

ORIGINAL ARTICLE

Assessment of Undergraduate Pharmacy Student Learning Styles Using the VARK Questionnaire

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ABSTRACT

Introduction: Many students struggle to recognise their own learning styles, which leads to poor academic achievement. Thus, this study aimed to determine the preferred learning styles of undergraduate pharmacy students at the Faculty of Pharmacy, Universiti Teknologi MARA (UiTM) Selangor Puncak Alam Campus. The correlation between the preferred learning style of pharmacy students and their gender, year of study, and academic performance was also investigated in this study. **Methods:** Respondents (N = 258) were recruited using simple random sampling from four cohort of pharmacy students. The learning style was evaluated by using a validated Visual, Aural, Reading/writing, and Kinesthetic (VARK) Questionnaire. **Results:** In this study, unimodal learning style was preferred by 65.1% of the respondents, with the remaining 34.9% having multimodal style preference. Kinesthetic (K) was the most preferred learning style (37.6%) while Reading/writing (R) was the least preferred method of learning (33.7%). The Chi-square test of independence revealed that there was a significant correlation between gender and the preferred learning style ($p = 0.002$). However, no correlation was observed in the preferred modality according to the year of study ($p = 0.877$) and academic performance ($p = 0.989$). **Conclusion:** In conclusion, the majority of our pharmacy students were unimodal learners, with the kinesthetic learning style being the most common and reading/writing being the least preferred. Our pharmacy students have also been discovered to be multimodal learners, which may be an important consideration for educators utilising a mixed teaching technique to support various learning styles.

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INTRODUCTION

Over the last two decades, a pharmacist's job description has undergone significant modification. Pharmacy professionals are now seen as more than just drug suppliers. Instead, they are required to provide a wide range of patient-centered primary care services, such as managing medications and lifestyles, giving guidance and counselling, and conducting illness screenings. (1). Their expected area of expertise has thus considerably expanded beyond just dispensing. In order to produce pharmacy graduates with both critical-thinking and problem-solving skills in addition to pharmacological knowledge, the educational content of pharmacy courses is increasingly geared towards this goal (2). A typical undergraduate degree in Pharmacy, such as the Bachelor of Pharmacy (B.Pharm) degree at Universiti Teknologi MARA (UiTM) is a four-year program (3).

The four years of B.Pharm is commonly considered to be a tough program as students are required to study all aspects of pharmaceutical sciences. John et al claim that the extensive range of subjects addressed and the constrained amount of class time may lessen the effectiveness of the teaching-learning relationship (4). Consequently, the learning methods used may have an effect on the effectiveness of the instruction given to students (5).

The optimum learning environment helps students develop independent and self-directed study abilities as well as increased motivation to fully comprehend the course material. A person's attitude to learning situations and how they interact with a learning environment can be described as having a particular learning style (6). Everyone has a different style when it comes to learning (7). Even in the same educational setting, not all students learn at the same rate or to the same extent. Poor academic performance is caused by many pupils' inability to identify their individual learning preferences (3). By taking steps to change how they gain knowledge, students may benefit from recognising their individual

learning style (8). Students also may use the findings to learn more about what it takes to be an effective learner and how to prepare when things are not working well (9). Therefore, students can maximize their learning potential and integrate their preferred learning styles into their study routines. Additionally, the identification of learning styles can be useful in helping instructors to improve the way they teach (10). According to a study by Zhu et al., having a better understanding of learning styles can make it simpler to construct curriculum and educational programmes that are more effective (11).

Learners can be divided into many learning style categories using a range of terminologies and methodologies (6). The VARK Model, Kolb Experiential Learning Theory, Gregorc Learning Style Model, and Felder-Silverman Learning/Teaching Style Model are some of the best and most well-known learning style frameworks (12). For this study, the VARK instrument is being used as it is known to be strongly reliable and with a high validity score (13). A questionnaire called VARK, which stands for Visual, Aural, Read/Write, and Kinesthetic Preference Modalities, assesses a person's sensory modality preferences and the learning techniques they like to use to process information (14). The VARK questionnaire consists of 16 questions and is freely available on the internet, making it an ideal cost-effective and time-saving tool. VARK instrument becomes a metacognitive tool to learn about a student's learning strengths and weaknesses. This instrument, based on students' interactions and responses to their learning environment, divides the students into four groups. Visual (V) learners are more likely to be given demonstrations and can process information best through descriptions, graphs, flow charts, and diagrams which represent graphical form. In Aural (A) mode students learn best through listening to verbal instructions such as lectures and attending tutorials. Students with the tendency of reading and writing (R) like to see written words such as textbooks, glossaries, and printed text. They prefer taking notes during lectures and study through the notes taken. Last but not least, kinaesthetic (K) students want to learn information through practise and experience that is related to reality. They are more likely to take instruction that involves physically manipulating objects (12).

Up to the present date, there have been only three studies that relate undergraduate pharmacy students with learning styles preference in Malaysia (3-4,15). One study from these three was carried out in UiTM. The study's learning styles were identified using the Pharmacists' Inventory of Learning Style (PILS) assessment. According to this study, undergraduate students primarily learned in two ways: assimilators (learners who enjoy working independently and at their own pace and prefer to study in a structured

learning environment) and convergers (learners who prefer to work quickly and want to complete a task as soon as possible without minding how to complete the task), and the results were not likely to be affected by the students' demographic information (4).

Understanding these students' learning preferences may help in the creation of effective techniques to enhance the learning experience for both students and teachers. As a result, this study was conducted to examine the preferred learning styles of pharmacy students and to ascertain how such preferences relate to the demographic aspects that have an impact on them. Each student may have different learning style preferences but they do not know how to apply those learning styles in their study routine. The recognition of learning styles can increase an individual's self-respect and confidence as it can give insight into their strengths and weaknesses which can help the individual to achieve the best result from their natural skills and inclination (10). In addition, it can help an individual to grow into a more effective learner as the individual will understand concepts faster with ease. The majority of research on health-related learning styles has been done in nations like China, India, and Pakistan. Previous research showed a strong correlation between learning preferences and academic success. According to research, each person has a unique approach to learning, which may be influenced by a variety of factors like the pupils' varied backgrounds, abilities, and weaknesses (16). Hence, this study was conducted to determine the learning styles preference of undergraduate pharmacy students at the Faculty of Pharmacy, UiTM Puncak Alam, while comparing the preferences of students' learning styles in relation to their gender, CGPA, and year of study. This study was an approach to enhance the pharmacy students' academic performance by recognizing and incorporating their preferred learning styles into their study routines. The study was also designed to raise the awareness of faculty's educators of students' diverse learning styles. As a result of this study, educators may have a valuable tool to create more successful teaching strategies depending on the learning preferences of their students.

MATERIALS AND METHODS

Research setting

This cross-sectional study was conducted by circulation of an online survey questionnaire through Google Form application. Respondents were recruited from undergraduate pharmacy students enrolled at the Faculty of Pharmacy Universiti Teknologi MARA (UiTM) Puncak Alam. Prior to data collection, the ethical approval from the Research Ethics Committee (REC) of UiTM has been approved for this study [REC(PH) 01/2022]. Only completed questionnaires with all of the required details were considered, and

the data from those forms were analysed afterward.

Research methodology

The questionnaire was divided into two sections and available only in English language. Section A was designed to obtain demographic data of the students which include age, gender, place of residence, pre-university qualifications, year of study (first, second, third, or fourth year) and student’s Cumulative Grade Point Average (CGPA). In this section, all the questions were in multiple-choice forms. Section B consists of the latest version (8.01) of VARK questionnaire developed by Neil Fleming to determine the students’ preferred learning styles (17). There were 16 multiple choice questions with four options each. Each option indicates a different type of learning styles, such as Visual (V), Aural (A), Reading-writing (R), and Kinesthetic (K). The questions were related to an individual’s learning experience by describing situations that they encounter on a regular basis. Students were encouraged to respond to the questions that best reflect their personal preferences. They had the option of selecting one or more option, or leaving any question blank if it did not apply to them. As a result, the learning styles that received the most points out of 16 questions were chosen as the student’s preferred learning styles. Multiple learning styles in various combinations can be produced since students were allowed to choose more than one choice (Table I).

The data collection was conducted between April 2022 and May 2022. The sample size was calculated by a sample size calculator by Raosoft Inc with a 5% of margin of error and 95% of confidence level. The total population of undergraduate pharmacy students in the Faculty of Pharmacy UiTM is 690. A total of 247 students were needed as the sample size of this study. Simple random sampling was used for the recruitment of the respondents in this study. As for the inclusion criteria, this research was accessible to all undergraduate pharmacy students and this study excluded postgraduate pharmacy students. The students were informed that completing the questionnaire would indicate their consent to participate in this study. The result was treated with confidentiality, and respondents were told that they could withdraw from the research at any moment. As the respondents’ identities were not included in the questionnaire, the data was considered anonymous.

Statistical analysis

The reliability and validity of VARK Questionnaire has been approved by experts. The reliability estimates for each of the four major components (visual, auditory, read/write, and kinesthetic) were 0.85, 0.82, 0.84, and 0.77, respectively. The research data were analysed by using the Statistical Package for the Social Sciences (SPSS) software (version 27). The

Table I : Examples of Unimodal and Multimodal of VARK Learning Styles

Unimodal	Bimodal	Trimodal	Quadmodal
<ul style="list-style-type: none"> Visual (V) Aural (A) Reading (R) Kinesthetic (K) 	<ul style="list-style-type: none"> Visual & Aural (VA) Aural & Reading (AR) 	<ul style="list-style-type: none"> Visual, Aural, Reading (VAR) 	<ul style="list-style-type: none"> Visual, Aural, Reading, Kinesthetic (VARK)

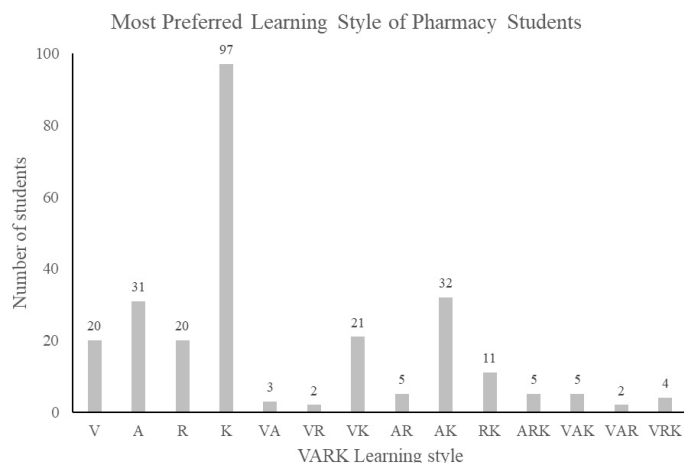


Figure 1 : Number of participants based on the most preferred learning style.

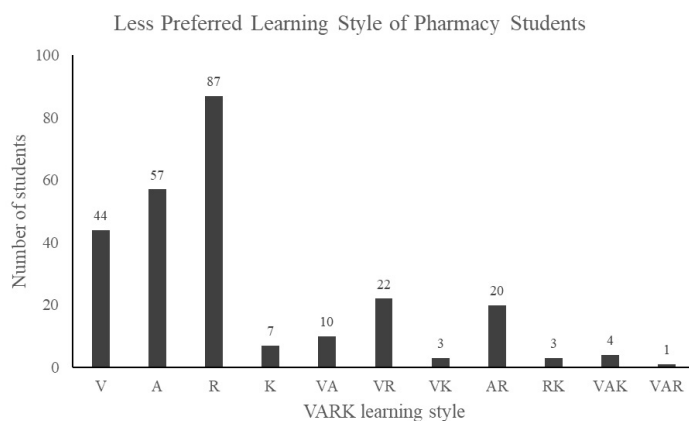


Figure 2 : Number of participants based on the least preferred learning style.

analysed data were expressed as the total number and percentages. The Chi-square Test of Independence is used to determine if two categorical variables have a significant relationship (18). Hence this test was used to determine the association between students' learning style preferences with gender, year of study, and academic achievement. From the result of the test, a P-value of less than 0.05 was defined as statistically significant.

RESULTS

Distribution of undergraduate pharmacy students in relation to gender and year of study

A total of 258 students completed the survey. With a total of 690 pharmacy students in UiTM, this provides an overall response rate of 37.39%. Table II demonstrates the demographic characteristics of students completing the questionnaire. Of 258 students, 84.1% were female and 15.9% were male. The mean age of the students was 22.2 years old. The highest number of participants were from third year (n=105/258, 40.7%), followed by second year (n=84/258, 32.6%), fourth year (n=37/258, 14.3%) and first year (n=32/258, 12.4%). Students who had previous education at diploma and foundation dominate the participation by 43.5% and 45.3%.

The remaining participants were from matriculation with 11.2%. Slightly more than half of the students (67.4%) had CGPA between 3.0-3.49, 25.6% had 3.5-4.0, 6.2% with 2.5-2.99 and 0.4% had 2.0-2.49 and 1.5-1.99 pointer. Majority of students (67.4%) lived in the university's college when answering this survey.

Most preferred learning style by pharmacy students

Analysis of VARK (Fig 1) showed that the dominant learning style preferred by pharmacy students was Kinesthetic (K) (n = 97/258, 37.6%), followed by Aural and Kinesthetic (AK) (n=32/258, 12.4%) and Aural (A) (n = 31/258, 12.1%). From a total of 258 students, 168 students (65.1%) preferred single modal, 74 students (28.7%) chose bimodal and 16 students (6.2%) chose trimodal as their most preferred learning style.

Least preferred learning style by pharmacy students

Based on Fig 2, it was found that Reading learning style is the least preferred by 87 students (33.7%), followed by Aural with 57 students (22.1%) and Visual with 44 students (17.1%). Out of 258 students, 195 students (75.6%) chose unimodal learning style, 58 students (22.5%) chose bimodal and 5 students (1.9%) chose trimodal as their least favoured learning style.

Table II : Demographic characteristics of pharmacy students (N = 258)

Demographics	Total number (N)	Percentage (%)
Gender		
- Male	41	15.9
- Female	217	84.1
Age		
- 18-20	24	9.3
- 21-23	153	59.3
- 24-26	81	31.4
Year of study		
- 1st year	32	12.4
- 2nd year	84	32.6
- 3rd year	105	40.7
- 4th year	37	14.3
Previous education		
- Matriculation	29	11.2
- Foundation	117	45.3
- Diploma	112	43.5
CGPA		
- 1.50-1.99	1	0.4
- 2.00-2.49	1	0.4
- 2.50-2.99	16	6.2
- 3.00-3.49	174	67.4
- 3.50-4.00	66	25.6
Residency		
- Relative's house	1	0.4
- Rent house	3	1.2
- Home with parents	30	11.6
- University's college	224	86.8

Correlation between dominant learning style and gender, year of study and academic performance

Majority of both male (n = 11/41, 26.8%) and female students (n = 86/217, 39.6%) preferred Kinesthetic as their preferred learning style and there was a significant correlation between gender and the most preferred learning style (p = 0.002). From year one to year four, there were no variations in the learning styles preferred by pharmacy students, with Kinesthetic being the most popular [First year (n = 10/32, 31.3%), Second year (n = 32/84, 38.1%), Third year (n = 43/105, 41.0%), Fourth year (n = 12/37, 32.4%)]. However, there was no correlation between the most preferred learning style and year of study (p = 0.877), a similar trend was observed with academic achievement (CGPA) of (p = 0.989). Only 38 students (14.7%) were aware of their own VARK learning style, whereas 220 students (85.3%) were unaware of their own learning style (Table III).

Table III : Result of Chi-square Test of Independence

Correlation factors	P-value
Gender and Dominant learning style	0.002
Year of study and Dominant learning style	0.877
Academic performance and Dominant learning style	0.989

DISCUSSION

Each student has a unique way of processing information. Thus, exposing students to various teaching and learning techniques might help them develop their preferred methods of learning (18,19). Recognising one's own learning preferences is crucial for students since it will help them become more aware of their learning style and, as a result, select learning tactics that will work better for them (20). The learners can be classified as unimodal or multimodal using the VARK Questionnaire depending on whether they favour one learning preference over another or a combination of two or more learning preferences. The results of our study revealed that the overall preferred learning modality by undergraduate pharmacy students was unimodal (65.12%) and specifically kinesthetic learning (37.6%).

Previous studies have documented similar findings, with unimodal being the most common learning style among pharmacy and medical students (21-25). Several other studies have also reported that the multimodal approach was the most effective way to learn (20, 26-28). Sarabi et al. reported that multimodal learning method is preferred by students who like to study in a variety of ways. They do not learn as effectively as those who just focus on one mode of learning, such as the auditory, visual, reading, or kinesthetic (20).

Our results were consistent with previous studies on students enrolled in health-related courses, which found that kinesthetic modality was the most preferred learning style (22,24,26,29-33). The study by Elkalmi et al. at a public university in Malaysia found that pharmacy students frequently reported using the visual way of learning, therefore this was not the case in that study (3). The prevalence of particular learning styles among students may be related to their field of study, instructional resources, classroom activities, and curriculum content (33). As a result, it is recommended that educators pay more attention to the variety of students' learning preferences when designing lesson plans. Reading/writing was the least preferred learning style among the participants in our study (33.7%). The rising usage of online learning may help to explain the shift in pharmacy students' preferences from reading and writing to visual, aural, or kinesthetic learning. It's possible that students have come to rely on online tools to advance their study. A study by Fahim et al. found that 83.9% of medical students use YouTube as a learning resource (28).

A statistical test in this study revealed that gender is associated with the choices of the domain learning style of pharmacy students (p = 0.002). Although many studies found that learning style did not significantly influence by gender (22,27,34), a similar outcome to our result was observed by a study of medical students from Saudi Arabia (35). These discrepancies can result from the smaller sample size in this study compared to other studies. Analysis of the gender differences in our study also found that majority of both males (39.6%) and females (26.8%) were kinesthetic learners. Similar results were found in Indian research, where a higher proportion of male medical students favoured the kinesthetic method of learning style (22). According to Manalo & Enriquez, female learners were presented with learning in a single way. They learn best by listening. Males, on the other hand, learn better when information is presented in a variety of ways. They have a variety of learning styles, such as visual-kinesthetic and auditory-kinesthetic learners, which combine two or more methods of processing inputs (36).

According to a study done among UiTM pharmacy students in 2016, there were no significant differences in preferred learning styles between the first, second, third, and fourth years (4). This finding remains the same, as the present study shows no correlation between year of study and preferred learning style (p = 0.877). Across all academic years, kinesthetic learning style remain the most common. In contrast, a study from a dentistry school in Saudi Arabia discovered that first-year students preferred a unimodal method more often than second-year students, who preferred a bimodal strategy. They discovered that this does correspond with a significant

shift in the structure of dentistry training from clinical courses that were predominantly patient-based to clinical courses that were mixed didactic and clinical. (31).

The influence of academic performance on learning style is of interest to many researchers. Our study reported there was no correlation found between the academic performance of undergraduate pharmacy students and their preferred learning style ($p = 0.989$). This result was similar with published studies among dental students in Pakistan (18), health science students in Malaysia (37), and medical students in India (23) and Barbados (38). As a result, no definitive finding can be drawn from these studies. However, a study conducted in Turkey by Akobirova et al. concluded students who were tested for their learning style and offered suitable instruction based on their learning style profile, outperformed other students in terms of academic achievement (16).

The findings from this study showed only 38 students (14.7%) had awareness of their own VARK learning style while the remaining 220 students (85.3%) did not have awareness of their own learning style. Understanding one's individual learning preferences is crucial for students since it will enable them to use the appropriate learning techniques to maximise their potential as lifelong, self-directed learners (27). In educational institutions, being aware of student learning preferences is also very useful since it enables educators to identify and solve students' learning issues. Knowing the different learning styles that students prefer may encourage teachers to modify their own teaching techniques (39). Additionally, it can help improve lesson plans while considering the preferred learning patterns of students, which might result in the development of new educational strategies (40).

Since the majority of the participants in our study were kinesthetic learners, it is essential for educators to incorporate more hands-on activities such as role play and experiments that will enhance more interactive sessions between students and teachers. Students with this type of learning style prefer to learn information through experience and are more likely to use motions as a memory help (41). However, the COVID-19 outbreak led to a sudden suspension of face-to-face educational activities across the world which cause some challenges for kinesthetic learners. Hence, interactive online learning activities have become the pillar of online pedagogy instead of the conventional paper-based approach. This could explain why reading/writing learning style has become the least preferred method among the participants in this study. Moreover, a study by Baba & Affendi revealed that students generally watch television and use the Internet more often than they read (42).

Therefore, E-learning has been employed extensively in the higher institution to cope with the COVID-19 pandemic and the rising use of technology among students (43). For instance, pharmacy students in the United Arab Emirates (UAE) have been introduced to Audience Response System (ARS) such as Wooclap and Slido to encourage active learning activities in their pharmacy education (44). Game-based learning also has been developed and applied to a variety of pharmaceutical curricula in the United State of America (USA) (45). Team-based learning (TBL) which is a collaborative approach that has been applied in a pharmacy school in Jordan has been proved to enhance pharmacy students' engagement and critical thinking abilities, especially for the kinesthetic type of learners (46). According to Karim et al., a health profession like pharmacy typically requires multiple concurrent skills involving sensory components, such as visual (V) skills like deciphering graphic content in research articles, auditory (A) skills like listening to patients, reading/writing (R) skills like reading journal articles and maintaining records, and kinesthetic (K) skills like performing physical exams and procedures (27). Thereby, understanding learning style will not only improve their academic performance but may help students become aware of development strategies to master these lifelong professional skills.

CONCLUSION

The majority of our pharmacy students were unimodal learners, with the kinesthetic learning style being the most common and reading/writing being the least preferred. Our pharmacy students have also been discovered to be multimodal learners, which may be an important consideration for educators utilising a mixed teaching technique to support various learning styles. Both male and female pharmacy students showed more preference toward kinesthetic learning modality and there was a significant correlation between gender and preferred learning style. Besides that, there was no association between preferred learning style, academic performance, or the academic year.

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