



A Comparison of Learning Styles of Health Students and its Association with Internet and Information Technology Skills

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Abstract

Background: Learners have vastly different learning styles, depending on their preference, psychological preparedness, and the condition of their senses. Identification of learning styles is essential in choosing effective teaching methods. The present study aimed to identify the learning styles of health students and examine the relationship between learning styles and the level of Internet skills and information technology.

Materials and Methods: In this cross-sectional study, 120 students from the School of Health at Mashhad University of Medical Sciences (Mashhad, Iran), were selected by the non-probability sampling method. Data were collected using Felder- Silverman index of learning styles and the researcher-made questionnaire. Data were analyzed using SPSS software (version 13.0).

Results: Out of 120 the distributed questionnaires, 99 questionnaires were returned (response percentage = 82.5%). The mean age of students was 21.91 ± 3.785 years, and 79.8% were single. The students' preferred learning styles vary across active, sensory, visual, and global styles. There was a statistically significant relationship between the students' learning styles in terms of processing dimension and gender and field of study ($p < 0.05$). There was also a statistically significant relationship between the learning style in terms of input dimension and marital status, so that single students leaned toward verbal and married students preferred visual styles ($p < 0.05$). There was no statistically significant relationship between students' learning styles and Internet skills and information technology.

Conclusion: The preferred learning styles of health students were active, sensory, visual, and global styles. Due to the diversity of learning styles among health students, the teaching style should be selected based on their gender, field of study, and educational levels.

Key Words: Health students, Information technology, Internet skills, Learning styles.

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1- INTRODUCTION

The credibility of an educational system depends on the learning of its learners. Learning is a complex variable affected by factors such as intelligence, motivation, appropriate environment, family, community, settings, and quality of education. In addition, another factor affecting learning is the learners' learning styles. Learners acquire learning styles, like other abilities, through experience and education, and each person absorbs content according to their learning style. Learning style consists of methods and conditions for perceiving, processing, storing, and recalling material more efficiently and effectively (1). Bertolami believes that one of the main causes of students' despair and frustration with the curriculum is the contradiction between the content and the forms of teaching (2). Poor learning levels despite skilled teachers emphasizes that learners have different learning preferences (3, 4). Learning outcomes will improve if the teaching suits the students' learning styles (5). Keefe and Reiff believe that a better understanding of learning styles by teachers can help reduce students' frustration and dissatisfaction and improve teaching delivery (6, 7).

Therefore, knowing the nature and types of learning styles and the style of students helps professors make optimal use of different learning styles. Also, professors can adapt their teaching methods to their students' styles to achieve the highest educational efficiency (8, 9). Today's rapidly changing world requires the ability to keep up with the changes. It is now inevitable to acquire the information, knowledge, and skills for a successful life through modern technologies. Integrating computer technologies in teaching and learning is necessary and inevitable (10). Many who use computers daily cannot imagine life without digital technologies (11). The introduction of computers and software to teaching and learning and their

expansion in recent decades have changed the direction of education. Students interact with computer training programs more than with teachers (12). The use of suitable information and communications technology (ICT) in education is deemed critical as it can benefit all students (13). In a Web 4.0 age, it is of utmost importance that digital skills are examined for future training opportunities and to ensure higher education institutes remain competitive and innovative in technologies used in a knowledge-driven environment (14). Besides, the healthcare system is becoming increasingly technology dependent; consequently, health-care providers in all regions of the world are expected to develop their skills in information and communication technology (15).

A study conducted by Aurore, Valens, Lune, and Nyssen (2016) at the University of Rwanda on "the assessment of health informatics competencies in undergraduate training of healthcare professionals in Rwanda" indicated that there is a low presence of health informatics in the curricula being used across the college of medicine and health sciences (16). There is a growing interest in learning styles of health-care professional students; however, the evidences about learning styles over time during undergraduate and postgraduate programs are rare. Some experts in education field believe that students' learning style is part of their personality that cannot be changed (17).

Promoting health sciences students' computer and internet skills helps them to achieve their learning goals and the skills required are essential for their future career. Using computers for teaching and learning is inevitable, and the role of computers in education has gained significance and continues to grow. Therefore, it is necessary to address computer-related issues to facilitate its use, especially in education and learning.

Research has shown that people differ in their learning approaches, and a specific learning strategy is not appropriate for all learners (18). Therefore, it is essential to identify the different learning styles of students. This study aimed to identify the learning styles of health students and examine the relationship between learning styles and the level of Internet skills and information technology.

2- MATERIALS AND METHODS

2-1. Study design

In this descriptive study, after consulting with a statistical advisor, 120 health students (from health education, public health, environmental health, and occupational health fields) at Mashhad University of Medical Sciences (Mashhad, Iran, in 2022), were selected using the simple random sampling method considering a 5% error rate and 90% confidence interval. The questionnaires were distributed among the students at the appropriate time with the justification and were analyzed after collection.

2-2. Instruments

The data collection tool was a questionnaire with three sections: demographic information, the Felder-Silverman index of learning styles questionnaire, and a researcher-made questionnaire with seven questions about Internet skills and information technology. The Felder-Silverman learning style model (1988, 1993) was proposed by Richard M. Felder and Linda K. Silverman. This model has four personality areas: active or reflective, sensing or intuitive, visual or verbal, and sequential or global, that contribute to the personality of an individual (**Figure.1**). This questionnaire contains 44 questions to measure four dimensions of learning. Each dimension

consists of two styles, so the questionnaire measures eight learning styles. Each dimension consists of 11 two-choice questions that test two conceptually contradictory learning styles.

The Felder-Silverman selective learning styles in four areas are based on the type of information that individuals receive preferentially, the channel through which individuals receive information most effectively, the mental processes by which input processes become knowledge, and the behavior that people have understood and mastered substances (**Table.1**).

The questions do not have cultural elements and are easy to answer. In each question, the individual marks the option that is most applicable to them from among the options (19). The content validity and the reliability of learning style tools have already been reviewed and validated by Felder and Silverman and other researchers (19-23). The content validity of the remaining questions of the questionnaire was confirmed by five experts in medical education, health education, nursing, midwifery, and community medicine. The reliability of the questions was also confirmed by Cronbach's alpha method (0.83).

2-3. Ethical considerations

The personal information of the participants was extracted as a whole. It was not compulsory to write names and surnames. Participation in the study was voluntary, and participants' satisfaction was obtained before the study.

2-4. Data analysis

Data analysis was done using SPSS software version 16.0 and appropriate statistical tests. A p- value of <0.05 was considered significant.

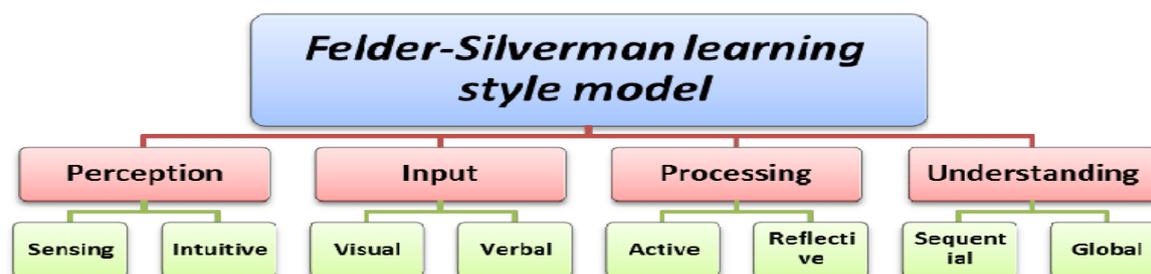


Fig.1: Felder-Silverman Learning Style Model.

Table-1: Dimensions of Felder and Silverman learning style (19).

Learning style	Dimension
Perception	Sensory/ Intuitive: How do you prefer to perceive or take in information?
Input	Visual/Verbal: How do you prefer information to be presented?
Processing Information	Active/Reflective: How do you prefer to process information?
Understanding	Global/ Sequential: How do you prefer to organize and progress toward understanding information?

3- RESULTS

Out of 120 distributed questionnaires, 99 questionnaires were returned (response percentage = 82.5%). The majority of participants were female (85.9%), and single (79.8%). The average age of students was 21.91 + 3.78 years. Of the students, 5.1% ASc of science degree students, 70.7% were BSc students, 15.2% were MSc students, and 9.1% were PhD students. The frequency of learning styles of students and the learning dimensions are shown in Table.2. As shown in the table, students' preferred learning styles are active, sensing, visual, and global, respectively. The Chi-square test showed a statistically significant relationship

between gender and the processing dimension so that the learning style of men was sensory and of women was intuitive (Table.3). The Chi-square test also showed a statistically significant relationship between the field of study and the processing dimension, so that the majority of health students had an active learning style (Table.4). There was a statistically significant relationship between marital status and the input dimension so that married students were visual, and unmarried students were verbal (Table.5). There was no statistically significant relationship between the dimensions of learning and the variables of Internet skills and information technology ($p>0.05$).

Table-2: The frequency of learning styles of studied students.

Statistic	Processing		Perception		Input		Understanding		Total
	Active	Reflective	Sensing	Intuitive	Visual	Verbal	Global	Sequential	
Number	69	30	54	45	53	46	51	48	99
%	69.9	30.1	54.6	45.4	53.6	46.4	51.5	48.5	100

Table-3: The relationship between gender and learning styles of studied students.

Learning Style	Dimension	Gender		Chi-square	Degree of freedom	P-value
		Female	Male			
Processing	Active	72	11	0.334	1	0.402
	Reflective	13	3			
Perception	Sensing	39	12	7.635	1	0.005
	Intuitive	46	2			
Input	Visual	45	9	0.624	1	0.311
	Verbal	40	5			
Understanding	Sequential	40	8	0.489	1	0.341
	Global	45	6			

Table-4: The relationship between the fields of study and learning styles of studied students.

Learning Style	Dimension	Fields of Study				Chi-square	Degree of freedom	P-value
		Public Health	Environmental Health	Health Education	Occupational health			
Processing	Active	18	59	3	3	8.975	3	0.03
	Reflective	1	10	3	2			
Perception	Sensing	10	36	4	1	2.561	3	0.464
	Intuitive	9	33	2	4			
Input	Visual	9	39	2	4	2.899	3	0.407
	Verbal	10	30	4	1			
Understanding	Sequential	10	31	3	4	2.474	3	0.480
	Global	9	38	3	1			

Table-5: The relationship between marital status and learning styles of studied students.

Learning Style	Dimension	Marital status		Chi-square	Degree of freedom	P-value
		Married	Single			
Processing	Active	14	69	3.542	1	0.06
	Reflective	6	10			
Perception	Sensing	8	43	1.331	1	0.183
	Intuitive	12	36			
Input	Visual	15	39	1.229	1	0.04
	Verbal	5	40			
Understanding	Sequential	8	40	0.722	1	0.275
	Global	12	39			

4- DISCUSSION

This study aimed to identify the learning styles of health students and examine the relationship between learning styles and the level of Internet skills and information technology. The results showed that students' learning styles are active, sensory, visual, and global. There was no statistically significant relationship between students' learning styles and Internet skills and information technology. In this research, the Felder-Silverman

model and its learning styles were used. The Felder-Silverman model defines four personality areas, or dimensions, that contribute to learning. These dimensions can be viewed as a spectrum, with one learning preference on the far left and the other on the far right. These are active or reflective, sensing or intuitive, visual or verbal, and sequential or global dimensions. A combination of these styles makes up the individual learning preferences (**Figure.1**). The preferences of Felder-Silverman learning styles are

shown in **Table.6**. One of the factors affecting learning is learning style. Knowing students' learning styles can help adapt teaching to their individual styles (24, 25). Research on learning styles and the development of adaptive systems has identified learning style models, stating that learners have different preferred methods of learning. Incorporating learning styles into the study plan facilitates learning and leads to better educational achievements. As Felder points out, learners with strong preferences for a particular learning style may have problems if the teaching style does not match it (26). Howard Gardner states that learners learn in different ways, and educators should value this by identifying their learning styles and provide the necessary teaching materials (27). Studies also show that the academic performance of university students is related to their learning style (24, 25, 28, 29). Adaptation of students' learning styles to the learning environment leads to better test scores, while the lack of coordination between the characteristics of learners will lead to poor performance of learners (30-32).

Based on the results, students' learning styles were active, sensory, visual, and global. There was a statistically significant relationship between gender and the processing dimension so the learning style of sensory men and women was intuitive. Gender is also an influential factor in determining the learning style in several studies. The different results in studies, based on the difference in learning style between male and female students, can be attributed to factors such as the number of students in the fields of study. The current study indicated a statistically significant relationship between the field of study and the processing dimension so that the majority of health students had an active learning style. Also, there was no

statistically significant relationship between students' learning styles and their educational levels. This finding is inconsistent with the results of Rashidi Jahan et al., Najafi Kalyani et al., and Allaa et al. (33-35). According to studies, the learning style changes after entering the university and at higher education levels according to the educational conditions of students. In connection with the degree, discussions about different subjects and the different nature of the material presented in different degrees can be used. At lower educational levels, university courses are more theoretical and usually do not require extensive explanations and interpretation. However, at higher levels, especially in postgraduate studies, where learning takes place at higher levels of Bloom's theory, the student is expected to analyze and even criticize the opinions of others in addition to learning different theories perceptually (36, 37).

Consequently, their learning styles are affected, and this can explain the difference in the learning style of students of different educational levels. In this study, the sample size of the study consisted of lower-level students, and the majority had theory courses. There was also a statistically significant relationship between marital status and the input dimension so that married students were visual and singles were verbal. It is useful for the teachers to consider these differences when teaching. In general, as teaching styles go hand in hand with learning styles, and students have different learning styles, it is necessary for professors and planners to know the differences, programs, and methods and to design and implement their training to meet the needs of students to optimize the efficiency of teaching and learning (38, 39).

Table-6: Description of Felder and Silverman learning preferences (19).

Type of learner	Preferences
Sensing	Prefers concrete thinking, practical, concerned with facts and procedures.
Intuitive	Prefers conceptual thinking, innovative, concerned with theories and meanings.
Visual	Prefers visual representations, pictures, diagrams, and flowcharts.
Verbal	Prefers written and spoken explanations.
Active	Prefers to try things out, working with others in groups.
Reflective	Prefers thinking things through, working alone or with a familiar partner.
Sequential	Prefers linear thinking, orderly, learns in small incremental steps.
Global	Prefers holistic thinking, systems thinkers, learns in large leaps.

4-1. Study Limitations

As the learning styles assessment questionnaire is a self-report tool, the perception of the people completing the questionnaire is personal and cannot be controlled. Another limitation of this study is its cross-sectional nature, making it difficult to explain causal relationships. Another limitation is the small research sample, which only covers students from one faculty. It is suggested that students be selected from all faculties to compare the results and create a more comprehensive view of learning styles and related factors. The findings of this study are limited to students of health, and the generalization of the results to other educational groups or other institutions of higher education should be made with caution.

5- CONCLUSION

Today, the health care system is highly dynamic, and traditional educational methods find it challenging to respond to rapid changes in the health system. Learning is an important process with different forms, and learners learn at different rates and paces. Based on the results, the preferences of learning styles in the majority of health students were active, sensory, visual, and global. Due to the diversity of learning styles among students, increasing awareness of learning

methods improves the teaching and learning processes. Also, gender, the field of study, and educational levels of health students should be considered in selecting the teaching style.

6- AUTHORS' CONTRIBUTIONS

Study conception or design: MV and FB; Data analyzing and draft manuscript preparation: MD, BZ, and SN; Critical revision of the paper: MV and FB; Supervision of the research: MV; Final approval of the version to be published: MV, FB, BZ, SN, and MD.

7- CONFLICT OF INTEREST: None.

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