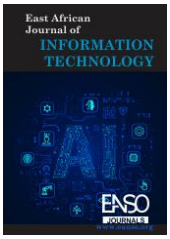

East African Journal of Information Technology
eajit.eanso.org
Volume 6, Issue 1, 2023
Print ISSN: 2707-5346 | Online ISSN: 2707-5354
Title DOI: https://doi.org/10.37284/2707-5354

EAST AFRICAN NATURE & SCIENCE ORGANIZATION

Original Article

Assessing Medical Students' Learning Style Preferences at Kabale University Medical School, Uganda

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Article DOI: https://doi.org/10.37284/eajit.6.1.1177

Date Published: *17 April 2023*

Keywords:

Medical Education, Students' Learning Styles, VARK Techniques, Competence-Based Medical Education, Knowledge-Based Education

ABSTRACT

This article is based on an empirical study conducted to assess and establish the preferred learning styles of medical students in the Kabale University Medical School. The study was prompted by a paradigm shift in teaching-learning strategies from the conventional knowledge-based medical curriculum to competency-based medical education (CMBE). In line with the learners' diversity and inclusion, CBME liberalises the learning environment by providing a variety of learning methods. Hence, the aim of this study was to ascertain the preferences of medical students' learning styles in relation to the competency-based learning approaches. Procedurally, the study employed online survey methods, and the respondents included 160 medical (MBChB) students, all from Kabale University School of Medicine. The data collected were captured on SPSS version 26 and subjected to t-test analysis. Besides, Visual, Aural, Read-Write, and Kinaesthetic (VARK) learning inventory was used to determine the students' learning preferences, while a t-test was used to establish the relationships between the demographic profiles and the learning styles. Notably, the Aural learning style produced the highest mean score of 7.21 ± 3.61, followed by Kinaesthetic (6.43 ± 3.22), Read-Write (6.12 ± 2.23) and Visual (4.04 ± 2.42). Relatively, t-test results showed significant ($p < 0.05$) differences in learning styles between pre-clinical and clinical students. However, the t-test results for gender factors for all the learning dimensions were insignificant ($p > 0.05$). Pre-clinical students prefer visual and read-write learning styles, while clinical students prefer kinaesthetic and visual learning styles. Based on the findings, this study believes that identifying the learners' preferred learning styles will help educators choose the most effective teaching methods.

Article DOI: https://doi.org/10.37284/eajit.6.1.1177

APA CITATION

Muhaise, H., Mbabazi, P. B., Ssemaluulu, P. & Kyomugishae, P. (2023). Assessing Medical Students' Learning Style Preferences at Kabale University Medical School, Uganda. *East African Journal of Information Technology*, *6*(1), 34-44. https://doi.org/10.37284/eajit.6.1.1177

CHICAGO CITATION

Muhaise, Hussein, Phelix Businge Mbabazi, Paul Ssemaluulu and Patricia Kyomugisha. 2023. "Assessing Medical Students' Learning Style Preferences at Kabale University Medical School, Uganda". *East African Journal of Information Technology* 6 (1), 34-44. https://doi.org/10.37284/eajit.6.1.1177.

HARVARD CITATION

Muhaise, H., Mbabazi, P. B., Ssemaluulu, P. & Kyomugishae, P. (2023) "Assessing Medical Students' Learning Style Preferences at Kabale University Medical School, Uganda", *East African Journal of Information Technology*, 6(1), pp. 34-44. doi: 10.37284/eajit.6.1.1177.

IEEE CITATION

H. Muhaise, P. B. Mbabazi, P. Ssemaluulu & P. Kyomugishae "Assessing Medical Students' Learning Style Preferences at Kabale University Medical School, Uganda", *EAJIT*, vol. 6, no. 1, pp. 34-44, Apr. 2023.

MLA CITATION

Muhaise, Hussein, Phelix Businge Mbabazi, Paul Ssemaluulu & Patricia Kyomugisha. "Assessing Medical Students' Learning Style Preferences at Kabale University Medical School, Uganda". *East African Journal of Education Studies*, Vol. 6, no. 1, Apr. 2023, pp. 34-44, doi:10.37284/eajit.6.1.1177.

INTRODUCTION

Globally, medical curricula are being streamlined to conform to a multipronged approach to content delivery, bridging the gaps between traditional (didactic) education and the new pedagogy [1]. Traditionally, knowledge in medical education was prioritised over competence and attitude in teaching-learning and assessment. However, a paradigm shift in the way medical education is being delivered would result from the widespread adoption of competency-based medical education (CBME) [1]. Whereas knowledge-based education focuses on knowledge production and comprehension, CBME promises increased responsibility, flexibility, and learner-centeredness. In a traditional lecture approach, the learning process is restricted to predefined schedules, modes, and contents, characterised by irregularities in students' attendance with reduced motivations especially in a crowded classroom environment [2]. The teachers are the main source of instructions, and the students are mostly passive listeners and followers of instructions. Thus, it is a teacher-centred method of learning and is content-oriented. Relatively, CBME involves coming up with strategies that focus on how specific students learn and acquire skills in different ways. Students are enhanced with a range of learning experiences including problem-based and student-centred learning methods. Schools foster a sense of belonging, embrace a growth mindset, and emphasise the importance of relationships for meaningful and relevant learning experiences. The overall goal of CBME is to improve learners' problem-solving abilities and acquisition of knowledge and skills [1]. Hence, universities ought to review their pedagogical practices to stay abreast with advancements in teaching methodology and technology and to ensure that they are giving their students the best possible direction and support as the learning environment evolves [3].

In a standard medicine programme, the curriculum of bachelor's degrees in medicine and surgery is often divided into pre-clinical and clinical phases [4]. The pre-clinical phase lasts for two to three years before students begin their three-year clinical phase. In pre-clinical courses, students learn the scientific theory up front and then apply it later on in the clinical courses [4]. The goal of the pre-clinical years is for students to be familiar with and comprehend the fundamental concepts and procedures of the biomedical sciences [4, 5]. Most

Article DOI: https://doi.org/10.37284/eajit.6.1.1177

significantly, students will have started to acquire abilities in oral and written communication, learning through curiosity, as well as skills in patient care and listening. Thus, the knowledge and abilities developed throughout the pre-clinical years would serve as a prerequisite for the clinical years. Students would then acquire the knowledge, skills, and attitudes necessary for successful clinical practice during their clinical years while continuing to value inquiry and critical thinking. However, there may still be some lectures and tutorials, which will serve to supplement clinical learning [5], [6]. Traditionally, the methods used in the delivery of medical curricula rely primarily on didactic approaches, such as classroom lectures for the pre-clinical period and clerkship methods for the clinical phase [6]. However, due to the limited nature of the didactic learning approaches, such as limited clinical exposure during the pre-clinical years, students experience difficulties applying clinical skills when they get promoted to the clinical phase [7]. As such, students can become quite stressed while transitioning from the pre-clinical to the clinical phase [7]. Therefore, CBME helps to bridge the gap by introducing teaching-learning methods that emphasise the early introduction of clinical skills training. Among the teaching-learning approaches emphasised, problem-based learning (PBL), community-based learning (CBL), self-directed learning, and simulation learning are largely encouraged [8]. In line with this, ICT offers capabilities to enhance the efficacy requirements related to CBME [9, 10].

CBME in Uganda

In 2011, five medical schools in Uganda joined forces to form MESAU – Medical Education for Equitable Services for All Ugandans, to address competency gaps in medical graduates [11]. The consortium members included Makerere University (Mak), Gulu University, Mbarara University of Science and Technology (MUST), Busitema University, and Kampala International University (KIU). Their primary goal was to review the medical curriculum in line with the CBME framework [11, 12]. The main objective of the CBME framework is to ensure that learners attain the desired patient-centred outcomes during their training [12], [13]. To achieve the intended competencies, the training thereby emphasises learner-centeredness and lifetime learning experiences that include feedback between the teachers and the students, as opposed to knowledge-based education, which emphasises knowledge creation and comprehension [13]. Following MESAU's assessment, the key competency gaps were then identified, including professionalism and ethical practice, ICT and communication skills, leadership and management skills, and abilities to engage communities to avoid diseases [11]. Afterwards, undergraduate medical curriculums were reviewed to address the competency gaps identified, and appropriate teaching-learning strategies including ICT methods, were identified to help students acquire and develop the necessary competencies.

Besides the traditional classroom lecture methods, problem-based learning (PBL), community-based learning (CBL), group discussion (GD), self-directed learning (SDL), and simulated learning (SL) were some of the approaches introduced in the CBME curriculum [11]. By 2018, all MESAU's consortium members had finalised their curriculum review process and the respective medical schools had embarked on training students using the revised curriculum. However, the effectiveness of the teaching-learning strategies with respect to the preference of the student's learning style had not been emphasised in the curricula review process [11]. Hence, this study was focused on bringing out the significance of addressing the gap by assessing and establishing the preferred learning styles of medical students in the Kabale University School of Medicine.

In line with CBME, Kabale University School of Medicine strives to create medical professionals whose specialised practice would promote the

Article DOI: https://doi.org/10.37284/eajit.6.1.1177

health of the population of an individual, family, and community in accordance with competency-based curricula [11], [14]. In this case, medical professionals would possess a specific set of competencies as suggested by the curriculum in order to accomplish this goal. So, the competencies consist of a suitable combination of knowledge, abilities, and attitudes that are combined to provide the effective performance of medical graduates. Because of this, Kabale University School of Medicine implements community-based programs that are, to the greatest extent possible, community-based. In order to guarantee that the graduates become lifelong and self-directed learners, it also employs implementation modalities that are competency-based and unique in that they promote active learning [14], [15]. By placing a focus on primary health care, emphasis is placed on illness prevention and the promotion of good health in addition to the therapeutic parts of the delivery of healthcare services [11], [15].

Likewise, research is also an integral part of the faculty programmes. Subsequently, various courses in the programme are implemented using a multifaceted approach in which strategies such as ICT that encourage active learning are emphasised [9], [10]. The key teaching-learning methods used include; small group tutorials, overview lecturers to provide guidance in scope and depth, large group discussions between students and discipline experts, seminars where the area to be discussed cuts across disciplines, laboratory practical, clinical demonstrations to emphasise the holistic approach, clinical clerkships aimed at integrating the art and science of medical practice, and fieldwork particularly important for Community Based Education, Research, Management, and Services (COBERMS) [11]. However, during the implementation of a given course, some or all of these strategies may be used in a way that will ensure that they complement one another to enhance the students' learning. Nevertheless, for effective learning outcomes, learning strategies should match with the preferences of the students' learning styles and learning methods [16].

From related literature, various studies have reiterated the disparities in students' level of motivation and comprehension with respect to the different learning styles [17], [18]. According to Kharb et al. [18], unmatched teaching-learning methodologies and learning styles can adversely affect learning and cause dissatisfaction and failure on the part of students. While some students prefer a combination of multiple learning methods, students with visual learning preferences may take in and give information completely and often make diagrams to comprehend concepts. Students with aural learning preference would prefer to listen while learning. Students with read-write learning styles would prefer print materials to comprehend learning material, and those with kinaesthetic learning would prefer the hands-on approach, including real-life examples and application of new materials in the learning process [17], [18], [19]. According to Atteaya et al. [20], exploring the preferred way of learning by the students is an important activity for the educational system to provide activities necessary to identify the learning styles of medical students. It is therefore imperative on the part of instructors to have awareness and understanding of students' learning style preferences to facilitate the design of the learning process effectively [21]. Thus, the ability to facilitate all the students with different learning preferences allows educators to help in enhancing students' comprehension and performance [20], [22]. Hence, this study is focused on the significance of addressing the diversity of styles of learning among medical students in the Kabale University School of Medicine and provides important guidance necessary to plan the teaching strategies accordingly. Thus, the study was intended to achieve the following specific objectives:

- To examine the teaching-learning methods used in training MBChB students in Kabale University School of Medicine.

Article DOI: https://doi.org/10.37284/eajit.6.1.1177

- To investigate the preferred learning styles of MBChB students in the Kabale University School of Medicine.
- To establish the relationships between demographic profiles and the learning styles of MBChB students in Kabale University School of Medicine.

RESEARCH METHODS

This study used an online survey technique, following a cross-sectional design method. The respondents included 160 (male 94, female 66) MBChB students categorised into two groups; pre-clinical years consisting of years 1, 2, and 3, and clinical years consisting of years 4, 5 and 6. The demographic status and learning style perspective components of the questionnaire were developed and separated into two sections. The first section consists of 5 questions capturing the demographic characteristics of the respondents, which include age, gender, and academic years. The second section was based on the VARK (Visual, Aural, Read-Write, and Kinaesthetic) inventory questionnaire consisting of 16 multiple-choice questions about students' preferred learning techniques [23].

VARK Technique

The VARK inventory's scope is described as follows: students that prefer visual learning employ body language, mimics, diagrams, maps, graphics, photographs, and tables to comprehend course material. Music and other aural stimulants are important to students who prefer aural learning. For learners who choose this approach, speaking, discussing, listening, narrating, tone of voice, and speaking pace are crucial. Students who use the read-write method read or write from published materials to obtain information, and the learning process for kinaesthetic learners involves movement, touching, and doing [23]. Altogether, there are a total of 16 questions in the VARK inventory [23]. Each question in the inventory has a distinct scenario constructed for it, and the respondent is asked what they would do in that circumstance. The person who prefers several options may select more than one. Total grades are obtained in these four dimensions for the responses to the inventory questions based on their visual, aural, read-write, and kinaesthetic qualities. A higher grade in a dimension denotes a greater degree of preference for the relevant learning style. An individual may be oriented to a multidimensional learning style, as evidenced by the fact that a student responding to the questionnaire may choose more than one learning style.

Data Analysis

The statistical packages for social science (SPSS) version 26 software, along with the Microsoft Excel applications, were used to analyse the data. The advantage of SPSS is its capability to be adaptable easily and successfully incorporating datasets received from other sources. Specifically, data was collected through Google Forms and exported to the SPSS environment after being converted to MS Excel format [24]. The study used both univariate and bivariate statistical tools. Including frequency counts, percentage distributions, and measures of central tendency like mean, median, and mode. While the graphical visual representations accessible for bivariate statistical analysis were tables, frequency distributions, and charts. The t-tests were used to analyse the relationships between the demographic variables to ascertain their nature and degree of strength with the learning style variables.

RESULTS PRESENTATION

The datasets were analysed and presented in line with the specific objectives stated in the introduction. To summarise and explain the results, the researcher employed narrative and simple graphical representations such as charts and tables. The key activities include examining teaching-learning methods, capturing demographic profiles

Article DOI: https://doi.org/10.37284/eajit.6.1.1177

of respondents, calculating VARK's dimensional data, and establishing the relationships between demographic profiles and VARK's Dimension datasets. The degree of the correlations between the variables was examined using a t-test. The key outputs from each segment are succinctly stated, together with the findings from the analysis for that area. Therefore, section 3 stipulates a comprehensive analysis and explanation of the results.

Demographic Profiles

The study's primary participants were 160 (male n = 94, female n = 66) (MBChB) medical students. *Table 1* aggregates and displays the demographic profiles of the respondents in order to illustrate how representative the respondents' members are within the category divisions. Hence, indicating the frequency counts and the corresponding percentage distributions.

Table 1: Demographic Profiles

KABSOM		Pre-Clinical Years (Biomedical Science)				Pathology And Clinical Years			
		Year 2		Year 3		Year 4		Year 5	
		n	%	n	%	n	%	n	%
Respondents		50	100	40	100	40	100	30	100
Gender	Male	26	52	25	63	26	65	17	57
	Female	24	48	15	37	14	35	13	43
Age-group	18 – 25	35	70	30	75	27	68	22	73
	26 – 35	08	16	05	13	10	25	04	13
	36 – 45	05	10	04	10	03	07	02	07
	46 and above	02	04	01	02	00	00	02	07
Nationality	Ugandan	42	84	38	95	36	90	29	97
	International	08	16	02	05	04	10	01	03

According to *Table 2* above, the demographic datasets show slightly skewed trends in frequency counts and the corresponding percentage distributions within the category divides; Gender (Male: n = 94 59%, female: n = 66 41%). The higher representation within the age group includes: (18 – 25 years: n = 115 72%). Notably, the mean age of respondents was 22.06 ± 1.73 years; nationality: (Ugandan: n = 144 90%). Altogether, the skewness in the dataset points out the study limitation [25]. Table 2 displays the average VARK scores for each of the four dimensions.

Table 2: Mean scores of individual VARK dimension

VARK Dimensions	Mean Scores (MS)	Standard Deviation (SD)	MS and SD
Visual (V)	4.04	2.42	4.04 ± 2.42
Aural (A)	7.21	3.61	7.21 ± 3.61
Read-Write (R)	6.12	2.23	6.12 ± 2.23
Kinaesthetic (K)	6.43	3.22	6.43 ± 3.22

Notably, from *Table 2* above, the aural learning styles had the greatest mean score of 7.21 ± 3.61, and visual learning had the lowest mean score of 4.04 ± 2.42. The rest of the dimensions fall in between. However, the standard deviation (SD) is slightly higher in aural and kinaesthetic dimensions, meaning the datasets are more spread, which also points to the limitation of the study [25].

Article DOI: https://doi.org/10.37284/eajit.6.1.1177

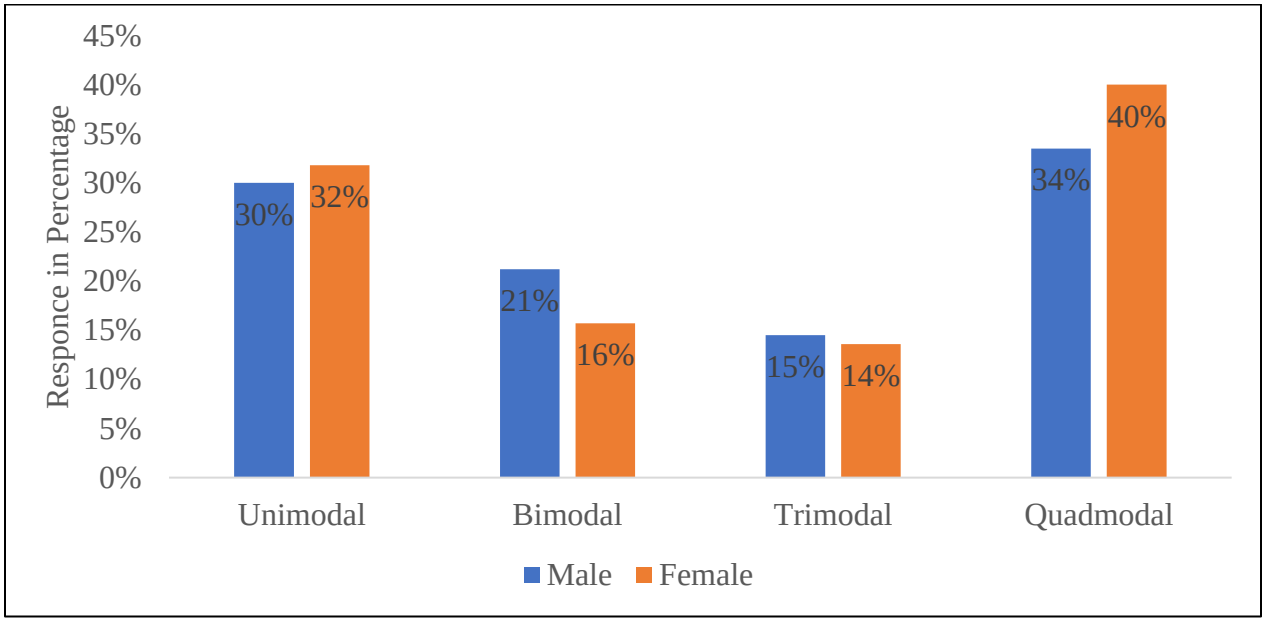
Table 3: Mean Scores (MS) of individual VARK components based on gender.

VARK Components	MS and SD	
	Male	Female
Visual (V)	4.82 ± 2.02	3.26 ± 2.80
Aural (A)	7.32 ± 4.34	7.10 ± 2.88
Read-Write (R)	6.14 ± 2.18	6.10 ± 2.28
Kinaesthetic (K)	6.64 ± 3.00	6.21 ± 3.44

According to independent t-teats results ($p > 0.05$), there is no significant difference in mean scores between the male and female datasets.

Medical students' gender-based VARK mode distributions, with n = 94 59% for males and n = 66 41% for females, adding to n = 160 100% total.

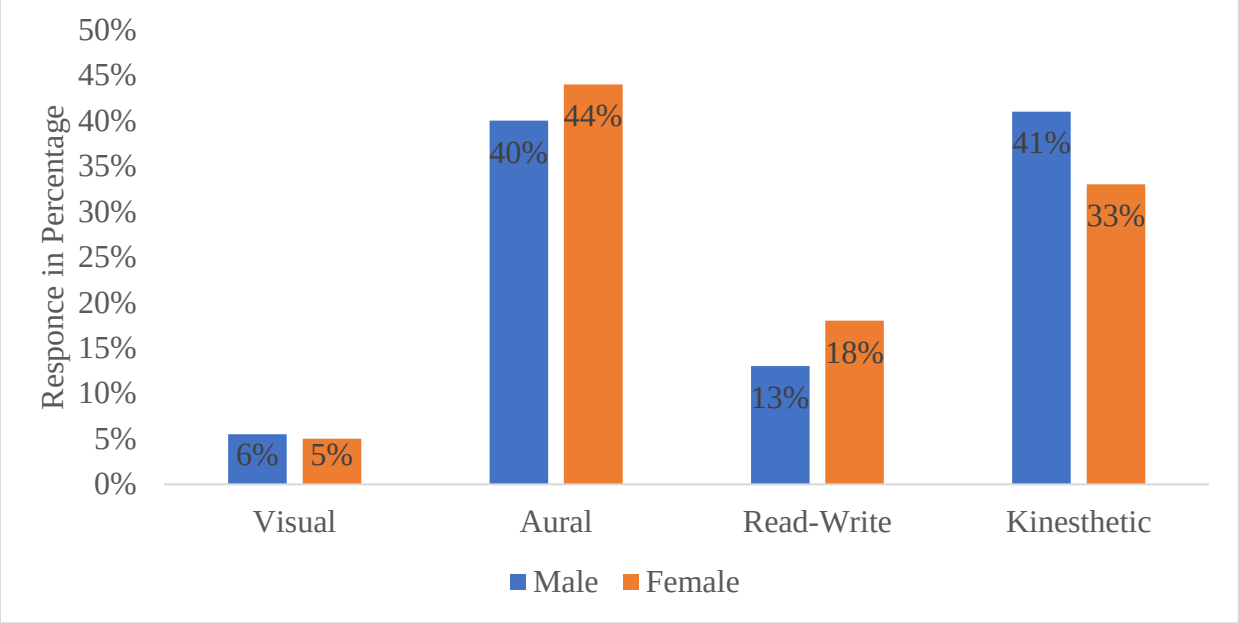
Figure 1: Medical students' gender-based VARK mode distribution



According to *Figure 1* above, the distribution of VARK modes by gender among 160 medical students indicates uniformity trend in percentage distribution between males and females. Notably, the majority of the students (70%) prefer multimodal (bimodal, trimodal, and qurdmodal) learning styles. Relatively, t-test results showed insignificant ($p > 0.05$) differences in learning mode between male and female datasets.

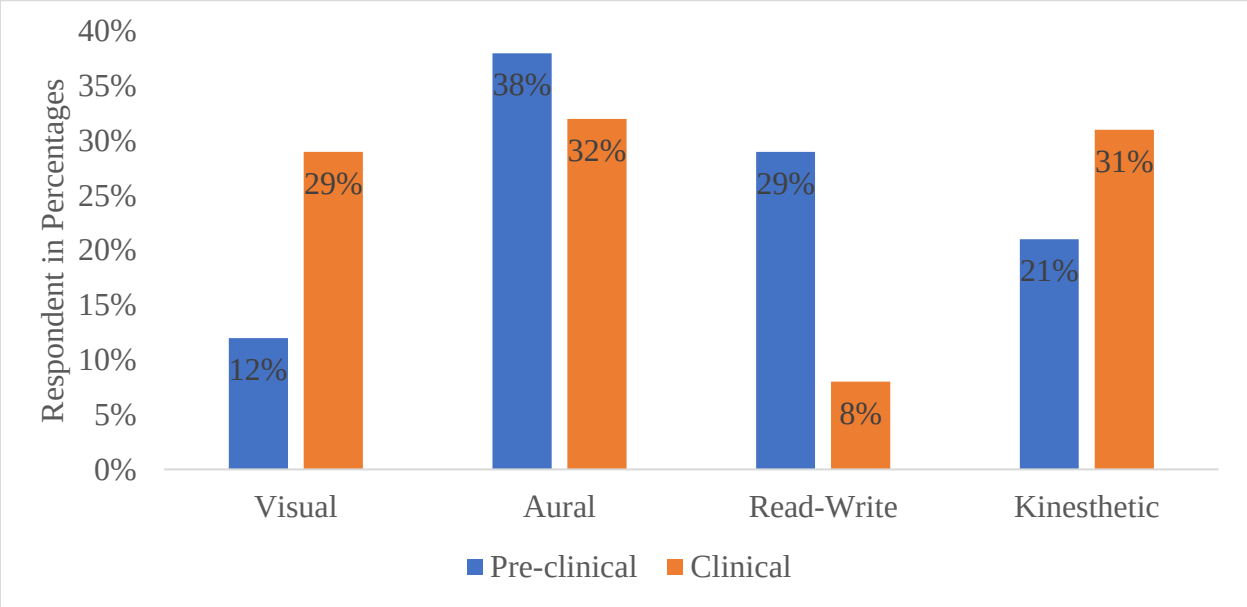
Article DOI: https://doi.org/10.37284/eajit.6.1.1177

Figure 2: Gender-based modality preferences among students with a unimodal learning style



According to *Figure 2* above, the distribution of VARK modes by gender among medical students with unimodal learning styles indicates uniformity trend in percentage distribution between male and female students. Relatively, t-test results showed insignificant ($p > 0.05$) differences in unimodal learning mode between male and female datasets.

Figure 3: Programme-based modality preferences among students with a unimodal learning style



According to *Figure 3* above, the distribution of VARK modes by gender among medical students with unimodal learning styles indicates inconsistency trend in percentage distribution between pre-clinical and clinical students. Relatively, t-test results showed significant ($p < 0.05$) differences in unimodal learning mode between pre-clinical and clinical datasets.

Article DOI: https://doi.org/10.37284/eajit.6.1.1177

Relatively, both pre-clinical and clinical students prefer aural learning styles in equal measure. However, pre-clinical students prefer visual and read-write learning styles more than clinical students. Clinical students prefer kinaesthetic and visual learning styles more than pre-clinical.

DISCUSSION

The purpose of this study was to assess the preferred learning styles of medical students in the Kabale University School of Medicine. The study was prompted by a paradigm shift in teaching-learning strategies from the conventional knowledge-based medical curriculum to competency-based medical education (CMBE). According to the statistics, over 70 % of medical (MBChB) students prefer a multimodal learning style. This finding reinforces the position of the faculty, whereby various courses in the programme are implemented using a multifaceted approach in which strategies such as ICT that encourage active learning are emphasised [9, 10]. Whereas both pre-clinical and clinical students preferred auditory learning, pre-clinical students preferred visual and read-write learning styles, while clinical students preferred kinaesthetic and visual learning styles. The gender mean scale, however, did not reveal any notable variations. According to other related studies, students favour the aural and read-write learning modes [26]. A different survey indicates that students in the faculty of health sciences prefer the kinaesthetic learning approach. Nevertheless, the results of this study are therefore fairly comparable to those of earlier studies [27, 28, 29].

On the other hand, several research have shown that students in the pre-clinical period primarily favour the kinaesthetic learning style [29, 28, 30]. According to the results of another study, students studying physical therapy and nursing likewise favour kinaesthetic learning methods [16]. This study discovered that medical (MBChB) students in the Kabale University School of Medicine often prefer an aural learning style. According to our analysis, the difference in learning styles between pre-clinical and clinical students could be due to the pre-clinical courses' emphasis on theory rather than practical application. With respect to study limitation, the discrepancy between the number of males (n = 94) and female (n = 66) students in the study sample is the study's limitation, and a balanced number of male and female could alter the results of this study. The fact that only MBChB students were included in our analysis and that we treated them as two groups without taking into account the distinctions across specialities is another drawback. Overall, our study's findings indicate that students who belong to Kabale University School of Medicine generally favour the aural and kinaesthetic learning styles.

CONCLUSIONS

The study identified that the majority of medical students at Kabale University School of Medicine, 70 % preferred a multimodal learning style including Auditory, Visual, reading and Writing and kinaesthetic modes. The findings focus on faculty members establishing teaching methods that cater to this learning style as they develop the course materials. Education professionals and their stakeholders could be guided in choosing the best teaching method by learning which style students prefer most

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