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STUDENT LEARNING STYLE OF MATHEMATICS EDUCATION BASED ON GENDER

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Abstract
This study aimed to identify and describe the learning modalities of students in mathematics education based on gender. This research is a type of quantitative research that uses a descriptive design. The research was conducted at the Mathematics Education Study Program, USN Kolaka. The population in this study were all students of the mathematics education class 2018, totalling 40 students. The sampling technique in this study used non-probability sampling in the form of saturated sampling. The instrument used in this study was a questionnaire containing statements used to obtain research information about visual (V), auditory (A), read/write (R), and kinesthetic (K) learning modalities, which are called VARK. The data analysis technique in this study used descriptive analysis based on the trend analysis of learning modalities. This trend data is then described in the form of tables and graphs. The results showed that the 2018 USN Kolaka Mathematics Education Study Program students' learning styles had a multimodal preference. Male students have a preference for multimodal learning style in bimodal (AR and AK) as 5 (41.66%) of 12 students. On the other hand, female students tend towards a multimodal learning style in bimodal (AR), as much as 6 (21.4%) of 28 students.

Keywords:
Gender; learning style; mathematics education

INTRODUCTION

Learning style is an approach to how individuals learn or how to acquire, process, interpret and master the desired skills or information (Hussain, 2017). Learning style is how students react and use the stimuli they receive in the learning process (Sapira et al., 2022). Learning style shows that learning has the characteristics of cognitive, affective, and behavioral activities based on seeing, interacting, and responding to methods in learning (Othman & Amiruddin, 2010). Due to its varied nature, it can be termed an individual learning style based on individual and intrinsic differences and their preferred mode of learning new things. So that learning according to modality (how to absorb information easily) will increase awareness about learning activities, help make the right choices and help individuals plan their learning goals. Hussain (2017) states that for better learning, students prefer combining certain styles and strategies rather than sticking to just one learning style.

A monotonous teacher or a teacher who needs to see each student's potential and deliver material to students where it is expected can improve students' abilities. In other words, a learning style in the learning process is applied to achieve learning goals, make it easier for students to absorb and understand the material provided by the teacher and obtain good learning outcomes (Farman, et al., 2021). Therefore, teachers are expected to understand the learning styles of each student or student. This is understandable because everyone has a different learning style. Some people easily absorb and process lessons by hearing information from the teacher. Some people learn more efficiently by reading from books or looking at charts. In addition, some people absorb the lessons by trying and experiencing them for themselves.

There is no biggest and best learning style, and all learning styles will be appropriate if the learner recognizes the learning style that is most suitable for him.

Every individual has various learning styles, but there is a dominant one, with a tendency to one particular learning style. In formal learning, in this case, at schools or colleges, teachers should be able to see the learning styles that exist in their students. In addition, learning styles can be influenced by the use of media such as music for aural-type learners and pictures or posters for visual-type learners. By knowing their learning style, students can change their study habits by adopting appropriate learning methods to improve their academic achievement (Sinha et al., 2013).

The fact is that there are still many educators who still need to utilize information on student learning styles as support for improving learning in the classroom. The use of learning style information to improve the teaching process or learning environment is only sometimes done by educators (Urval et al., 2014). This phenomenon aligns with the conditions at the Mathematics Education Study Program, Universitas Sembilanbelas November Kolaka (USN Kolaka). The observations indicate that the use of learning models in lectures carried out by lecturers needs to follow student learning styles. The implementation of lectures has dominated the use of learning models, and teaching materials are almost the same yearly. Lack of use of technology as innovations in learning media. This can lead to less than optimal learning that affects student achievement. This can be seen in the achievement value of the 2017 class of mathematics education students in linear algebra courses, which are still not optimal. Only 10 students (25%) scored in the special (4.0), excellent (3.5), and good (3.0) category; the remaining 30 students (75%) scored below the good category. Therefore, it is significant to know the student's learning style. The learning style information is increasingly essential for teacher education programs because prospective teachers will become models for their students (Güryay, 2016).

There are several methods used to assess learning styles. The method used is in the form of learning style tendencies based on sensory modalities. Fleming defines four learning modalities, namely visual (V), auditory (A), *read/write* (R), and kinesthetic (K), which is better known as VARK. Visual learners prefer to learn with visual aids that represent ideas with graphs, charts, diagrams, or symbols. Auditory learners learn by listening through lectures, discussions, or listening to tapes. *Read/write* students like learning activities through reading and writing activities. Kinesthetic learners are more interested in learning through experiences including moving, active exploration of the world, project work or conducting experiments (Stephenson, 2019). Fleming revealed that students could use the model to identify their preferred learning style and, in turn, maximize their learning by focusing on the most beneficial modes. VARK categorizes student learning based on the preferred nervous system when receiving information (Choudhary et al., 2011).

Several experts and researchers highlight the critical role of knowledge of VARK learning modalities and their use. (Karim et al., 2019) stated that students were able to learn effectively as long as the teacher provided a mix of visual (V), auditory (A), *read/write* (R), and kinesthetic (K) activities. Research by Akbar & Nasution (2021) states a relationship between learning styles and student GPAs. Marzo (2016) stated that there was no significant difference in preference for VARK learning modalities between male and female medical students. However, research by Wehrwein et al. (2007) states that male and female psychology students have different preferences for VARK learning styles. Meanwhile, this research was conducted to obtain information

on the gender-based learning styles of mathematics education students based on gender.

Identification and analysis of student learning styles are essential to be carried out by lecturers as the primary driver of learning activities. Through information on student learning styles, lecturers are expected to be able to further optimize learning activities by establishing a learning approach that is appropriate to the material and learning style desired by students. Thus, this study aimed to identify and describe the learning modalities of students of mathematics education study programs based on gender.

METHOD

This research is a type of quantitative research that uses a descriptive design. Descriptive research is conducted to describe or describe phenomena related to the problem and unit under study. Descriptive research in this study is a study that describes the tendency of learning modalities of 2018 mathematics education students based on gender and then draws conclusions on the percentage of learning style tendencies.

The research was conducted at the Mathematics Education Study Program, FKIP USN Kolaka. The population in this study were all students of mathematics education class 2018, totalling 40 people. The sampling technique in this study used non-*probability sampling* in the form of saturated sampling. This is done to provide generalizations with relatively small errors.

The instrument used in this study was a questionnaire containing statements to obtain research information about the VARK learning modality preferred by the research subjects. The VARK questionnaire instrument is a standard questionnaire taken from The VARK Questionnaire Version 7.1 on the www.vark-learn.com page. The questionnaire comprises 16 statements with four answer choices representing indicators or VARK. This questionnaire has been validated and tested with a validity value with Pearson's product-moment is 0.266, and a reliability value with Cronbach's alpha is 0.803. The results showed that the VARK learning style questionnaire was valid and reliable (Lisiswanti, 2014). The questionnaire was compiled in a google form and then given to students through the WhatApp class group.

The data analysis technique in this study used descriptive analysis based on the analysis of learning modalities. The analysis of the learning style tendencies of each respondent was obtained through the recapitulation of the questionnaire data. The analysis of the tendency of each respondent's learning style was carried out by comparing 4 (four) choices of respondents' learning styles consisting of visual (V), auditory (A), *read/write* (R), and kinesthetic (K). Students who only choose one option mean that their learning style tends to be unimodal (V, A, R, K), and students who choose more than one option mean that their learning style tends to be multimodal. Determination of learning styles the VARK questionnaire that students have filled out is analyzed by referring to the scoring guidelines of the questionnaire. According to (Fleming & Bonwell, 2019), the VARK questionnaire scoring guidelines are as follows.

1. Count the number of answers to all questions.
2. Calculating the total score for each learning style V, A, R, and K
3. Sorting V, A, R, and K scores from the highest to the lowest
4. Calculating the difference in learning style scores

a. If the difference in the scores of the first and second learning styles exceeds the tolerance threshold, then the student's learning style is categorized as *unimodal*.
b. If the difference in the first and subsequent learning styles scores is less than the tolerance threshold, then the student's learning style is categorized as *multimodal. Multimodal* learning *styles* are divided into three subgroups, namely: *bimodal* (two learning styles), *trimodal* (three learning styles), and *quadmodal* (four learning styles). If the first and second learning styles are still within the tolerance threshold, the respondent's learning style is categorized as *bimodal*. If the first, second, and third learning styles are categorized as *trimodal*, and if the difference between all four is within the tolerance limit, it is categorized as *quadmodal.*

TABLE I. Guidelines for Tolerance Limits for Learning Style Scores

Number of Answers	Tolerance Limit
16 – 21	1
22 – 27	2
27 – 32	3
> 32	4

After scoring and determining each student's learning style, then calculate the percentage of the overall learning style tendency of the students and the percentage of the learning style tendency based on the student's gender. The percentage is determined by dividing the number of respondents who like a specific learning style by the total number of respondents. This trend data is then described in the form of tables and graphs.

RESULTS AND DISCUSSION

The learning styles of the 2018 USN Kolaka Mathematics Education Study Program students are generally presented in Table 2.

TABLE 2. Student Learning Style Preference

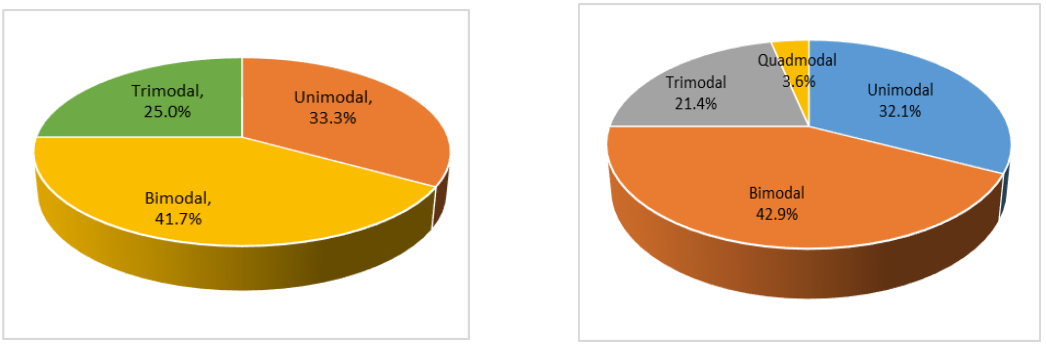
Learning Style		Frequency	Percentage (%)
Unimodal	V	1	2.5%
	A	5	12.5%
	R	4	10.0%
	K	3	7.5%
Bimodal	VA	1	2.5%
	AR	8	20.0%
	AK	7	17.5%
	RK	1	2.5%
Trimodal	VAR	2	5.0%
	ARK	7	17.5%
Quadmodal	VARK	1	2.5%
	Total	40	100%

Based on the results of data analysis in Table 2, it shows that as many as 13 students (32.5%) class 2018 Mathematics Education Study Program at USN Kolaka have a unimodal tendency (V, A, R, K) and as many as 27 students (67.5%) have a multimodal tendency. (bimodal, trimodal, quadmodal). Furthermore, in the multimodal distribution, each shows that 17 students (42.5%) have a tendency for bimodal learning modalities, nine students (12.5%) tend trimodal learning modalities, and one

student (2.5%) has a quadmodal learning modality tendency. Thus, the learning styles of the 2018 USN Kolaka Mathematics Education Study Program students have a multimodal tendency.

Student Learning Styles Based on Gender

The 2018 Mathematics Education Study Program consists of 12 males and 28 females. This study also examines differences in learning styles based on gender, as Choudhary et al. (2011) mention that gender influences student learning styles in addition to age, academic achievement, brain processing, culture, and creative thinking. Student learning style preferences based on gender are presented in Figure 1.



(a) (b)

FIGURE 1. Student learning styles (a) male (b) female

Figure 1 shows that 33.3% of male students have unimodal learning styles, and 66.7% have multimodal learning styles (41.7% bimodal and 25% trimodal). Meanwhile, 32.1% of female students had unimodal learning styles, and 68.9% had multimodal learning styles (42.9% bimodal, 21.4% trimodal, and 3.6% quadmodal). Thus, male students of the 2018 Mathematics Education Study Program have preferences for multimodal learning styles, and female have preferences for multimodal learning styles.

Male Student Learning Style

Twelve male students tend to have a multimodal learning style. The complete reference to male student learning styles is presented in Table 3.

TABLE 3**.** Male Student Learning Style Preference

Learning Style		Frequency	Percentage (%)
Unimodal	A	2	16.66%
	R	2	16.66%
Bimodal	AR	2	16.66%
	AK	3	25.0%
Trimodal	ARK	3	25.0%
	Total	12	100%

Table 3 shows that male students only have two learning styles unimodal, namely auditory (A) and *read/write* (R). In multimodal, males tend to have a bimodal (AR) and trimodal (ARK) learning style. In general, males tend to have a multimodal

learning style in bimodal (AR and AK) as many as 5 (41.66%) students. This is in line with research (Choudhary et al., 2011) that men prefer multimodal learning styles over unimodal ones, where men are more inclined to the AK and ARK learning styles.

Female Student Learning Style

Twenty-eight female students tend to have a multimodal learning style. The complete reference to female student learning styles is presented in Table 4.

TABLE 4. Learning Style Preferences for Female Students

Learning Style		Frequency	Percentage (%)
Unimodal	V	1	3.6%
	A	3	10.7%
	R	2	7.1%
	K	3	10.7%
Bimodal	VA	1	3.6%
	AR	6	21.4%
	AK	4	14.3%
	RK	1	3.6%
Trimodal	VAR	2	7.1%
	ARK	4	14.3%
Quadmodal	VARK	1	3.6%
	Total	28	100%

Female students have a bimodal auditory *read/write* (AR) learning style as the most dominant preference. In general, 9 (32.1%) women liked the unimodal form, 12 (42.9%) students liked the bimodal (3.6% VA, 21.4% AR and 14.3% RK), 6 (21.4 %) students like trimodal (7.1% VAR and 14.3% ARK) and 1 (3.6%) students like quadmodal. This is in line with research (Marzo, 2016) that women have a multimodal preference, especially in the bimodal learning style.

Overall, the modalities of students from the 2018 Mathematics Education Study Program batch are multimodal. Regarding gender, men have a multimodal tendency and women have a multimodal tendency. This is in line with Farman, et al. (2021) that gender differences in the same study program do not significantly affect the type of learning style. Likewise, research by Eid et al. (2021) showed no significant difference between learning styles in terms of gender in students. This means that male and female students have the same tendency in their learning styles.

Awareness of student learning style preferences has beneficial implications for learning. Thus, an educator must know the learning modalities of his students. Learning style information can assist educators in choosing innovative, effective, and efficient learning models/methods to facilitate students' understanding of learning materials to increase their interest in learning (Farman, et al., 2021). Thus, educators always use innovative and varied learning methods and media so that learning materials can be understood by all students who have different learning styles.

CONCLUSION

The 2018 USN Kolaka Mathematics Education Study Program students have a multimodal tendency. Male students have a tendency of multimodal learning style in bimodal (AR and AK) as much as 5 (41.66%) of 12 students. On the other hand, female students have a tendency of multimodal learning styles in bimodal (AR), as much as 6 (21.4%) of 28 students. Through the identification and analysis of student learning

styles, lecturers can develop and use learning models and media that are appropriate to the material and student learning styles. Activities that can be done to accommodate all types of learning styles. Through this adjustment will create an efficient learning environment and motivate students to achieve academic performance and success. Future research can examine the effectiveness of developing learning models or media that are appropriate to student learning styles.

REFERENCE

Akbar, R. R., & Nasution, E. S. (2021). Correlation Learning Style with Grade Point Average Fourth Year Medical Student. *Macedonian Journal of Medical Sciences*, *9*(T3). https://oamjms.eu/index.php/mjms/article/view/7728

Choudhary, R., Dullo, P., & Tandon, R. (2011). Gender Differences In Learning Style Preferences Of First Year Medical Students. *Pak J Physiol*, *7*(2), 4.

Eid, A. B., Almizani, M., Alzahrani, A., Alomair, F., Albinhamad, A., Albarrak, Y., Alzuaki, M., Alyahya, S., & Abdulrahman, K. B. (2021). Examining Learning Styles with Gender Comparison Among Medical Students of a Saudi University. *Advances in Medical Education and Practice*, *12*, 309–318. https://doi.org/10.2147/AMEP.S295058

Farman, F., Arbain, A., & Hali, F. (2021). Learning Style Preferences Based on Class and Gender. *AL-ISHLAH: Jurnal Pendidikan*, *13*(1), 164–172. https://doi.org/10.35445/alishlah.v13i1.368

Farman, F., Chairuddin, C., & Marniati, M. (2021). Interest in Gamification Learning Based on Student Learning Styles. *JME (Journal of Mathematics Education)*, *6*(2), Article 2. https://doi.org/10.31327/jme.v6i2.1586

Fleming, N. D., & Bonwell, C. (2019). *How Do I Learn Best? A Student's Guide to Improved Learning VARK*. VARK Learn Ltd.

Güryay, B. (2016). The Relationship between Learning Modalities and Perceived Self-regulation Levels. *Procedia - Social and Behavioral Sciences*, *232*, 389–395. https://doi.org/10.1016/j.sbspro.2016.10.054

Hussain, I. (2017). Pedagogical Implications of VARK Model of Learning. *Journal of Literature, Languages and Linguistics*.

Karim, M. R., Asaduzzaman, A., Talukder, M. H. K., Alam, K. K., Haque, F., & Khan, S. J. (2019). Learning Style Preferences Among Undergraduate Medical Students: An Experience from Different Medical Colleges of Bangladesh. *Bangladesh Journal of Medical Education*, *10*(2), 26–30. https://doi.org/10.3329/bjme.v10i2.44640

Lisiswanti, R. (2014). The Relation Ship Learning Styles And Student's Achievement Of Lampung University Faculty Of Medicine. *JUKE*, *4*(7), 6.

Marzo, R. R. (2016). Learning Style Preferences Among Medical Students in Malaysian Medical Universities. *Texila International Journal Of Public Health*, *4*(1), 121–131. https://doi.org/10.21522/TIJPH.2013.04.01.Art009

Othman, N., & Amiruddin, M. (2010). Different Perspectives of Learning Styles from VARK Model. *Procedia - Social and Behavioral Sciences*, *7*, 652–660. https://doi.org/10.1016/j.sbspro.2010.10.088

Sapira, S., Yeni, M., & Tria Sauhana, F. (2022). An Analysis Of Students' Learning Style In Learning English At Eighth Grade Of SMP N 1 Tembilahan Hulu. *J-Shelves Of Indragiri (JSI)*, *3*(2), 151–166. https://doi.org/10.32520/jsi.v3i2.2039

Sinha, N., Bhardwaj, A., Singh, S., & Abas, A. (2013). Learning preferences of clinical students: A study in a Malaysian medical college. *International Journal of Medicine and Public Health*, *3*(1), 60. https://doi.org/10.4103/2230-8598.109325

Stephenson, S. S. (2019). Learning Styles Assessment Diagnostics (LAMP-D) Framework: Accounting Students' Preferred Learning Styles & Course Learning Assessment. *The Accounting Educators' Journal*, *XXIX*, 33.

Urval, R. P., Kamath, A., Ullal, S., Shenoy, A. K., Shenoy, N., & Udupa, L. A. (2014). Assessment of learning styles of undergraduate medical students using the VARK questionnaire and the influence of sex and academic performance. *Advances in Physiology Education*, *38*(3), 216–220. https://doi.org/10.1152/advan.00024.2014

Wehrwein, E. A., Lujan, H. L., & DiCarlo, S. E. (2007). Gender differences in learning style preferences among undergraduate physiology students. *Advances in Physiology Education*, *31*(2), 153–157. https://doi.org/10.1152/advan.00060.2006