-confidence higher than males (Brassard, 2004). Furthermore, males are likely to attribute their success in the classroom to external causes, such as teaching; while females generally see their success is being directly related to their efforts in the classroom (Grollinio & Velayo, 1996). This suggests that males tend to be more externally focused, but females tend to be more introspective and self-critical.

Figure 5: Ethnic distribution of students considered for this study in AIMST

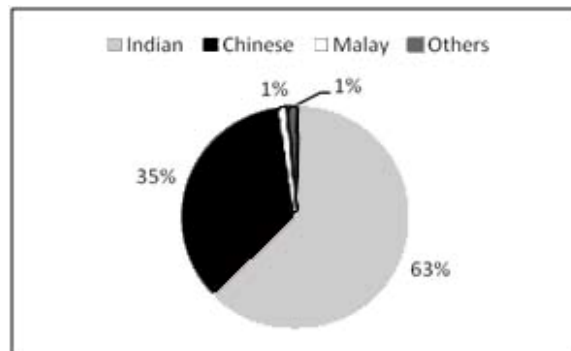


Table 3: Comparison of the means of read/write learner’s score and kinesthetic learner’s score with ethnicity and study practice

Variable	n	Mean (SD)	F statistics (DF)	p-value
Read/Write learner’s score				
Study type			2.959 (3)	0.033
Individually	151	4.86 (2.16)		
Pair	22	4.27 (2.35)		
Multimodal	19	4.84 (1.46)		
Combination of all	22	6.09 (2.11)		
Kinesthetic learner’s score				
Ethnic group			2.655 (3)	0.050
Indian	134	5.00 (2.35)		
Chinese	75	4.88 (2.16)		
Malay	2	4.50 (2.12)		
Other	3	8.67 (3.22)		

Limitations and strengths of VARK

The VARK questionnaire has not been statistically validated and that represents a limitation to this study. Educational investigators have been attempting to find a way to validate VARK. Despite this limitation, there is substantial evidence for the existence of modality-specific strengths and weaknesses (for example, in visual, auditory or kinesthetic processing) in people with various types of learning difficulty. Importantly, a number of strengths emerge from the VARK analysis. For example, it offers a positive, inclusive affirmation of the learning potential of all students. The VARK philosophy encourages the belief that everyone can learn if their preferences are addressed. This view of learning encourages teachers to ask themselves an insightful and critical question, namely: how can we teach our students if we do not know how they learn? (Dunn & Griggs, 2003).

Future directions

The rationale for this descriptive study was to help us design a lesson plan that addresses all students and to identify areas for further research. With regard to future research, several questions regarding learning styles emerged from this study. For example: (1) how do grades correlate with learning styles for specific classes, e.g., do kinesthetic learners perform better in laboratory classes and do aural learners perform better in lecture classes? (2) do students in preclinical years use different learning styles compared to students of clinical years. (3) do pre-university students have different learning styles? (4) how does the professor accommodate those who prefer only one style and those who prefer many? The administration of VARK at the beginning of the course has recommended teaching to be modulated according to the needs of the students especially during self-directed learning hours.

Conclusion

A majority of AIMST University students preferred a quadrimodal learning style among the multimodal learners. Among unimodal learners, the highest preference of learning styles were read/write and kinesthetic. The study practice depicted a high trend towards independent learning strategies. Mentors should be attentive of these differences in order to accommodate or at least investigate the prospective of enhancing opportunities for read/write and kinesthetic learners. The fact that a student may have a favored mode does not mean he/she cannot function successfully in another.

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