



Analysis of Learning Styles of Students Majoring in Computer and Network Engineering

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Keywords

Students majoring in TKJ, learning style, Visual, Kinesthetic, Auditory

Abstract

This research was motivated by the ignorance of TKJ students at SMK Negeri 2 Salatiga about learning styles; some still need clarification about their learning styles. This research was conducted to analyze learning styles and know the dominant learning styles in grade X, XI, and XII TKJ SMK Negeri 2 Salatiga students. Also, to find out the most dominant learning style in TKJ students at SMK Negeri 2 Salatiga. The research method used quantitative descriptive with research subjects of 150 students selected using stratified random sampling techniques. Testing and data collection were done through Akupintar.id website and analyzed by frequency distribution. The results showed that class X TKJ 38% tended to have a kinesthetic visual mixed learning style, grade XI TKJ 56% tended to have a visual learning style, and XII TKJ 44% tended towards kinesthetic visual mixed learning style. Overall, students majoring in TKJ have the most dominant learning style, namely kinesthetic visual mixture, with a percentage of 82%. Students majoring in TKJ predominantly learn by involving their sense of sight and physique in the learning process. This research provides learning style analysis information for teachers as an evaluation material and future learning program plans.

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INTRODUCTION

Student learning style is a crucial factor that is very influential in supporting the learning process. The interaction between students and teachers and learning resources in a learning environment occurs in the learning process. This learning process will later have an impact on student learning outcomes. Students, at the core of learning activities, must learn. At the same time, the teacher is a facilitator who will provide a service to provide convenience for students in learning activities. Teachers must be able to adjust the model to be used in learning activities. Yulianci et al. (2020) stated that a teacher who is said to be professional would adjust learning techniques suitable for his class. Therefore, before teaching, teachers must consider the suitability between learning strategies and the characteristics of each student.

Learning styles are part of the characteristics of students that need to be considered by a teacher. Every student has a different learning style. The students may have more than one learning style. This is because each individual has their dominant side, or in other words, they can have two mixed learning styles to learn something new (Dilmurodovich, 2022). Thus, it does not rule out the possibility that one student simultaneously has one or more learning styles. Abdurrahman & Kibtiyah (2021) said that learning style could be interpreted as a tendency for a person or individual to adjust to a particular learning strategy by looking and trying. Each student uses a different approach, so it varies.

Learning style is an important aspect that needs to be considered because knowing the learning style is owned by each student. This can help students find weaknesses in themselves and learn. Therefore, students must know their learning styles, and teachers must also know each characteristic of each student's learning style because learning styles are also crucial in teaching activities. Because in this case, a teacher will know the various ways students learn and how students absorb the information they receive. If the teacher already knows, it will be straightforward for the teacher to design learning in the classroom effectively. Meanwhile, according to Labu (2021) who said that a teacher who can find out how the characteristics of the learning styles of his students will be able to understand and implement both media and learning strategies that match student learning styles.

Students who know their learning style will soon be familiar with it and can determine the essential steps in learning faster, more precisely and efficiently. Deporter & Hernacki (2013) state that the first step before the learning experience is to recognize learning styles as initial modalities such as visual, auditory, and kinesthetic (V-A-K). From the three modalities, it is known that students with a visual learning style learn through what they see, students with an auditory learning style learn through what they hear, and students with a kinesthetic learning style learn through touch or movement. Yulianci et al. (2020) revealed that every student must vary in learning styles. Therefore, teachers need to know the learning style that dominates students. Thus, teachers can consider appropriate learning techniques to support the learning process.

The phenomenon related to learning styles that occur is that students themselves do not know the learning style they have. Even though recognizing one's learning style needs to be done because, in this case, teachers must know students' learning styles, and students must first know their learning styles. Many students need to learn about the characteristics of their learning styles and even what senses they often use during the learning process Dt Tanamir et al. (2020). From the results of questions and answers conducted with students, some TKJ students of SMK Negeri 2 Salatiga related to whether they know about learning styles; some answered yes because they had been explained in counselling guidance subjects, and some answered forgotten.

Then when asked about their knowledge of their learning style, some students answered that they knew their learning style. While the rest answered, not knowing the learning style he had. After being explained the three types of learning styles such as visual, where students learn to use the sense of sight with their main characteristics, students are easy to learn through what is seen either in the form of pictures or videos, auditory who learn by relying on the sense of hearing with the main characteristics, students are easy to learn by hearing explanations such as lectures or hearing the audio, and kinesthetics who learn using mobile devices with their main characteristics students quickly learn while practising using locomotor or in other words more actively.

After the students heard the explanation of some of these learning styles, several spontaneously answered their learning styles. Other students only answered based on the answers expressed by the theme, and some still needed clarification about the most dominant learning style of several types of learning styles that had been explained, whether one of them was in them or not. So not all TKJ students of SMK Negeri 2 Salatiga know their learning style. Of course, this must be considered if it continues to be left. Then students will learn in ways that are easier for them to do if they know their learning style.

Recognizing one's learning style depends on intelligence in academic and non-academic fields. However, recognizing learning styles is essential for students because recognizing their learning styles will affect the effectiveness of the learning process in the classroom. So that students can capture their learning stability. One way that students can learn optimally in receiving, organizing and processing information from the learning process that has been carried out is to know learning styles by conducting learning style analysis of students through learning style tests. Learning style is a style chosen by each individual to gain knowledge or information about the material taught during the learning process (Daik et al., 2020).

The primary modality in learning that is most important is learning style. If students are familiar with their learning style, this will significantly help them carry out the learning process. Therefore, students need to know that he belongs to which type of learning style of the three learning styles: visual, auditory, and kinesthetic. If students already know what type of learning style they belong to, this will be the principal capital of students in learning and make it easier for teachers to know each student's learning style. So it will be easy for teachers to adjust the learning model to the needs of students. That is why both parties need to know about learning styles. As stated by Nur 'aini et al. (2021), learning styles should not be known by one party only but by both (students and teachers) because both are directly involved in learning.

Research conducted by Dt Tanamir et al. (2020) identified the type of learning style of student-age adolescents in a larger population without grouping subjects at what level of education. However, the current research focuses on narrower subjects, namely students at the secondary school level. Daik et al. (2020) researched groups of junior high school students. As well as previous research from Labu (2021) has conducted research with subjects in groups of high school students. However, many similar studies have been found that have examined learning styles in junior and senior high school students (Such as Supit et al., 2023; Yulianci et al., 2020; Nur'aini et al., 2021; Solihah et al., 2020).

The research subject this time differs from the previous one, namely students at the high school level, such as vocational schools. The SMK students in this study were taken in specific majors, namely students majoring in Computer and Network Engineering (TKJ). The purpose of this research is the first, namely to analyze and find out the most dominant learning styles in grade X, XI, and XII students of TKJ SMK Negeri 2 Salatiga. Furthermore, the second is to find out the most dominant student learning styles in TKJ students at SMK Negeri 2 Salatiga.

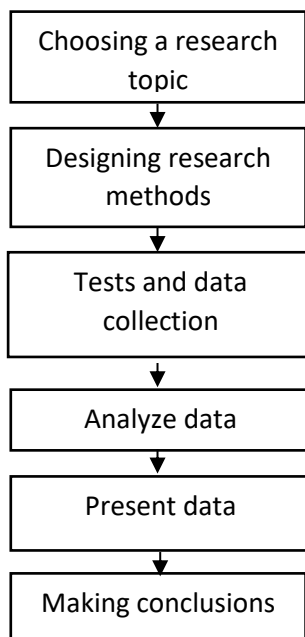
METHOD

The type of research used in this study is descriptive research with a quantitative approach. At the same time, descriptive research aims to make a systematic, factual, and accurate description or picture of the reality and nature of a particular population. Rujakat (2018) revealed that this descriptive research is used as research carried out to determine the value of independent variables in the form of one or more (independent) by not connecting or comparing variables.

The independent variable in this study is learning style, where researchers only analyze without comparing learning style variables with other variables. This research was carried out at SMK Negeri 2 Salatiga. The population in the study related to this learning style was TKJ students of SMK Negeri 2 Salatiga, as many as 150 students with population/sample taking using stratified random sampling techniques. Data collection using learning style tests through akupintar.id website. In implementing this test, students are directed to prepare their devices in the form of mobile phones or other devices.

Afterwards, students are asked to go to the www.akupintar.id website, select the "Interest Aptitude Test" feature, and click "Learning Style Test". In the test, students do 30 questions with answer choices A, B, and C. After taking the test; the results appear in the form of learning styles owned by students. In the end, students are asked to show the test results to be recorded in Excel. After the data is collected, it is analyzed using frequency distribution to determine the number of students with visual, auditory, and kinesthetic learning style preferences. In other words, the frequency distribution provides a clear picture of student learning preferences.

Therefore data can be classified into several categories, such as visual, auditory or kinesthetic. In addition, the frequency distribution is used to indicate the percentage of each category—presentation of data using frequency distribution tables. The data displayed becomes more structured and easy to understand by presenting using a frequency distribution table. This table shows the values of each learning style variable for each class. From the analysis, it will be concluded that most students have visual or auditory learning preferences, or some are more inclined to kinesthetics.

Research flow chart**RESULTS AND DISCUSSION**

The test results are obtained that show the tendency of student learning styles that have been presented in the frequency distribution table. Here are the results;

Data on the learning styles of TKJ students at each grade level

Table 1. Learning Style Preferences of Grade X TKJ Students

No	Learning Style	Frequency	Percentage (%)
1	Visual	6	12
2	Auditori	3	6
3	Kinestetik	11	22
4	Visual Auditori	3	6
5	Visual Kinestetik	19	38
6	Auditori Kinestetik	3	6
7	Visual Auditori Kinestetik	5	10
	Total	50	

Table 1 shows that kinesthetic visual mixed learning styles rank highest, with a percentage of 38%. They were then followed by kinesthetic learning style with a percentage of 22%. The visual obtained a percentage amount of 12%. The learning style is a mixture of visual, auditory and kinesthetic, which has a percentage of 10%. Both auditory and mixed learning styles, such as visual auditory and auditory kinesthetic, obtained a percentage of 6%.

The following is a histogram of the learning style of grade X students of TKJ SMK Negeri 2 Salatiga:

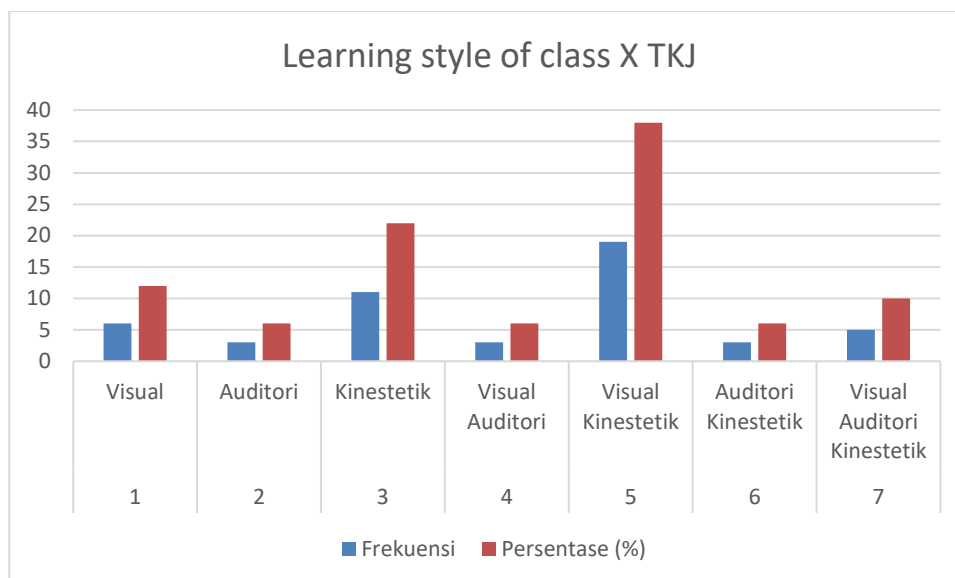


Figure 1. Histogram of Learning Style Preferences of Class X Students of TKJ SMK Negeri 2 Salatiga

The histogram listed in Figure 1.7 shows that the learning style possessed by grade X students of TKJ SMK Negeri 2 Salatiga is a kinesthetic visual mixed learning style of 38%. In contrast, the learning styles that TKJ grade X students least own are auditory and mixed visual, auditory, and kinesthetic learning styles, with the same percentage of 6%.

Table 2. Learning Style Preferences of Class XI TKJ Students

No	Learning Style	Frequency	Percentage (%)
1	Visual	28	56
2	Auditori	4	8
3	Kinestetik	11	22
4	Visual Auditori	6	12
5	Visual Auditori Kinestetik	1	2
	Total	50	

Table 2 shows that the visual learning style ranks highest with a percentage of 56%. Kinesthetic learning style has a percentage of 22%. The auditory-visual learning style has a percentage of 12%. Auditory obtained a percentage amount of 8%. While the rest, namely kinesthetic auditory visual mixed learning styles, have a percentage of 2%.

The following is a histogram of the learning style of class XI students of TKJ SMK Negeri 2 Salatiga:

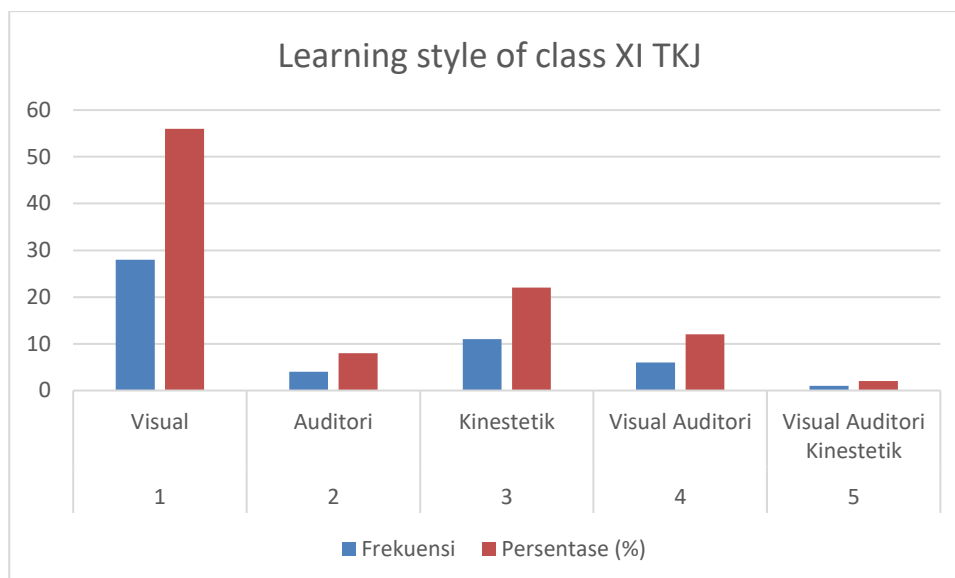


Figure 2. Histogram of Learning Style Preferences of Class XI Students of TKJ SMK Negeri 2 Salatiga

The histogram listed in Figure 2 shows that the learning style possessed by class XI students of TKJ SMK Negeri 2 Salatiga is the visual learning style of 56%. In comparison, the learning style that grades XI TKJ students least own is a diverse visual, auditory, and kinesthetic learning style with a percentage of 2%.

Table 3. Learning Style Preferences of Class XII TKJ Students

No	Learning Style	Frequency	Percentage (%)
1	Visual	6	12
2	Auditori	1	2
3	Kinestetik	9	18
4	Visual Auditori	6	12
5	Visual Kinestetik	22	44
6	Auditori Kinestetik	2	4
7	Visual Auditori Kinestetik	4	8
	Total	50	

Table 3 shows that the kinesthetic visual mix learning style ranks highest with a percentage of 44%. They were then continued with the kinesthetic learning style, which has a percentage of 18%. The visual and visual-auditory learning styles have the same percentage of 12%. Kinesthetic auditory visual mixed learning styles have a total percentage of 8%. Kinesthetic auditory has a total percentage of 4%. Moreover, the rest is the auditory learning style which has a percentage of 2%.

The following is a histogram of the learning style of class XII students of TKJ SMK Negeri 2 Salatiga:

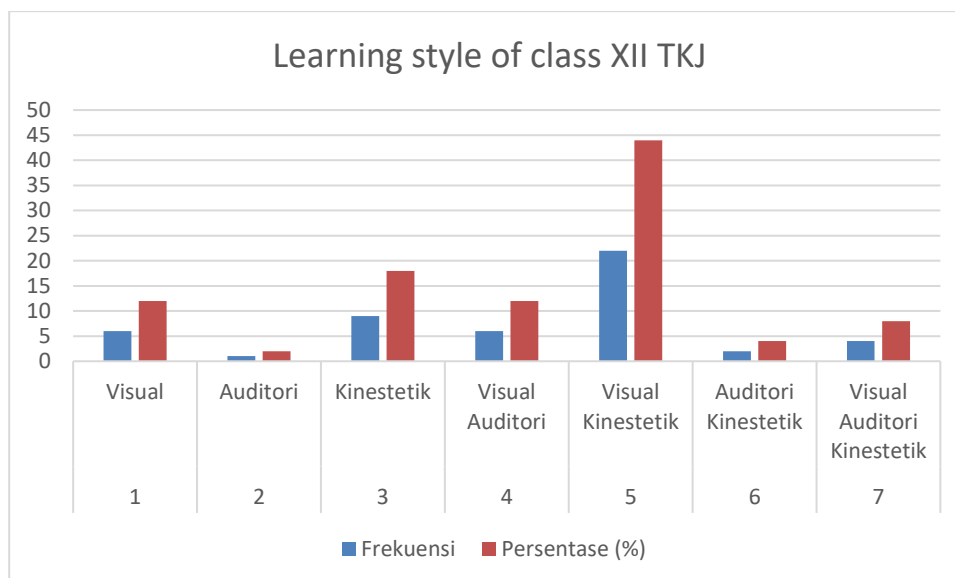


Figure 3. Histogram of Learning Style Preferences of Class XII Students of TKJ SMK Negeri 2 Salatiga

The histogram in Figure 3 shows that the most common learning style possessed by class XII students of TKJ SMK Negeri 2 Salatiga is a kinesthetic visual mixed learning style with a percentage of 44%. At the same time, the learning style that grades XII TKJ students least own is the auditory learning style, with a percentage of 2%.

Data on the learning styles of students of the TKJ Department of SMK Negeri 2 Salatiga as a whole

Table 4. Learning Style Preferences of Students Majoring in TKJ SMK Negeri 2 Salatiga

No	Learning Style	Frequency	Percentage (%)
1	Visual	40	80
2	Auditori	8	16
3	Kinestetik	31	62
4	Visual Auditori	15	30
5	Visual Kinestetik	41	82
6	Auditori Kinestetik	5	10
7	Visual Auditori Kinestetik	10	20
Total		150	

Table 4 shows that kinesthetic visual mixed learning styles rank highest, with a percentage of 82%. They were then followed by visual learning styles, which have a percentage of 80%. Meanwhile, kinesthetics obtained a percentage of 62%. The auditory-visual mixed learning style gains a percentage amount of 30%. Then there is the kinesthetic auditory, visual mixed learning style that obtains a percentage sum of 20%. Auditory obtained a percentage of 16%. Furthermore, finally, there is the kinesthetic auditory learning style with a percentage of 10%.

The following is a histogram of the learning style of students majoring in TKJ SMK Negeri 2 Salatiga:

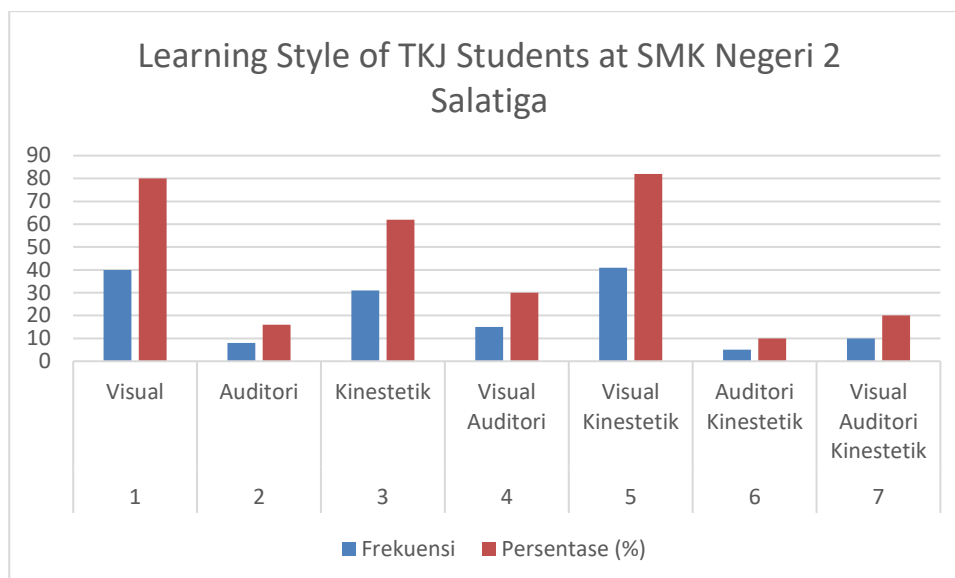


Figure 4. Histogram of Learning Style Preferences of Students Majoring in TKJ SMK Negeri 2 Salatiga

The histogram in Figure 1.4 shows that the overall learning style most possessed by TKJ students of SMK Negeri 2 Salatiga is a kinesthetic visual mixed learning style with a percentage of 82%. In comparison, the learning style least possessed by TKJ students is a kinesthetic auditory mixed learning style with a percentage of 10%.

Learning style preferences found in TKJ students

From the results of research and data processing that has been carried out to analyze the learning styles that exist in students majoring in TKJ SMK Negeri 2 Salatiga, it was found that grade X TKJ students have a percentage of 38% of students with a tendency to kinesthetic visual mixed learning styles. The same learning style preference is also found in class XII TKJ, which both tend to kinesthetic visual mixed learning styles with a percentage of 44%. This means that the class has two types of learning styles; the first is visual. According to DePorter and Hernacki (2013), students with visual learning styles tend to learn to use the sense of sight or in other words, they learn by seeing. Those with visual types are more interested in reading and looking at illustrations.

The second type is kinesthetic, which shows that students with a kinesthetic learning style learn using physical or. In other words, students with this type can learn by moving or touching. Those with kinesthetic types prefer to move and interact in a group. Meanwhile, class XI TKJ with a percentage of 56% of students, tends towards visual learning styles, just like the previous explanation presented by DePorter and Hernacki (2013) regarding visual types students. Those with this type learn with various visual aids, be it graphs, pictures or diagrams. As well as they can quickly memorize something from what they read by taking notes or talking to themselves.

The dominant learning that TKJ students have as a whole

Overall, the learning style of TKJ SMK Negeri 2 Salatiga students shows 82% tending towards kinesthetic visual mixed learning styles. This means that the average student majoring in TKJ tends to use two types of learning styles at once by involving two senses that are used to obtain, absorb and process the information he receives when in the learning process in class. Of the two types, Faiz (2021) stated that students with visual learning styles are individuals who have good vision. They are known to be good at interpreting the shapes, models, and images they see. Although this way of learning depends on what is seen through the senses of the eye and how the brain processes information that becomes easy to understand, this is what makes not all individuals have this way of learning.

Individuals with visual types are also not classified as nerds because they like to read, and they are easily distracted if the surrounding atmosphere is noisy. The kinesthetic type is classified as an individual who cannot be still, and this individual learns by imitating a movement. They also need a prop to absorb information well and prefer to experiment. With most TKJ students having a kinesthetic visual blended learning style, it can be an advantage for educators. Because educators can plan or develop teaching strategies that can later be used in the learning process in each class meeting by relying on two types of learning styles that are dominant in TKJ students, namely visual kinesthetics.

Characteristics of the dominant learning style possessed by TKJ students

With the discovery of the dominant learning style in TKJ students, they have different characteristics. DePorter and Hernacki (2013) revealed the characteristics of the two learning styles most commonly found in TKJ students: The first is the characteristics of visual learning styles found in TKJ students, namely they are easy to remember through various visual sequences or from what is seen. TKJ students showed enthusiasm when delivering material about computer components by showing presentation slides containing pictures of computer components. Even during the post-test, students can name several network components and their functions.

In addition, students also sometimes ask to be shown a learning video. TKJ students also look unexcited when the material is read, so at the end of the lesson, they usually ask for presentation files to be read at home. Next, the characteristics of kinesthetic learning styles are found in TKJ students. Individuals with this type learn by way of practice. This characteristic is seen in TKJ students when there are practical activities in class; they tend to be more enthusiastic about practice in class. TKJ students seem unable to sit quietly and even noisy in class and gather to chat with friends next to them when they finish doing assignments. Not only that, but they also often go back and forth to see their friends' work. TKJ students also cannot stay still without any activities; they are sometimes seen doing other tasks when they have finished doing the assignments given before.

Teaching and learning strategies for teachers and students according to the learning styles of TKJ students

Teachers as educators should also facilitate students learning by paying attention to student learning styles, making learning activities in class more exciting and beneficial for the learning process that occurs in class, especially for students. Each individual indeed receives learning in different ways; of course, this is influenced by teachers who present learning activities according to student learning styles. Therefore, in the learning process in class, students must be assisted and directed to learn to recognize learning styles that suit them. This will be very useful for achieving learning objectives effectively (Solihah et al., 2020).

Because it is not just students who have to know the learning style they have; however, recognizing learning styles is also very important for teachers because this will help teachers apply the proper techniques and strategies for self-development, and if the application is appropriate, it will have a success rate (Cecilia & Nursalim, 2019). Based on the learning style that dominates the TKJ students of SMK Negeri 2 Salatiga, namely a kinesthetic visual mixture. Teachers can vary the way they teach at each meeting by not only providing visual explanations but also by providing practice in class. Cecilia & Nursalim (2019), Wulandari (2011), Chania et al. (2016) and Sari (2014) offer teaching strategies that are tailored to learning styles and can be used by teachers and students while in the classroom.

Les enseignants peuvent ajuster la façon dont ils enseignent aux élèves TKJ qui ont tendance à adopter des styles d'apprentissage visuel, ce qui peut être fait en: a) enseignant aux élèves des concepts à l'aide de symboles, par exemple des composants de réseau tels que des routeurs symbolisés par des rectangles et des lignes centrales, des commutateurs avec des symboles carrés et des lignes horizontales, des ordinateurs avec de petits symboles circulaires, etc., qui sont ensuite utilisés pour décrire la topologie du réseau; b) en tant que support d'apprentissage, les enseignants peuvent utiliser des tableaux ou des graphiques présentés par le biais de présentations PowerPoint sur l'écran du projecteur; c) teachers can also instruct students to record the information they receive according to student creativity such as using pictures or various interesting colors so that students get used to it; d) Also pay attention to the lighting in the classroom during the learning process. Poor lighting will make it difficult for students when practicing using computers and other network components; e) In addition, teachers can take advantage of laptop, computer/LCD, and mobile phone learning media. These learning media can provide reinforcement of knowledge to students because with these media can provide images, videos, or audio at the same time.

As for TKJ students kinesthetic learning style, teachers can adjust the way of teaching by: a) continuously using a physical tool when teaching, for example when delivering material about the introduction of network device components, so that students will more readily accept the meaning and description of what is conveyed by the educator; b) The teacher must also get used to standing or sitting next to the student in other words accompanying the student, for example when the student is practicum, the teacher must move actively such as approaching students who are doing practicum; c) teachers should give students the opportunity or freedom to express the knowledge they have gained through a movement or action; d) When learning takes place always demonstrate what is explained to students by utilizing aids or moving hands and facial expressions to strengthen the emphasis of the material and

student understanding, e) getting used to actively communicating with students while in class by asking which parts are not understood or asking student progress.

The things that can be done by TKJ students who have a visual learning style in the learning process include: a) students can give a colour to their notes, such as underlining the points of the note or giving a different colour to the same object with a particular meaning; b) students can channel their creativity through recording what they get from the learning material that has been delivered by providing pictures or colours; c) students should also understand the concept first in-depth before proceeding to the details; d) and can use a symbol that can represent concepts such as shapes that can be used to describe network topology; e) and imagine while writing when you want to remember something, this is done to facilitate remembering.

Meanwhile, kinesthetic learning style, students can carry out learning activities such as: a) using physical activities to learn, such as direct practice and encountering and interacting with equipment used for practicum; b) using learning aids to absorb learning materials easily; c) in explaining the concept needs to be simulated or analogous in order to understand better the meaning of the concept explained; d) Students can also be next to the teacher to listen to the delivery during the explanation from the teacher. Because by sitting next to the teacher, students can see directly how the teacher practices what is being taught so that students understand how the concepts taught by the teacher are applied in real situations, such as the practice of configuring a router.

CONCLUSION

Based on research findings, problem formulations, and research objectives that have been described, it can be concluded that the learning styles of TKJ students vary greatly; some have visual, auditory, and kinesthetic learning styles and even combined learning styles from two to three types of learning styles. However, each class has a dominant learning style, including class X TKJ, which prefers kinesthetic visual mixed learning styles with a percentage of 38%. Second, class XI TKJ with a preference for visual learning style with a percentage of 56%. Class XII TKJ prefers kinesthetic visual mixed learning style with a percentage of 44%. Thus, it can be seen that the learning style of students of the TKJ Department of SMK Negeri 2 Salatiga tends towards kinesthetic visual mixed learning styles with a percentage of 82%. This shows that most TKJ students at SMK Negeri 2 Salatiga can learn with two learning styles at once, namely kinesthetic visual mixture, which means that students majoring in TKJ have easier obtaining knowledge or information during the learning process with these two types. The first is visual, where students with this learning style learn through graphs or images that can be seen with the sense of sight. Second, kinesthetic where students with this learning style learn by moving or learning by using their physique to be able to obtain knowledge or information quickly.

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