A Survey on Phenomenon of VARK Learning Style Preferences of Undergraduate Students in a Private University Baseon Gender and Scientific Background

Tjipto Subadi[1], Hernawan Sulistyanto[2]

Faculty of Teacher Training and Education, Universitas Muhammadiyah Surakarta, Indonesia

Email: tjipto.subadi@ums.ac.id[1], hs283@ums.ac.id[2]

Abstract. This paper aims at studying and analyzing student learning style preferences in a private university based on differences in clusters of scientific backgrounds (exact and non-exact) and gender. This research is quantitative research with a descriptive design, which gives a description of individuals or groups about the conditions and symptoms that occur by describing the profile of learning style preferences. The computation process of identifying learning style preferences was done and analyzed computationally with a MySQL PHP-based online application that is made independently and has never been before. The finding is that there are differences in the learning style preferences of undergraduate students with different scientific backgrounds. Meanwhile, learning style preferences concerned to gender differences in the same science tend to be the same. Both male and female are dominant in learning style preferences according to their scientific backgrounds. So that the learning style preferences based on gender are not much different. The information regarding student learning style preferences is expected that the lecturer will be able to develop lecture strategies in increasing student academic achievement, providing motivation for lecturers to always innovate and developing the learning models. In addition, the data provided can be a reference for educators everywhere so they do not treat all students the same way.

Keywords: Learning Styles, Gender, Science, Students, Preferences, VARK.

1. Introduction

In the current era of new millennium there is a phenomenon in the world of education, namely the change in learning methods from teacher-centered learning to student-centered learning (J. Lee, Ng, Rabinovich, & Wu, 2016). In addition to the use of appropriate learning methods, new innovations in the field of education are currently trying to introduce students to learn in ways that are different from each other. That is, currently many experts and researchers have laid a strong foundation for accepting and understanding differences between individuals, such as personality types, learning styles, and multiple intelligences. This should be a concern, because when it has entered the new millennium era, differentiation becomes very important in providing services to all students (Truong, 2016)(C. H. Lee, Wang, & Trappey, 2015). For this reason, we need a new perspective in seeing and observing differences in student learning styles which has the potential to be a motivating factor for achieving good cognitive abilities. This can be seen from the results of research (Jerome, Lee, & Ting, 2017) which states that there is a close relationship between student learning styles and the achievement of the average score of students' critical thinking skills and cognitive abilities. Teaching and learning process is a series of interactions between students and educators in order to achieve goals. Learning is a complex process because it is influenced by several things. If these things are not considered, it will cause students to have difficulties in learning and if these difficulties are not immediately overcome will result in low student achievement, it will even result in failure of the educational process so that the competency of graduates becomes low. Based on observations in odd and even semester Academic Year 2019/2020 it was found that learning activities in the Informatics and Communication Studies Program were not going well because the lecturers did not recognize the learning styles owned by the students so that there was no match between the style of the lecturers teaching and the student learning (Sulistyanto, Nurkamto, Akhyar, & Asrowi, 2019). As a result the implementation of the learning process runs monotonous, boring and learning outcomes, in this case the student achievement index,

has not been satisfactory.During this time the lecturer also still did not pay attention to the gender aspects of students in the learning process, however even so the lecturer of the course assesses the tendency of differences in learning outcomes between male and female students.

Based on the description above, the research question was formulated "Are there differences in learning style preferences between students who have different scientific backgrounds and are of different gender?"So this study aims to determine the distribution of Visual, Auditory, Read / Write, and Kinesthetic (VARK) learning styles based on gender and scientific background.

The benefits of this research are: 1) Students are expected to know each other's learning styles so that they are aware of and care about developing their potential through the use of their learning styles; 2) Educators are expected to pay attention to aspects of students' learning styles in the learning process so that they can facilitate students in improving their academic abilities.

Learning style is one of the important aspects that must be considered by lecturers and students in the learning process. After knowing how the student's learning style is, the lecturer can choose a lecture model that fits the student's learning style, and the student is able to devise strategies in learning that are in accordance with his learning style so that he can improve his academic abilities. This is consistent with the opinion (Willingham, Hughes, & Dobolyi, 2015) that the suitability of teaching styles and learning styles can enhance learning effectiveness.

In the categorization of learning styles, (Özyurt, Özyurt, Baki, & Güven, 2013) divides learning styles into three types, consist of visual, auditory, and kinesthetic (VAK). According to (Fleming, 2016) learning modalities are divided into four components, namely visual, auditory, read/write, and kinesthetic abbreviated as VARK. In line with (Fleming, 2016) in a study by (Rijal & Arifah, 2017) VARK is defined as learning style preferences associated with students' sensory use in the retrieval of new information. Students with a tendency to visual modalities generally prefer to use visual media, such as diagrams or graphs, flow charts, and models that present information visually. Students with an auditory learning style will tend to take information from what is heard, so the best way to learn is discussion, lecturing, talking to one-self and others. Reading/writing types of students prefer strings of words and sentences as a means of obtaining information, so they prefer textbooks, lecture notes, leaflets, lists, and glossaries. Furthermore, students with kinesthetic tendencies will combine sensory function abilities, they must feel or experience their learning experiences, preferring practice simulations and real experiences, lessons that emphasize doing activities, trips, exhibitions, samples, case studies and role play. (Jerome et al., 2017) in their research suggested that to provide the best way of learning for each individual, the learning style must be determined or known in advance by considering differences such as personality, perception, ability and intelligence. This is confirmed by research (Terzimehić, Schneegass, & Hussmann, 2018) which explains that learning styles significantly affect student learning outcomes in general.

Learning by considering student learning styles needs to be done so that the interaction between the teacher and students in the learning process can be well established and communicative. This can be fulfilled if the teacher knows and recognizes student learning styles. (Khanal, Giri, Shah, Koirala, & Rimal, 2019) strengthen (Jerome et al., 2017) and Terzimehić et al., 2018) by explaining that students will easily do something well, such as sharing knowledge, with instructors who have style learning the same as students, conversely if there is no match between the teaching style of the teacher with the learning style of the student, then the student will feel bored, not paying attention to the material being taught, and low test results. The diversity of learning style preferences can also be considered with gender differences. Understanding gender here refers to the concept of men and women based on biological, socio-cultural and psychological dimensions. Gender roles are social expectations that determine how men and women should think, act and feel (Rager, 2017). According to (Almigbal, 2015) biologically men and women are different. That difference is clearly seen in the reproductive organs. Biological differences between men and women are caused by the presence of different hormones.Furthermore (Wang & Mendori, 2016) explains that one of the causes of differences between men and women lies in their sex chromosomes. According to him, this causes differences in the brains of men and women in their structure and in the background of their functions. But a little different study from (Wang & Mendori, 2016) where according to (Kintu & Zhu, 2016) the human brain is basically the same, regardless of whether he is male or female. Besides biological factors, other factors that influence students' gender differences are psychological factors. Psychologically men and women are different. Psychological factors are related to intelligence, attention, interest, talent,

discipline, maturity, and readiness. Furthermore, research conducted by (Halili, Naimie, Sira, AhmedAbuzaid, & Leng, 2015) shows that men and women have approximately the same value on the verbal part, but men have higher values on mathematics. Another area of cognitive ability that shows gender differentiation is visual-spatial relations. Men have a higher score, especially if the assignment or test is timed and requires mental rotation of the object (Haberland, 2015). Controversy arises about academic similarities and differences in terms of academics. Such evolutionary psychologists (Willingham et al., 2015) argue that gender differences are sustainable and are caused by adaptive problems encountered throughout evolutionary history. (Halili et al., 2015) agree that gender differences are substantial. He stressed that gender differences occur because of social conditions that have resulted in women having less power and control over resources than men.

Furthermore, a common thread can be drawn that differences that have been found through various studies can only be assumed that this happens to most or the average boy or girl and it cannot be said that the difference applies absolutely to all boys or women.

Finally, it can be conveyed that the research plan is to explore, present information, and analyze differences in VARK learning styles based on scientific background and gender clusters so that they become an important consideration for each lecturer in developing lecture strategies. Learning modality preferences that will be presented are categorized in two aspects, include V, A, R, K (unimodal)and multimodal includes bimodal (VR, VA, VK, RK), trimodal (VRK, VAK, VAR, ARK), and quadmodal (VARK) (Meyer, Stomski, Innes, & Armson, 2016).

2. Methodology

This research is quantitative research with a descriptive design that gives a careful description of an object, both particular individual or group about the circumstances and symptoms that occur, in which describes the profile of student's learning style preferences (Sugiyono, 2016). So that this research is philosophied by post-positivism, in which is conducted to examine the condition of natural objects, data source sampling is done purposively, data analysis is inductive/quantitative, and then research results emphasize the meaning rather than generalization(Retnawati, Djidu, Kartianom, Apino, & Anazifa, 2018).

The subjects of this study were 128 students of the 2018 class of the Informatics Study Program, Faculty of Communication and Informatics Technology (FKI) representing the scientific background in the exact sciences and the Communication Studies Program of the Faculty of Communication and Informatics Technology (FKI) representing a non-exact sciences background, a University, Surakarta, in Indonesia. Data collection techniques used were observation and questionnaire techniques. The main instrument in this study was the VARK questionnaire which contained 16 standard questions related to learning styles. This questionnaire is a standard questionnaire adopted from The VARK Questionnaire Version 7.1 and adapted from www.vark-learn.com. All questions and answers to the questionnaire in this study have been translated from English into Indonesian. Each statement number in this questionnaire has four answer options, each option representing the VARK indicator itself, namely visual, auditory, read/write and kinesthetic. If you only choose one option, the learning styles tend to be unimodal, and if there is more than one, then you tend to multimodal learning styles. Analysis of the data used in this study is descriptive analysis, which describes or describes all the results of the study. The variables that will be displayed include student learning style (modality), where is grouped into two categories, namely unimodal (V, A, R, K) and multi-modal, consist of bimodal (VR, VA, VK, RK), trimodal (VRK, VAK, VAR, ARK) and quad model (VARK). Additional variables that also became determinants in data analysis were gender and scientific background.Identification of learning styles conventionally uses a paper-based questionnaire. In this current study, the deciding of VARK learning style preferences conducted by a questionnaire using a web-based application. The author his selves create this application, which can be accessed online in the domain www.gayakubelajar.com. Examples of questions and answer options in the VARK questionnaire are as follows:

Question:
You have to make an important speech at an important conference or event then you will do it by:
Answer option:
a. Make a diagram or graph to explain something.

b. Write a few key words and practice repeating your speech repeatedly.
c. Write your speech and study by reading several times.
d. Combining many examples and stories to make the conversation come true through practice.

3. Result and Discussion

The determination of learning style preferences is done by a web-based application with the results shown in Figure 1 below.

Modality Determining Result

Student Number	:	H200140007
Name	:	Hernawan
Sex	:	Male
Major	:	Informatics
Item	:	Visual Auditory Read/write Kinesthetic
Preference	:	Kinesthetic

Figure 1. Display determination of learning style preferences

In accordance with the results processing the questionnaire conducted by the application and then collecting learning styles can be seen in the bottom row in Figure 1. The overall data of the learning style assessment results are then formulated programmatically using Equation in Figure 2 below to get the percentage of learning styles according to the diagrams and tables below.

$$Y_{Z,X} = \frac{\sum (X,Y)_Z}{\sum X_Z} x100\%$$

Figure 2. Equation formula on learning style percentage

Where $Y_{z,x}$ presents the learning style y in the study program of z with sex x, $\Sigma(X,Y)_z$ conveys the number of students with sex x and learning style y in the study program of z, and ΣXz displays the number of students with sex x in the z study program.

Based on analysis of the questionnaire data, Figure 3 shows a comparison of learning style composition between Informatics and the Communication Studies Program students in a privateuniversity.
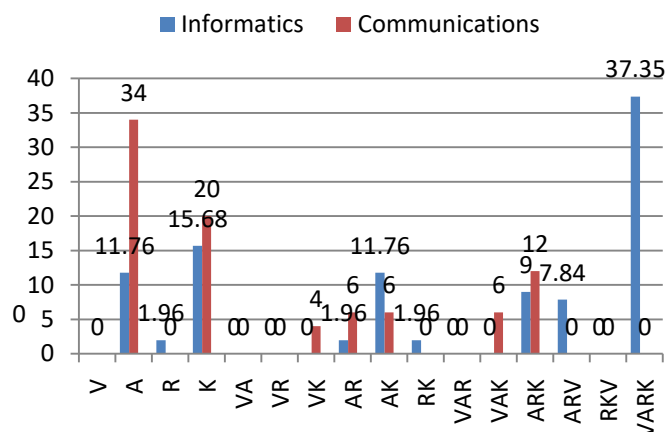

Figure 3. Informatics and Communications student learning style preferences

The percentage in Figure 3 above displays that the Informatics Study Program students have a learning style tendency VARK-K-A=AK-ARK-ARV-R=AR=RK, with A: auditory, K: kinesthetic, V: visual, R: read/write. Meanwhile, Communication Studies students have a learning style tendency A-K-ARK-AK=AR=VAK-VK.

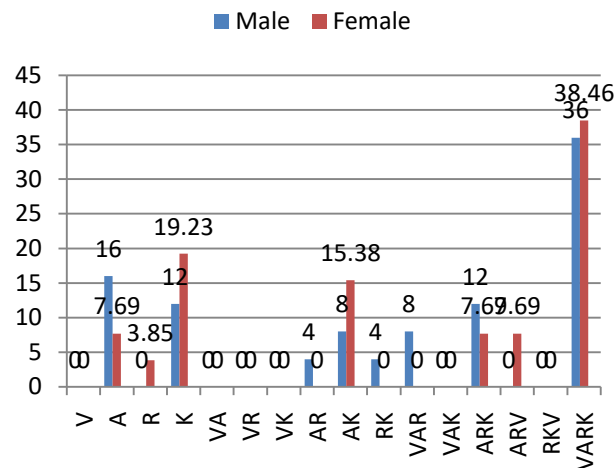Furthermore, Figure 4 presents a comparison based on gender differences in the Informatics Study Program students.

Figure 4. Informatics student learning style preferences based on gender

Figure 4 shows male students of the Informatics Study Program have learning style tendencies from the largest to the smallest percentage, namely VARK-A-K=ARK-VAR=AK-AR=RK, and female students tend to learn from VARK-K-AK-A=ARK=ARV-R. Meanwhile, the comparison of learning style preferences based on gender differences in the Communication Studies Program is illustrated in Figure 5 below.
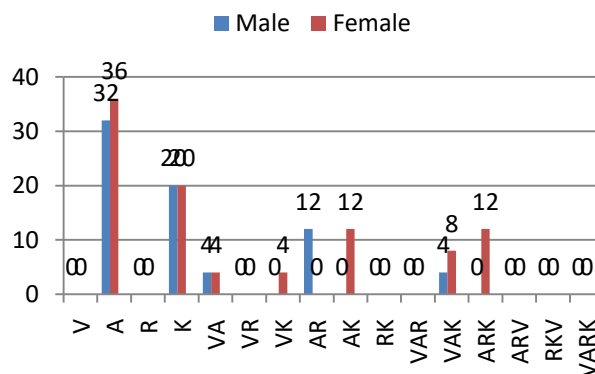

Figure 5. Communication student learning style by gender

In Figure 5, it observed that male students have a learning style preference from A-K-AR to VA=VAK, and the female students of Communication Studies tend towards learning styles A-K-AK=ARK-VAK-VA=VK.

Table 1. Comparison of student learning style preferences.

Learning Modality (%)	Study Program			
	Informatics		Communication	
	Sex	Non-Sex	Sex	Non- Sex
Unimodal	Male Female		Male Female	

V	0	0	0	0	0	0
A	16	8	12	43	43	38
R	0	4	2	0	0	0
K	12	19	16	28	24	22
Total	28	31	30	71	67	60
Multimodal						
Bimodal	16	15	16	23	19	19
Trimodal	20	16	17	6	14	21
Quadmodal	36	38	37	0	0	0
Total	72	69	70	29	33	40

In accordance with Table 1, it can be seen that Informatics students are more dominant in multimodal learning style preferences (70%) than unimodal (30%). In contrast, Communication Science students were more dominant in unimodal learning style preferences (60%) than multimodal (40%). Meanwhile, by comparing between the two study programs, it can be stated that Informatics students (background in exact sciences) have more dominant multimodal learning style preferences (70%) compared to Communication Studies students (non-exact sciences background) who have dominant learning style preferences unimodal (60%).

Furthermore, the Informatics Study Program by Table 1 states that male students are dominant in multimodal learning style preferences (72%) compared to unimodal (28%). Likewise, female students dominate multimodal learning style preferences (69%) than unimodal (31%). But male students have a higher multimodal percentage (72%) compared to female students (69%). In contrast, female students have a higher unimodal percentage (31%) than male students (28%). Table 1 shows that in the Communication Studies Program male students dominated more unimodal learning style preferences (71%) than multimodal (29%). Likewise, female students are more dominant in unimodal learning style preferences (67%) than multimodal (33%). But male students have a higher unimodal percentage (71%) compared to female students (67%). In contrast, female students have a higher multimodal percentage (33%) than male students (29%).

The facts of the learning style preference reveal that Informatics students (background in exact sciences) have multimodal learning style preferences (70%). Vice versa, students from Communication Sciences (with a background of non-exact sciences) dominate learning style preferences in unimodal (60%). Both males and females in the Informatics Study Program have almost the same dominant learning style preferences, namely multimodal. But male students are superior in percentage compared to women, which is 72% and 69%. Both male and female students in the Communication Studies Program have almost the same dominant learning style preferences, namely unimodal. But male students are superior in percentage compared to women, which is 71% and 67%.The existence of data on the results of students learning style preferences in the facultyinforms that lecturers should deliver course material with a variety of methods that combine visual, auditory, read/ write, and kinesthetic. The fact is due to the tendency of learning styles possessed by informatics study program students is the quad model type. Meanwhile, a lecturer who is teaching a lecture in the communication science study program advised using the way of presenting course material by relying on sound. This fact is due to the tendency of the learning style possessed by students of the communication science study program is the auditory type.

The existence of data about the preferences of student learning modalities, lecturers will be able to develop lecture strategies in improving student academic achievement. By conducting learning in a way liked by students, learning will never be a burden. Therefore, it is the responsibility of every lecturer to understand the learning styles that belong to each student in determining the right lecturing strategy.In addition, this data overview can be a reference for every educator in general and lecturers everywhere to help overcome the tendency to treat all students in the same way, providing motivation for teachers to always develop learning models, always innovating in learning that can improve academic achievement.

4. Conclusion

Student learning modalities with exact backgrounds have a multimodal learning style preference of quadmodal types with a percentage of 70%. This means that most students learn with learning styles that combine visual, auditory, read/write and kinesthetic. So if lecturers want to improve student academic achievement, lecturers should use a learning model that encompasses the four learning styles referred to. Instead students with a non-exact background are more dominant with unimodal learning style preferences, which is 60%. The gender differences in one scientific field do not distinguish the learning style preferences that are too far between males and females. Finally, there are differences in learning style preferences against genders of different scientific backgrounds. This conclusion can assume that this matter happens to most of the average male or female, but it cannot state that these differences apply everywhere.

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