Learning styles and their associated factors among medical undergraduates' of 2018/2019 intake in selected medical faculties in Sri Lanka

Kumarasinghe W M M[1*], Wijeratne D C[1], Caldera H S D[1], Silva N H K[1], Ranasinghe B A H P[1], Hettiaratchi U P K[2], Shiyam A[3], Seneviwickrama K L M D[3]

[1]*Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka*
[2]*Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka*
[3]*Department of Community Medicine, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka*
*****me93714@sjp.ac.lk

Abstract

Background: Medical undergraduates need to be equipped with required skills to bear their responsibilities as future doctors. Learning styles and their associated factors play a major role on this regard.

Objective: To describe learning styles and their associated factors among medical undergraduates' of 2018/2019 intake in selected medical faculties in Sri Lanka.

Methodology: A descriptive, cross-sectional study was conducted among 432 third year medical undergraduates in selected medical faculties using an online questionnaire. Based on Felder-Silverman model, learning styles were categorized under four dimensions as active-reflective, sensing-intuitive, visual-verbal and sequential-global. Associated factors were studied under socio-demographic, skills, lifestyle and academic performance. Data was analysed using SPSS software. Chi squared test was used to find associations. Level of significance was considered as $p<0.05$.

Results: The majority preferred active over reflective, sensing over intuitive, visual over verbal and sequential over global learning style. Factors associated with active learning style included Colombo faculty, males, involving in a part time employment, greater time management skills, high perceived computer literacy level and high academic performance. Sensing learning style was associated with practicing mindfulness. Colombo faculty, being single, greater time management skills, high perceived computer literacy level, involving in extra-curricular activities and high academic performance were associated with visual learning style. Rajarata faculty and low perceived computer literacy level were associated with sequential learning style.

Conclusion: Socio-demographic factors, life style factors, skills and academic performance were found to be significantly associated with four dimensions of learning styles.

Keywords - Learning styles, time management, medical undergraduates, academic performance, Felder-Silverman mode

Introduction

Learning is not just vital for educational progress, but also it builds personal skills of an individual. Learning style is used to refer to "an individual's desired method of gathering, organizing, and thinking about information". Technically, learning style refers to the superior way in which someone absorbs, processes, understands and retains information (1).

Individuals have different levels of abilities and preferences in gaining new information and understanding them. Some individuals desire to learn by facts or concrete information, while others desire theories over facts. Some prefer pictures, diagrams over verbal explanations while others prefer verbal methods. Some desire to learn by trying things out while others reflect on things. Some individuals are linear thinkers while some thinks in huge leaps (2).

Learning styles are subjective to the individual. It is implicated to be associated with individual comprehension and as a predictor of success at examinations. It is a complex task to figure out the learning style that best suits for an individual (3).

The learning strategies of high achievers often show a well-made pattern or schedule. University students should realize the importance of personalized studying methods and studying on a consistent basis instead of frequent delaying strategies in order to uphold student success and to achieve their final career goal after graduation (4).

A study revealed mismatches between learning styles of engineering undergraduates and traditional teaching styles used by engineering professors. As a result, students become uninterested and get disheartened about their curriculum, and themselves. Researchers emphasized that this mismatch is mainly responsible for loss of potentially excellent engineers (5).

Development of students` skills in both their preferred and less preferred learning styles should be an objective of education. If teaching methods are exclusively based on their less preferred learning styles students will get uncomfortable.

However, if teaching methods are exclusively based on their preferred learning style, students may not develop the ability which they need to gain for their achievement in university as well as in their profession. Therefore, learning style models give a good help to design instructions with the optimum width (6).

Thus, it is well identified that the learning styles and associated factors play a key role in academic performance of an individual. And a successful academic performance produces high quality graduates who will become great human resources in the country and great leaders (7).

Methodology

A descriptive cross-sectional study was conducted among undergraduates from selected medical faculties in Sri Lanka from April 2022 to July 2022. Undergraduates who had faced 1st bar exam in Faculty of Medical Sciences-University of Sri Jayewardenepura, Faculty of Medicine- University of Colombo, Faculty of Medicine and Allied Health Sciences- University of Rajarata, and Faculty of Medicine- University of Ruhuna were selected as participants of the study. Students who were not in their WhatsApp batch groups at the time of data collection were excluded from the study.

Sample size calculation for the study was computed using the formula for a prevalence study (8).

Significance level was set at 1.96 corresponding to a 95% confidence limit. P was taken as 0.5 and the degree of accuracy (precision) desired for the margin of error is set at 0.05. Considering a 10% non-response rate, the final sample size was 422.

Convenience sampling method was used to collect data till the sample size is fulfilled. We divided the sample size by 4 to determine the number of participants to be recruited from each Faculty.

A validated, pre-tested, structured, self-administered Google questionnaire was distributed through batch representatives via WhatsApp groups.

The Index of Learning Styles Questionnaire, obtained from North Carolina State University online site was used in the questionnaire. This 44-item questionnaire has been widely used to assess learning styles and designed based on the four categories of learning styles described in Felder-Silverman model: Active-reflective, Sensing-intuitive, Visual-verbal, Sequential-global. Each learning style is determined by 11 questions.

Results obtain a learning style preference score for each individual showing across a range from negative 11 to positive 11 for 4 different categories. The reported score for a dimension indicates the preference for one category or the other.

Socio-demographic, skills, life style factors and academic performance were assessed as associated factors by several self-administrated questions.

The time management skill was measured by using the Time Management Questionnaire (TMQ) developed by Britton and Tesser (1991) which has 18 questions (9) based on a 5-point Likert scale.

Mean was used as the cut-off and the total sample was divided into two categories as having greater and lesser time management concerns.

Overall academic performance and performance in different subjects (Anatomy, Biochemistry, Physiology) at the 1st bar examination were self-reported.

Data entry and analysis were done by the investigators, by using the Statistical Package of Social Sciences (SPSS). Quantitative data were described using standard deviation values and mean values. Qualitative data were presented using frequencies and percentages. Associations were determined by using Chi squared test. Statistical significance was taken as $p<0.05$

Ethics approval to conduct the study was obtained from the Ethics Review Committee of the Faculty of Medical Sciences, University of Sri Jayewardenepura. Administrative clearance was obtained from relevant authorities.

Results

***Table 1*- Distribution of socio-demographic characteristics**

Character		*N (%)*
Faculty		
	Faculty of Medicine, University of Colombo	108 (25%)
	Faculty of Medical Sciences, University of Sri Jayewardenepura	108 (25%)
	Faculty of Medicine and Allied Sciences, University of Rajarata	108 (25%)
	Faculty of Medicine, University of Ruhuna	108 (25%)
	Total	432(100%)
Gender		
	Male	160 (37%)
	Female	272(63%)
	Total	432(100%)
Relationship status		
	Single	244(56.5%)
	In a relationship	183(42.4%)
	Married	5(1.2%)
	Total	432(100%)
Involvement in part time employment		
	Yes	110 (25.5%)
	No	322(74.5%)
	Total	***432(100%)***

Learning styles among Medical Undergraduates

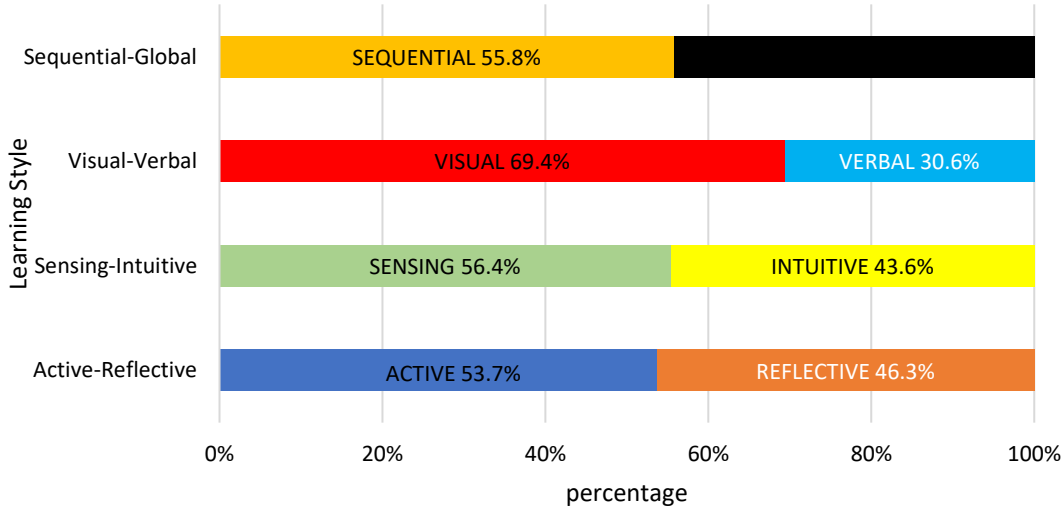

***Figure 1*-Learning style distribution**

Most of the students preferred active learning style (53.7%) over reflective learning style. There were 236 (56.4%) students who preferred the sensing learning style over intuitive learning style. Visual learning style was preferred by 69.4% students over verbal learning style. There were 55.8% students who preferred the sequential learning style and the remaining 44.2% students preferred the global learning style.

We aimed to describe association between learning styles among participants and their academic performance at the first bar examination in the university. We considered the grade they obtained and having distinctions or referring in subjects in our study. Table 2 presents the association between the learning styles and the grade they obtained.

Table 2 **- Association between learning styles among medical undergraduates and the grade they obtained in their first bar examination**

		Grade				
		Who had a class	***Pass***	***Referred***	***Total***	***χ2; df ; p***
Learning style	***Active***	106 (45.7%)	76 (32.7%)	50 (21.5%)	232 (100%)	
	Reflective	85 (42.5%)	96 (48.0%)	19 (9.5%)	200 (100%)	16.709;3;0.001
	Sensing	108 (45.8%)	93 (39.4%)	35 (14.83%)	236 (100%)	
	Intuitive	83 (42.3%)	79 (40.3%)	34 (17.3%)	196 (100%)	2.806;3;0.422
	Visual	146 (48.7%)	98 (32.6%)	56 (18.6%)	300 (100%)	
	Verbal	45 (34.1%)	74 (56.0%)	13 (9.8%)	132 (100%)	21.531;3;0.000
	Sequential	107 (44.4%)	95 (39.4%)	39 (16.1%)	241 (100%)	
	Global	84 (44.0%)	77 (40.3%)	30 (15.7%)	191 (100%)	3.50;3;0.321

A statistically significant association was found regarding active-reflective learning styles (p=0.001) and visual-verbal learning styles(p<0.001) with the students who had obtained a grade at the first bar examination

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Table 3 **- Association between Active-Reflective style and associated factors among medical undergraduates**

		Learning style			
		Active	***Reflective***	***Total***	***χ2; df ; p***
Socio-demographic characteristics					
Faculty*					
	FOM, UOC	76 (70.4%)	32 (29.6%)	108(100%)	20.334; 3; 0.000*
	FMS, USJ	45 (41.7%)	63 (58.3%)	108(100%)	
	FOMAS, UOR	51 (47.2%)	57 (52.8%)	108(100%)	
	FOM, UOR	60 (55.6%)	48 (44.4%)	108(100%)	
Gender*					
	Male	62.5%	37.5%	160(100%)	7.908; 1; 0.005*
	Female	48.5%	51.5%	272(100%)	
Relationship status					
	single	135 (55.3%)	109 (44.7%)	244(100%)	0.741; 2; 0.690
	In a relationship	94 (51.4%)	89 (48.6%)	183(100%)	
	Married	3 (60%)	2 (40%)	5(100%)	
Involvement in part-time employment*					
	Yes	73 (66.4%)	37 (33.6%)	110(100%)	9.513; 1; 0.002*
	No	159(49.4%)	163(50.6%)	322(100%)	
Skills					
Time management skills*					
	Greater time management concerns	153(64.8%)	83 (35.2%)	236(100%)	25.902;1; 0.000*
	Lesser time management concerns	79 (40.3%)	117 (59.7%)	196(100%)	
Self -satisfaction on English language proficiency					
	Low	93 (52.0%)	86 (48.0%)	179 (100%)	0.376;1; 0.540
	High	139 (54.9%)	114 (45.1%)	25 (100%)	

Level of perceived computer literacy*				
Low	97 (51.9%)	90 (48.1%)	187(100%)	
High	135 (55.1%)	110 (44.9%)	245(100%)	0.445;1; 0.050*
Life style				
Extra-curricular activities				
Yes	149 (55.8%)	118 (44.2%)	267(100%)	1.242;1; 0.265
No	83(50.3%)	82 (49.7%)	165(100%)	
Practicing mindfulness				
Yes	85 (59.9%)	57 (40.1%)	142(100%)	3.224;1; 0.730
No	147 (50.7%)	143 (49.3%)	290(100%)	
Academic performances				
Grade obtained in the first bar exam*				
1st class	32(59.3%)	22(40.7%)	54(100%)	16.709; 3; 0.001*
2nd class	74(54%)	63(46%)	137(100%)	
Pass	76(55.5%)	96(44.5%)	172(100%)	
Referred	50(72.5%)	19(27.5%)	69(100%)	
Having distinction in anatomy				
Yes	22(61.1%)	14(38.9%)	36(100%)	0.867; 1; 0.352
No	210(53%)	186(47%)	396(100%)	
Having distinction in biochemistry				
Yes	35(67.3%)	17(32.7%)	52(100%)	0.220; 1; 0.639
No	197(53.2%)	173(46.8%)	370(100%)	
Having distinction in physiology*				
Yes	50(64.1%)	28(35.9%)	78(100%)	4.140; 1; 0.042*
No	182(51.4%)	172(48.6%)	354(100%)	
Referring in anatomy*				
Yes	43(72.9%)	16(27.1%)	59(100%)	10.108; 1; 0.001*
No	189(50.6%)	184(49.4%)	373(100%)	
Referring in biochemistry*				
Yes	37(72.5%)	14(27.5%)	51(100%)	8.260; 1; 0.004*
No	195(51.2%)	186(48.8%)	381(100%)	
Referring in physiology*				
Yes	22(73.3%)	8(26.7%)	30(100%)	4.996; 1; 0.025*
No	210(52.2%)	192(47.8%)	402(100%)	

*These factors were found to be significantly associated with the active-reflective learning style.

The faculty, Gender, Involvement in a part time employment, Time management skills, Level of perceived computer literacy, the grade obtained in the first bar examination, having distinction in Physiology, referring in Anatomy, Biochemistry and Physiology were found to be significantly associated with the active-reflective learning style. In contrast according to our study a significant association was found only with practicing mindfulness towards sensing – intuitive learning style. When considering the visual – verbal learning style there were significant associations with the faculty, relationship status, time management skills, level of perceived computer literacy, involvement in extra – curricular activities, the grade obtained in the first bar examination, having distinctions in Biochemistry and referring in Anatomy. Only the faculty and level of perceived computer literacy were found to be significantly associated with sequential – global learning style.

Discussion

Learning styles

According to our study 69.4% students preferred the visual learning style over verbal learning style. Similarly to our findings, another study among medical undergraduates of Kazakhstan reported verbal learning style been preferred by 80.0% students over verbal learning style (1). Furthermore, both studies showed students 'preference to the sequential, active, and sensing learning styles over global, reflective, and intuitive learning styles.

Associated factors of learning styles

Under the socio-demographic characteristics we found that active-reflective learning style has a statistically significant association with the faculty, gender and involvement in part time employment. When considering about the faculty, majority of the medical students from university of Colombo and university of Ruhuna were active learners while majority of the medical students from university of Sri Jayewardenepura and university of Rajarata were reflective learners.

When considering about the gender, majority of the male medical students were active learners while majority of the female medical students were reflective learners. A descriptive cross-sectional study (10) was conducted at the Dental school of Isfahan University in Iran including 200 undergraduates to evaluate the relationship between learning preferences of dental students and academic performance. They used a questionnaire which included questions on socio-demographic factors and Persian language version of VARK questionnaire. They did not find a statistically significant difference between the learning style

preference and gender(p=0.43) of the participants. Similarly, a descriptive cross-sectional study (11), a VARK questionnaire-based format was conducted by King Saud University in Riyadh, Kingdom of Saudi Arabia to describe the relationship between the learning Style preferences of Medical students and gender, targeting 600 Medical students who were learning in 2nd, 3rd ,4th , and 5th years. The results revealed that there were 317 (52.8%) females and 283 (47.2%) males who referred teacher's PowerPoint slides. Descriptive and analytical statistics showed that learning Style preferences were significantly related to a student's academic achievements with gender.

When considering about the involvement in a part-time employment majority of the students who are involved with a part-time employment were active learners while majority of the students who are not involved with a part-time employment were reflective learners. However, there was no study related to this. Time management skill and level of perceived computer literacy were associated with active-reflective learning style. Misclassification bias can be there because this was assessed by a self -administered question and the participants who does not have much understanding about the exact meanings and criteria of each level, might be found it difficult to select the exact category of level to which they are falling. The study can be generalized because the medical faculties we selected for the study includes the students from all over the country. Though our study failed to reveal any association between learning styles and level of self-satisfaction on English language proficiency, a study conducted in the Rajarata University implied an association between students learning and the English language proficiency (3).

Life style

We attempted to find the association between practicing mindfulness and learning styles among medical undergraduates in this study. Only 142(32.87%) students are practicing mindfulness among 432 participants. It indicated the students who are practicing mindfulness is low as a number. A statistical difference was found only in the sensing-intuitive learning style. Sensing learners prefer to learn facts, try to memorize them and they tend to be more practical and may be practicing mindfulness help sensing learners to take information through their senses and memorize them. No similar study to make comparisons could be found. Our study only focused whether students practicing mindfulness or not and importantly this has limited our study when considering the complex nature of the mindfulness because we did not focus on the nature of methods of mindfulness that they are practicing.

Academic performance

COVID-19 pandemic may have a significant effect on learning style preferences among medical undergraduates' of 2018/2019 intake since their 1st bar examinations were held during this period. A statistically significant association between active-reflective learning style and the grade obtained in 1st bar examination was observed in our study. Out of the 232 active learners, 21.5% got referred while only 9.5% got referred out of 200 reflective learners. The difference could be due to the limited time that medical undergraduates has restricted the active involvement in subject matters. In that case, reflective learners could earn more advantages in exams.

Although there was no study that depicts the association between the grade obtained in 1st bar examination of Medical undergraduates and their learning styles, some sort of preference towards aural learning style was demonstrated in a cross sectional descriptive study including 200 Iranian dental students from October to November 2016 (10). Moreover, it indicates that students with reading/writing preference had high academic performance. According to our study a significant association was found only with practicing mindfulness towards sensing – intuitive learning style. During our study we found the visual – verbal learning style there were significant associations with the faculty, relationship status, time management skills, level of perceived computer literacy, involvement in extra – curricular activities, the grade obtained in the first bar examination, having distinctions in Biochemistry and referring in Anatomy. Only the faculty and level of perceived computer literacy were found to be significantly associated with sequential – global learning style.

Conclusion

Among medical undergraduates in our study sample, the learning style with the highest % was visual learning (69.4). The following factors were found to be significantly associated with active – reflective learning style. They are the faculty, Gender, Involvement in a part time employment, Time management skills, Level of perceived computer literacy, the grade obtained in the first bar examination, having distinction in Physiology, referring in Anatomy, Biochemistry and Physiology.

A significant association was found only with practicing mindfulness towards sensing – intuitive learning style.

When considering the visual – verbal learning style there were significant associations with the faculty, relationship status, time management skills, level of perceived computer literacy, involvement in extra – curricular activities, the grade obtained in the first bar examination, having distinctions in Biochemistry and referring in Anatomy.

Furthermore, the faculty and level of perceived computer literacy were found to be significantly associated with sequential – global learning style.

Limitations

Since this study used convenience sampling method, possibility of selection bias to be kept in mind when interpretations are made. Study was limited only to medical students and thus, cannot be generalized to other fields.

Conflict of Interest

Authors declare that there is no conflict of interest.

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