Knowledge E
enriching | engaging | empowering

Original Article

A Comparative Questionnaire-based Study on Learning Styles and Studying Resources among Undergraduate Medical Students in Public and Private Universities

Khadija Mahamadou[1] and Khalid A. Awad[2]

[1]University of Medical Sciences and Technology, Khartoum, Sudan
[2]Department of Anatomy, Faculty of Medicine, University of Khartoum, Khartoum, Sudan
ORCID:
Khalid A. Awad: https://orcid.org/0000-0002-2751-5050

Corresponding Author:
Khadija Mahamadou; email:
khalid-alamin@uofk.edu

Editor-in-Chief:
Prof. Mohammad A. M. Ibnouf

🔒 **OPEN ACCESS**

Abstract

Background: Learning styles are circumstances beneath which learners most expeditiously and successfully understand, process, store, and recall what they are attempting to learn. The main goal of the current study was to compare different methods of study and learning style predilections amongst undergraduate MBBS students who attend public and private universities.

Methods: The current study was a descriptive cross-sectional research. Data collected were obtained through a questionnaire filled by second- and third-year students in Omdurman Islamic University - OIU (public) and University of Medical Sciences and Technology – UMST (private) using systematic random sampling. Using the SPSS version 23 software, the data were analyzed and Chi-square test was used to test the significance considering the α (alpha) level of significance as 0.05.

Results: The application of the Chi-square test showed that there is no relation between the a method of study used and the students' grades (P = 0.333). The most preferred learning style in OIU was found to be Aural (60.0%), while in UMST it was read/write (57.9%). The most preferred source of studying used in OIU was found to be extra-courses (private courses given outside the university), whereas in UMST it was found to be the teachers' slides.

Conclusion: The most preferred learning style for public university was found to be aural while for private university it was found to read/write. This factor must be taken into consideration while teaching sessions are being conducted. Interestingly, there was no statistical association between the study methodology and students' grades.

Keywords: learning predilections, learning styles, studying methods, instructing techniques, teaching and learning

1. Introduction

Learning can be defined as the relatively permanent change in an individual's behavior which comprises their knowledge, skills, and attitude. This can involve studying, reading, memorization of facts or attending school, so as to find out about a subject [1]. Learning

styles are circumstances beneath which learners most expeditiously and successfully understand, process, store, and recall what they are attempting to learn [2].

Medical school is a unique learning environment as by the time of graduation, students are expected to attain many new skills ranging from taking blood to breaking bad news. In addition, they should be able to integrate skills with knowledge in order to diagnose patients. In the end, they are expected to find out what they need to study and master that material [3].

The learner's preferred mode of learning characterizes their learning style. Four modes of learning styles have been defined by Neil – Visual, Auditory, Read/Write and Kinesthetic (VARK) learners [4]. The reason behind choosing this specific data collection tool is that the variables used here are derived from simple and actual events that happen in our daily life. Viewed in this way, a study performed by Fleming on the VARK website showed that nearly 60% of the respondents tested the accuracy of its results, while 5% disagreed with its outcomes and the remainder said that they have no idea about their learning predilections [5].

It is essential that every medical teacher meets the educational needs of the students by assessing their learning preferences and developing an appropriate approach [6]. The learning system in universities differs from the one found in schools where students are passive learners. With the constant emergence of new information, medical education requires lifelong learning in order to stay up-to-date. Some of the undergraduate students suffer from a language barrier in the beginning in order to attain the best medical knowledge [3]. Medical students often complain of studying hard but with no expected results, hence attention should be drawn to different methods of learning and studying to achieve the expected results [3].

The past decade has witnessed a change in medical education from being teacher-centered to student-centered. Different instruction techniques are being used at the preclinical level to target undergraduates with different learning styles. These range from teacher-centered instruction technique to providing real-life events in which students can learn and demonstration through videos as well as problem-based learning (PBL). The question of whether or not these methods are appealing and useful to students needs to be answered [6]. A number of studies have been done to address these issues. In Sudan, kamil *et al.* conducted a study which showed that adopting an interactive method of lecturing enables the vital role of students in the learning process. They also found that adopting a bilingual type of instruction enhances the knowledge and encourages students' contribution [7].

The idea of learning styles has undergone indepth analysis in empirical literature in a trial to grasp the dynamic processes of learning [8]. Keefe described a learning style as "the complex of intellectual, perceptible, and physiological characteristics that serve as relatively stable indicators of how a learner perceives, interacts, and responds to learning surroundings." [8]. Understanding undergraduates learning styles is crucial for lecturers, as every learning style needs different instructional materials. Alignment of undergraduates' learning styles and instructors' instructing techniques increases the undergraduates' understanding of the course content. Numerous studies have been done to deal with this issue; one of which is a study among preclinical undergraduate medical students of the International Medical University (IMU) in Kuala Lumpur. This study showed that majority of students had unimodal (kinesthetic) learning style [9]. Another study by Ojeh *et al.,* among preclinical medical students in Barbados (2014) using the validated VARK questionnaire, showed that most preclinical medicals students are multimodal learners [10]. Furthermore, similar conclusions on learning styles have been reported by other studies [11–15].

In this study, we shed light on the different study methodologies and tools that students utilize. As it is already known, undergraduates have different learning predilections and these learning predilections should be addressed in order to attain the maximum knowledge during their medical course. Some students attain results below their expectations despite their considerable efforts throughout the academic year. Furthermore, with the shifting of medical education to be student-centered, their opinion should be taken into consideration. Therefore, the main goal of the current study is to compare between public and private universities in terms of their learning predilections and studying methods.

2. Materials and Methods

The current study is a descriptive, cross-sectional, comparative, questionnaire-based study conducted among students studying in Omdurman Islamic University (OIU) and the University of Medical Sciences and Technology (UMST). Students studying in the second and third years at the Faculty of Medicine in OIU and UMST were enrolled in the study. OIU is a government university located in the Omdurman locality, Khartoum state, Sudan, while UMST is a private university located in the Khartoum locality, Khartoum state, Sudan.

2.1. Study sample

Sample size was calculated using the formula for known population, and the estimated sample size for OIU and UMST were found to be 207 and 146, respectively. Using the stratified sampling technique, the number of second-year students who participated in this study was 92 from UMST and 102 from OIU, while those in the third year were 54 (UMST) and 105 (OIU).

2.2. Data collection

Data were collected using two questionnaires.

1. VARK which symbolizes Visual, Aural, Read/Write, and kinesthetic sensory modalities that are applied to profile learning predilections. The version applied was the VARK Version 7.8 developed by Fleming (http://vark-learn.com) [5] comprising 16 questions. The completed VARK questionnaire was then evaluated online.

2. A written questionnaire was used to obtain the demographical characteristics such as location, age, gender, year in which they are studying and their study methodology.

After gaining informed consent, hard copies of two questionnaires were distributed. The participants were then invited to respond to the questionnaires anonymously or to write their names if they wished to get their VARK results.

a) **Data analysis**

Data were analyzed through the SPSS version 23 software, and Chi-square test was used to test the significance, taking α (alpha) level of significance as 0.05 per statistical convention. The results were generated in the form of charts, tables, and graphs.

3. Results

Out of the 353 questionnaires that were given, 336 were completely filled and returned (95.2% response rate). Students from UMST were 146 (43.5%) and 190 (56.5%) students were from OIU. The age of the participants ranged between 16 and 24 years, while the mean age was 18.95 ± 1.186 years. Among the participants, 60 (18%) were male and 273 (82%) were female. Regarding the academic year, 183 (55.1%) were in second year while 149 (44.9%) were third-year participants (Table 1; Figure 1).

Regarding students' perception on whether their grades are affected by the way they study, Figure 2 shows that 86.8% of students agreed that their method of study does affect their grades while 13.2% disagreed.

Most students agreed that the best method to study was by both understanding and memorizing (85.4%), and stated that they revise what they studied twice (42.8%). Most students preferred teaching to be in English language (58.1%). Moreover, 53.5% of the students agreed that case-based learning (CBL) and problem-based learning (PBL) should be increased. Of the total students, 64.7% agreed that tutorials should be improved and suggested that they should be done in smaller groups, include past exams with more interaction between students and teachers in addition to the outlines of the tutorial being given beforehand (a day before). Regarding seminars, 78.1% of students believed that they are useful while 21.8% did not (Table 2).

Most of the students, regardless of their grades (distinction, very good, good, pass, and fail) agreed that their grades are affected by their method of study. However, no statistical association was found between the study methodology and students' grades (P-value = 0.333) (Table 3).

The VARK questionnaire results showed that the most preferred learning modality for OIU was found to be unimodal (aural), while the preferred learning modality for UMST was found to be read/write (Table 4).

While comparing the study methodologies between UMST and OIU, a co-variable (the best way student obtain information, that is, study resource) was used to determine the method of study. Table 5 shows that the most preferred study methodology in the OIU was extra-courses (81.5%) followed by peers (66.2%). However, contrastingly, the UMST students chose teachers' slides (46.5%) followed by videos (44.8%).
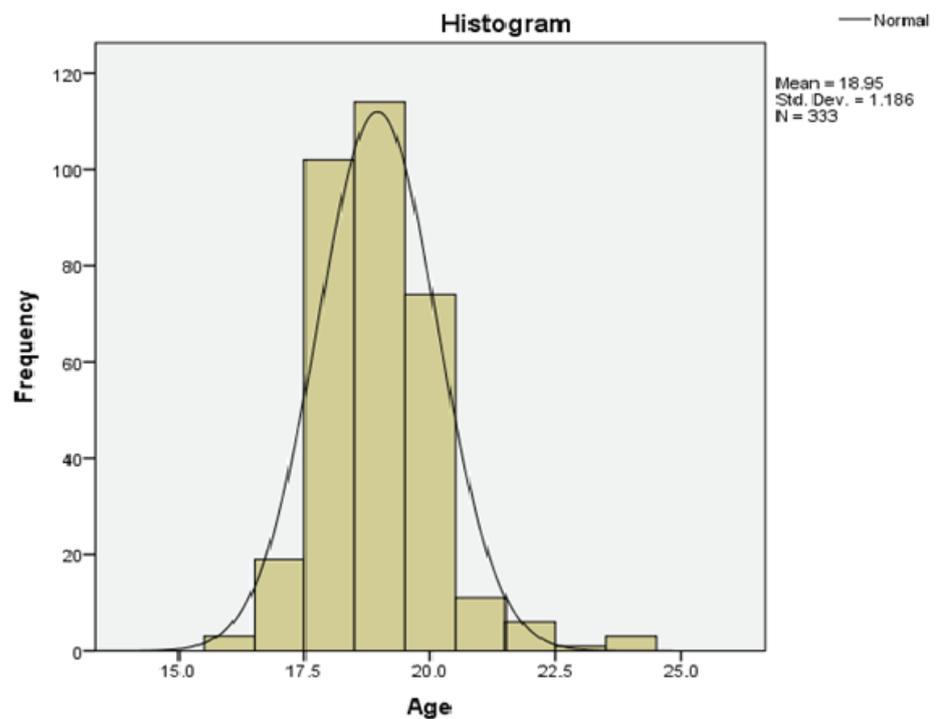
4. Discussion

In this study, while determining students' study methodology, it was found that the English language was the most preferred instructional language which contradicts Kamil *et al.*'s study [7] conducted in Sudan that suggested that bilingual instruction attracts students attention. This contrast may be justified by the fact that most students in the current study had studied in English medium throughout their higher secondary school education.

Concerning the tutorials, a majority of participants agreed that they need improvement in many ways. This contradicts Kamil *et al.*'s [7] study in which most students agreed that tutorials were useful. This difference could be explained by the fact that the

TABLE 1: The demographic characteristics of the study participants.

Demographics	(n = 336)		
	n	Frequency	Percentage
Gender	333		
	(3 missing)		
Male		60	18
Female		273	82
Location	336		
UMST		146	43.5
OIU		190	56.5
Academic year	332		
	(4 missing)		
Year 2		183	55.1
Year 3		149	44.9

Figure 1: The age distribution of the study participants (n = 333).

tutorial sessions in the studied universities were not very interactive. Somehow tutorials turned into a lecture on the same topic that was explained in the original lecture, and students therefore lost interest and felt as though it was a repetition of the same topic.

In addition, this study showed that students were pleased with seminars while in the study of Khane and Joshi [6], it was least preferred. Perhaps, environment or ethnic background play a role in this distinction, and further research is needed in this area.
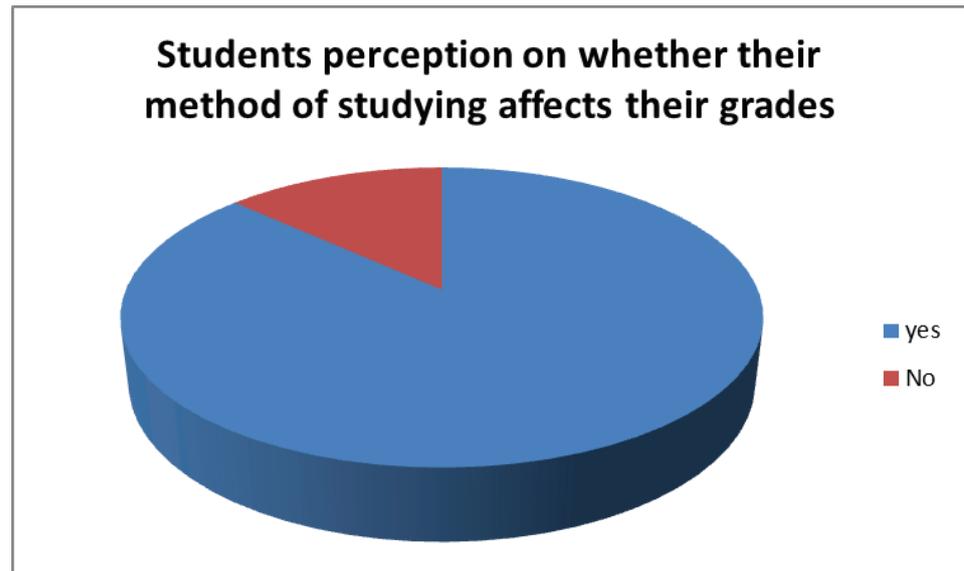
Figure 2: Students' perception on whether their method of study affects their grades.

Students can use a variety of modes for learning; however, one mode can be dominant and preferred or there can be equal preference for one or more modes. The majority of university lecturers assume that the reason behind students' educational poor performance is the lack of hard work and study; however, this poor performance could occur due to a discrepancy between students' learning styles and instructors' instructing method. In view of this, one of the important factors for applicable education is to look at students' learning styles at the start of every academic year and apply pertinent instructing technique accordingly [11]. In light of this, while comparing a public (OIU) university with a private one (UMST), the preferred learning modality for OIU students was found to be aural which is not the same as preferred learning method (kinesthetic) found in a public University by Jmanai *et al.* [14]. With regards to UMST, the results were also not in line with that of Joshi *et al.* In their study, which was done in a private university, it was found that the preferred learning style was multimodal [15], which contradicts the results obtained in this study, in which the dominant style was unimodal (Read/Write). However, Shahrakipour *et al.*'s study [11] showed the same results. Interestingly, learning styles show variations among different schools, and educators need to assess their students' learning styles in teaching and learning and in discussing examination results.

Nowadays, students have access to various study resources [16]. In the present study, students, depending on whether they were from a government or a private school, described different study resources. Extra-courses and peers were the most used resources in the OIU, which may reflect the effect of increase emigration of expert

TABLE 2: Students' reflections on study methodology and some instructional methods.

The best method to study (n = 335) (1 missing)	Frequency	Percentage	
By understanding	40	11.9	
By memorization	9	2.7	
Both	286	85.4	
Number of times they revise what they have studied (n = 334) (2 missing)			
Once	103	30.8	
Twice	143	42.8	
Three	49	14.7	
Others	39	11.7	
Preferred instructional language (n = 334) (2 missing)			/
English	194	58.1	
Arabic	7	2.1	
Both	133	39.8	
Problem-based learning/Case-based learning in the curriculum (n = 327) (9 missing)			
Satisfactory	122	37.3	
Should be increased	175	53.5	
Should be decreased	30	9.2	
Tutorials in the curriculum (n = 334) (2 missing)			
Satisfactory	118	35.3	
Need improvements	216	64.7	
Interactive sessions between students and teachers	66		
Include assignment and past exams	43		
Omit tutorials	30		
Outline about the topic prior to tutorial	27		
Increase tutorials	33		
Taken seriously by students	17		
Seminars in the curriculum (n = 331) (5 missing)			
Yes	259	78.2	
No	72	21.8	

academic staff in Sudanese public schools [17]. At UMST, students relied mainly on teachers' slides and videos indicating the different study resources seen in medical schools. In line with the results of UMST students, a survey-based study done in Australia showed dependence on traditional resources such as lecture notes and textbooks in addition to e-learning resources such as videos [18]. Medical school administrators, teachers, and students should keep in mind the increasing use of e-learning resources [19].

TABLE 3: Students' perception on whether their method of study affects their grades.

			Students' perception on whether their method of studying affects their grades		Total
			Yes	No	
Overall grades in last exam	Excellent 11.3%	Count	35	3	38
		% within over all grades in last exam	92.1%	7.9%	100.0%
	Good 41.2%	Count	120	18	138
		% within over all grades in last exam	87.0%	13.0%	100.0%
	Pass 36.4%	Count	104	15	119
		% within over all grades in last exam	87.4%	12.6%	100.0%
	Fail 10.1%	Count	26	8	34
		% within over all grades in last exam	76.5%	23.5%	100.0%
	Very Good 0.9%	Count	3	0	3
		% within over all grades in last exam	100.0%	0.0%	100.0%
Total		Count	288	44	332
		% within over all grades in last exam	86.7%	13.3%	100.0%

P-value = 0.333.

4.1. Strengths and Limitations

The strength of this study is that in contrast to most previous studies, we compared the learning styles and study methodologies between the students of public and private medical universities.

The limitation of this study is that it did not include males from the OIU. The faculty of medicine is divided into two sections, males and females, respectively. The permission was sought from female section only.

5. Conclusion

The most preferred learning style for a public university was found to be aural while for a private university it was read/write. This factor must be taken into consideration

TABLE 4: VARK results among students of OIU and UMST.

			Location		Total
			UMST	OIU	
VARK results	VARK	Count	28	41	69
		% within VARK results	40.6%	59.4%	100.0%
	VAK	Count	8	11	19
		% within VARK results	42.1%	57.9%	100.0%
	VAR	Count	2	2	4
		% within VARK results	50.0%	50.0%	100.0%
	VRK	Count	4	4	8
		% within VARK results	50.0%	50.0%	100.0%
	ARK	Count	4	3	7
		% within VARK results	57.1%	42.9%	100.0%
	VK	Count	6	5	11
		% within VARK results	54.5%	45.5%	100.0%
	AR	Count	3	8	11
		% within VARK results	27.3%	72.7%	100.0%
	RK	Count	2	2	4
		% within VARK results	50.0%	50.0%	100.0%
	AK	Count	5	13	18
		% within VARK results	27.8%	72.2%	100.0%
	VR	Count	2	3	5
		% within VARK results	40.0%	60.0%	100.0%
	VA	Count	1	5	6
		% within VARK results	16.7%	83.3%	100.0%
	A	Count	28	42	70
		% within VARK results	40.0%	60.0%	100.0%
	K	Count	32	31	63
		% within VARK results	50.8%	49.2%	100.0%
	R	Count	11	8	19
		% within VARK results	57.9%	42.1%	100.0%
	V	Count	10	12	22
		% within VARK results	45.5%	54.5%	100.0%
Total		Count	146	190	336
		% within VARK results	43.5%	56.5%	100.0%

while teaching sessions are being conducted. With regards to study resources, public-university students relied on courses whereas the private-university students preferred teachers' slides. Interestingly, there was no association between the method of study and students' grade.

TABLE 5: Comparison between study methodologies of UMST and OIU students.

| | | | Location | | Total |
			UMST	OIU	
Study resource	Teachers slides	Count	92	106	198
		% within Study resource	46.5%	53.5%	
	References	Count	87	132	219
		% within Study resource	39.7%	60.3%	
	Videos	Count	108	133	241
		% within Study resource	44.8%	55.2%	
	Courses	Count	10	44	54
		% within Study resource	18.5%	81.5%	
	Peers	Count	26	51	77
		% within Study resource	33.8%	66.2%	
Total		Count	323	466	789

Acknowledgments

Ethical Considerations

The study protocol was approved by the research technical and ethical committee at the Faculty of Medicine, UMST. It was also sought from the administration of Faculty of Medicine, OIU. In addition, the participants were assured confidentiality and given the option to participate in the study. Students' privacy and confidentiality were maintained.

Competing Interests

None.

Availability of Data and Materials

All data and materials associated with this study are available through the corresponding author upon reasonable request.

Funding

None.

References

[1] ABA English. (2019). What is the difference between learn and study? [Web log post]. Retrieved from: https://blog.abaenglish.com/what-is-the-difference-between-learn-and-study

[2] Salah, A. T., Alameen, M. G., ElSheikh, N., et al. (2015). Type of high secondary school (governmental vs. private) and type of high secondary school certificate (Sudanese vs. Arabian): Do they affect learning style? *Sudan Journal of Medical Sciences*, vol. 10, no. 3.

[3]] Evans, D and Brown, J. (2009). *How to succeed at medical school* (2nd ed.). Wiley-Blackwell.

[4] Almigbal, T. H. (2015). Relationship between the learning style preferences of medical students and academic achievement. *Saudi Medical Journal*, vol. 36, no. 3, p. 349.

[5] VARK. (n.d.). The VARK questionnaire. Retrieved from: http://vark-learn.com/the-vark-questionnaire/

[6] Khane, R. S. and Joshi, A. A. (2014). A questionnaire based survey from first year MBBS students about teaching learning methods of physiology in private medical college. *Medical Science*, vol. 3, no. 2.

[7] Kamil, A. I. and Kheder, S. I. (2015). Methods of instruction in the National University: Preferences, opinions, and students' perception (2014–2015). *Sudan Medical Monitor*, vol. 10, no. 4, p. 117.

[8] Keefe, J. W. (Ed.). (1987). Learning style: Theory and practice. Reston, USA: National Association of Secondary School Principals.

[9] Liew, S. C., Sidhu, J., and Barua, A. (2015). The relationship between learning preferences (styles and approaches) and learning outcomes among pre-clinical undergraduate medical students. *BMC Medical Education*, vol. 15, no. 1, p. 44.

[10] Ojen, N., Sobers-Grannumna, N., Gauru, U., et al. (2017). Learning style preferences: A study of Pre-clinical Medical Students in Barbados. *Journal of Advances in Medical Education & Professionalism*, vol. 5, no. 4, p. 185.

[11] Shahrakipour, M., Arbabisarjou, A., Zare, S., et al. (2017). Learning styles in students of medical sciences. *Global Journal of Health Science*, vol. 9, no. 2, pp. 192–200.

[12] Rahman, S. M., Alam, T., Alam, N. N., et al. (2017). Medical undergraduates preference in learning style: A single-institute experience from Bangladesh. *Kuwait Medical Journal*, vol. 49, no. 1, pp. 12–16.

[13] Soundariya, K., Deepika, V., and Kalaiselvan, G. (2017). A study on the learning styles and learning approaches among medical students. *National Journal of Physiology, Pharmacy and Pharmacology*, vol. 7, no. 10, p. 1020.

[14] Jamani, N. A., AbdAziz, K. H., Ab Karim, H. S., et al. (2018). Learning style preferences among pre-clinical medical students in a public university in Pahang. *Age*, vol. 21, pp. 0–84.

[15] Joshi, A., Prabhakaran, A., Ganjiwale, J., et al. (2018). Identification of learning styles in 1st year undergraduate MBBS students of a private medical school in western India. *National Journal of Physiology, Pharmacy and Pharmacology*, vol. 8, no. 1, pp. 102–6.

[16] Baudains, C., Metters, E., Easton, G., et al. (2013). What educational resources are medical students using for personal study during primary care attachments? *Education for Primary Care*. , vol. 24, no. 5, pp. 340–345.

[17] Abdall, S. Z. (2016). Quality assurance in Sudanese higher education: Current status and challenges ahead. *Journal of Total Quality Management*, vol. 17, no. 1, pp. 1–18.

[18] Wynter, L., Burgess, A., Kalman, E., et al. (2019). Medical students: What educational resources are they using? *BMC Medical Education*, vol. 19, no. 1, p. 36.

[19] Romanov, K. and Aarnio, M. (2006). A survey of the use of electronic scientific information resources among medical and dental students. *BMC Medical Education*, vol. 6, no. 1, p. 28.