



Analysis of learning styles in terms of knowledge, skills and attitudes

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Abstract: The purpose of this study is to determine the domains of knowledge, skills and attitudes of students which are dominantly influenced by learning styles. The approach used is quantitative research with a correlation method in the form of a survey on 71 high school students in the Aceh Tengah area. The data collection instrument used a questionnaire for learning style data and a documentation study for student learning outcomes data. The results of data analysis using descriptive and inferential statistics show that there is a significant relationship between learning styles and knowledge, skills and attitudes with an average contribution of 17.67%, 14.77% and 72.4% respectively. Based on the types of learning styles selected in this study, the visual learning style is more highly related to students' knowledge, skills and attitudes. The conclusion from the results of this study is that teachers as educators need to know and understand the characteristics of each student's learning style, so as to be able to place students in the right position during the learning process.

Keywords: Learning style, Visual, Auditorial, Kinesthetic, Learning Outcomes

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Introduction

Various terms have been used to explain the meaning of learning styles, including saying the preferred way of learning for students (Farashahi & Tajeddin, 2018); Susilowati, 2018), the ability of students to respond, perceive and interact with the environment (Martin & Bolliger, 2018), or describe variations in the way students learn individually (Odic, 2018). It also used the term cognitive style to respond, view and interact with the learning environment (Valencia-Vallejo et al., 2019). It refers to the concept that individuals are different in terms of how to teach or learn and choose what is most effective for them (Grant, 2020). Although there are several definitions of learning styles, this study chose to use the definition proposed by Odic (2018) and Susilowati since the definition is more significant with the case being studied and the definition is also indirectly related to student learning outcomes.

The learning style inventory has been used by various types of instruments since 1976 (Olanipekun et al., 2020), including using the Cranfield Learning Style Inventory (CLSI) with 30 items covering aspects of seeing, reading, listening and experience (Sudria et al., 2018). It applies the Kolb Learning Style Inventory (Kolb-LSI) includes aspects of divergence, assimilation, convergence, and accommodation (Mpwanza & Dockrat, 2020), and using Honey and Mumford's Learning Style Questionnaire (H&M-LSQ) which includes 4 additional variables from the Kolb model, namely activist, reflector, theoretical, and pragmatic (van Gaalen et al., 2021). Based on these instruments, this study uses the Deporter model instrument (Mashoedah et al., 2018) covering three main aspects, namely



visual (absorbing information by relying on sight), auditory (absorbing information by relying on hearing), and kinesthetic (absorbing information by moving the object).

Some research results show that learning styles affect several other variables, including the learning outcomes significantly (Husmann & O'Loughlin, 2019; Nortvig et al., 2018; Sudria et al., 2018). Learning styles depend on student achievement and gender (Nikoopour & Khoshroudi, 2021) and are affected by the applied learning model (Razzaque & Hamdan, 2020). Learning styles also affect student learning activities (Ardila & Gómez-Restrepo, 2021). Besides, specifically, learning styles are also related to attitudes in mathematics learning (Naenah, 2022; Weng et al., 2018), gender, attitudes and perceptions (Şener & Çokçalışkan, 2018), motivation, attitudes and achievements (İlçin et al., 2018), and attitudes and achievements (Cimermanová, 2018). Several other research results show that learning styles are related to problem-solving skills in mathematics (Kim et al., 2018), critical thinking skills (Muali et al., 2018), higher order thinking skills (Saido et al., 2018), and computer use skills (Kolekar et al., 2018).

Based on the description above and several results of previous studies, it can be understood that learning styles are related to latent variables as well as physical variables, but there are still very few previous studies that have a relationship between learning styles and knowledge or cognitive. Therefore, the research will examine in detail about (a) how the relationship between learning styles and knowledge, skills and attitudes are, (b) what types of learning styles that have a high correlation with knowledge, skills and attitudes, and (c) what the form of the diagram (TAM model) the correlation between the types of learning styles and the realm of learning outcomes is.

Methods

This study uses a quantitative research approach, correlation method and survey design in three classes of High School students in the Central Aceh region totaling 24 students in class XI-IPA1, 27 students in class XI-IPA2, and 20 students in class XI-IPA3.

This study uses a questionnaire to obtain data on student learning styles and study documentation to obtain data or the final score of physics learning outcomes in three domains, namely the value of knowledge, skills and attitudes. The questionnaire to obtain learning style data was adopted from Deporter (Idkhan & Idris, 2021) which refers to the modality model. The purpose of the modality model is that students enjoy learning by using sight, hearing, and movement. Based on the modality model, the Deporter version of the learning style measurement questionnaire covers three main aspects, namely visual (about 14 items), auditory (about 14 items) and kinesthetic (about 16 items). All these items (44 items) used a four-point Likert scale with the categories Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The questionnaire instrument validation was carried out in two stages, namely expert validation and questionnaire testing on a limited sample. Meanwhile, the Documentation Study, which was conducted on the archives of grade XI student report cards at senior high schools in the Central Aceh region, was to obtain data or the value of students' knowledge, skills and attitudes.

The process of data collection is carried out based on the type of data and the applied instrument. Learning style data is collected after the learning process is completed in the current semester. Then, it proceeded with a documentation study to get report cards in the realm of knowledge, skills and attitudes of students who have answered the learning style questionnaire.

There are two types of data that have been collected, namely data from the questionnaire in the form of a Likert scale (4,3,2,1) and data from the results of the documentation study in the form of scores or report cards (0-100). Data analysis was carried out in two stages. On the first stage, learning outcomes data and also questionnaire data were analyzed using descriptive statistics to obtain a total score and an average score. Then, the second stage of data analysis uses inferential statistics to get the correlation coefficient and the coefficient of termination between learning styles and learning outcomes. All data analysis results are displayed in graphical form as shown in Figure 1 to Figure 5.

Result and Discussion

The results of data analysis and discussion are adjusted to the study objectives, namely (a) how the relationship between learning styles and knowledge, skills and attitudes is (Q1), (b) what types of learning styles have a high correlation with knowledge, skills and attitudes (Q2), and (c) how is the form of the diagram (TAM model) the correlation between the types of learning styles and the realm of learning outcomes (Q3). Figure 1 shows the relationship between visual learning styles with knowledge, skills and attitudes.

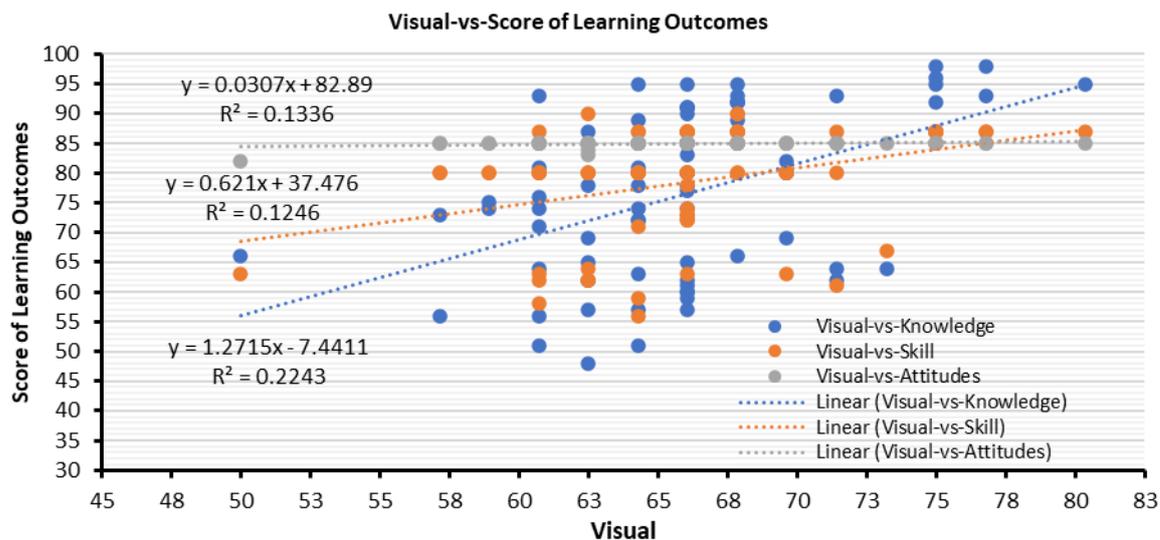


Figure 1. The relationship between visuals and the realms of learning outcomes

Based on Figure 1, it can be understood that the visual learning model has the highest contribution to the learning outcomes of the knowledge domain. After that, the attitude domain and the lowest contribution is to the skills domain results. In other words, students who have a visual learning style have the highest score in the realm of knowledge or cognitive domain. This is because students who have a visual learning style are easier to accept in concepts by using the five senses of seeing or observing if the concept is displayed in the form of images or animations.

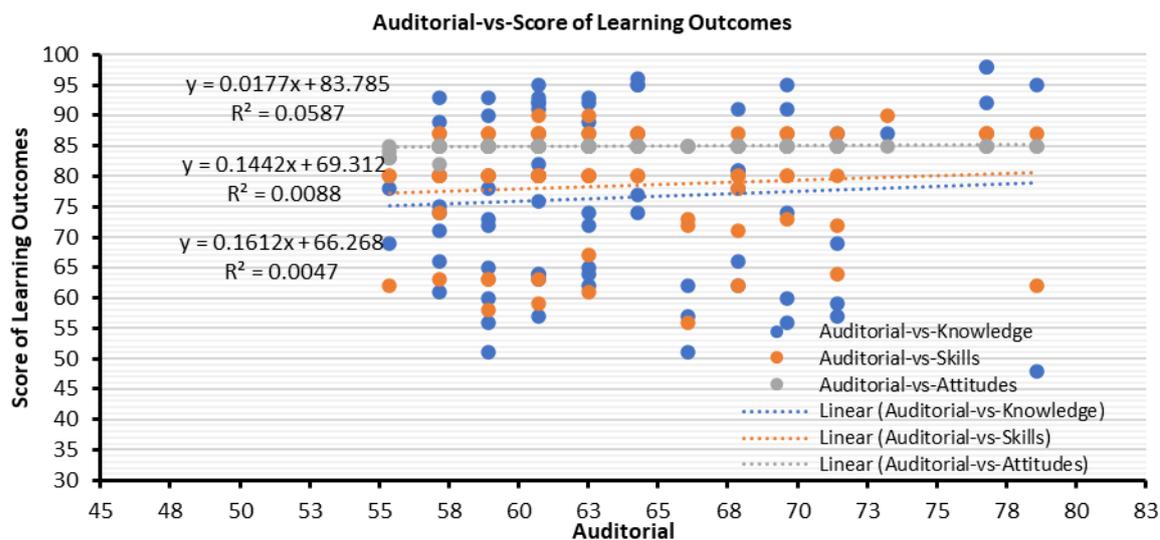


Figure 2. The relationship between auditory and learning outcomes

Furthermore, based on Figure 2, it shows that students who have the auditory learning model have the highest contribution to the learning outcomes of the attitude domain, after that to the skills domain and the lowest contribution to the knowledge domain outcomes. In other words, students

who have an auditory learning style have the highest scores in the attitude or affective domain. This is because students who have an auditory learning style are easier to accept concepts by using the five senses of hearing if the concept is displayed in the form of a video or animation that makes a sound. Based on the two pictures above or Figure 1 and Figure 2, it can be understood that students who have a visual learning style have a higher contribution to learning outcomes in the realm of knowledge compared to students who have an auditory learning style. The same applies to learning outcomes in other domains.

Figure 3 shows that students who have the kinesthetic learning model have the highest contribution to the learning outcomes of the skill domain, after that to the knowledge domain and the lowest contribution to the attitude domain outcomes. In other words, students who have a kinesthetic learning style have the highest grades in the skill domain. This is because students who have a kinesthetic learning style are easier to accept concepts by using the five senses that are easily moved like hands. In other words, students who have this type of learning style enjoy learning that involves movement. Usually, students find it easier to learn something not just by reading a book, but also by practicing it. Doing or touching the object being studied will provide its own experience for the kinesthetic type. Based on the three images above or Figure 1, Figure 2, and Figure 3, it can be understood that students who have a visual learning style have a higher contribution to learning outcomes in the realm of knowledge, auditorial learning styles in the realm of attitudes and kinesthetic learning styles in the realm of skills.

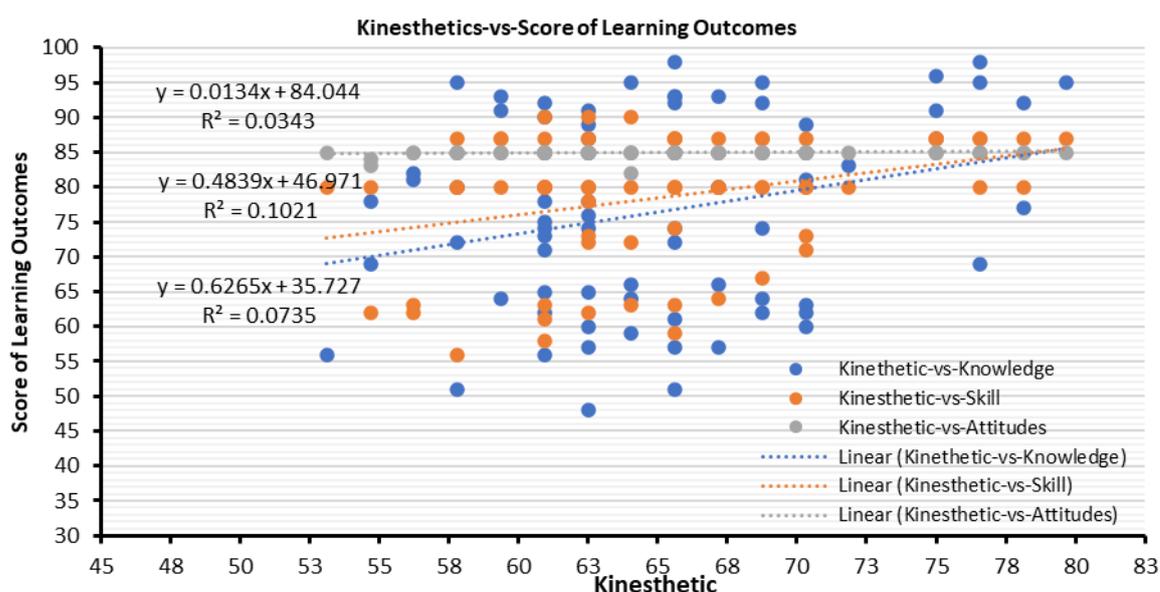


Figure 3. The relationship between kinesthetic and learning outcomes

The graph in Figure 4 shows the relationship between the average score of learning styles with Bloom's domain type learning outcomes. It turns out that the aspect of learning style that contributes the highest to student learning outcomes is in the realm of knowledge. Then, in the realm of attitudes and the lowest contribution is in the realm of skills. If we relate to the results obtained in Figure 1, it can be said that the students who were respondents in this study were more dominant in the visual learning style compared to other types of learning styles. In other words, these students prefer to learn by using the five senses of seeing or observing. In addition, students with visual learning styles focus on sight. When learning something new, it is usually necessary to see something visually to make it easier to understand. In addition, visual types are also more comfortable learning by using colors, lines, and shapes.

The graph in Figure 5 shows the relationship between the average score of learning styles and the average score of learning outcomes. It turns out that overall aspects of learning styles contribute to student learning outcomes about 13% of the total student report cards. In other words, the high or low grades of student report cards are only 13% influenced by student learning styles, while 67%

are influenced by teacher factors, reading books, learning environment, models used by teachers, and others.

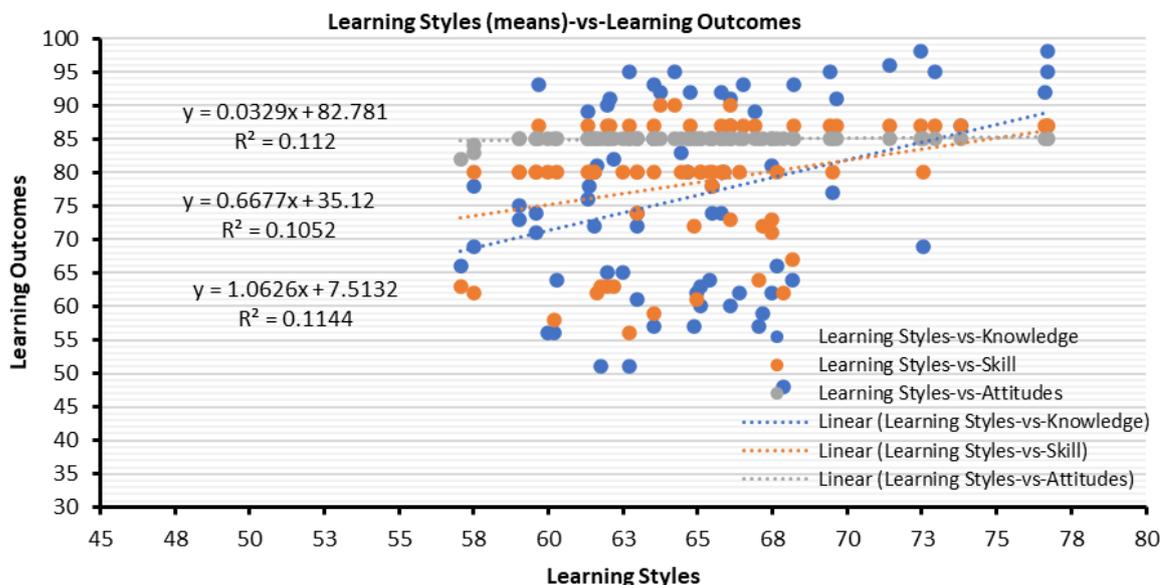


Figure 4. The relationship between Learning Styles and learning outcomes

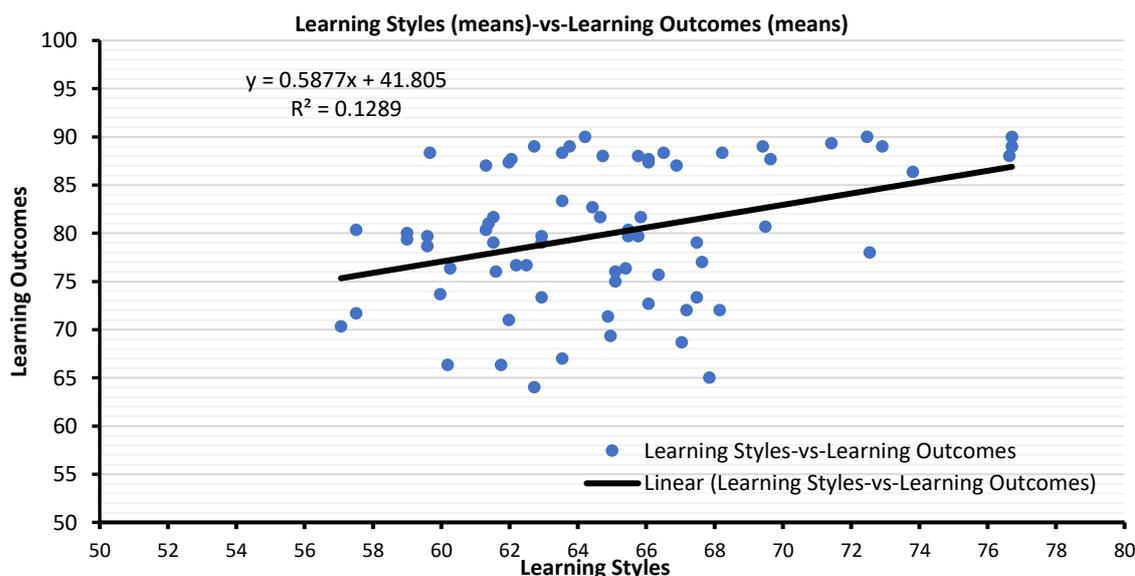


Figure 5. The relationship between Learning Styles and learning outcomes (means)

The information in Figure 6 illustrates the relationship between the types of learning styles and the Bloom realm of student learning outcomes. The learning styles studied are visual, auditory, and kinesthetic, while Bloom's realm of learning outcomes includes knowledge, skills and attitudes. Based on the results of the data analysis shown in Figure 6, it can be concluded that the overall relationship between learning styles and learning outcomes is in the medium and positive categories. The highest correlation is visual learning style to the land of knowledge with a contribution of around 47.4%, while the lowest correlation is auditory learning style to the realm of knowledge learning outcomes.

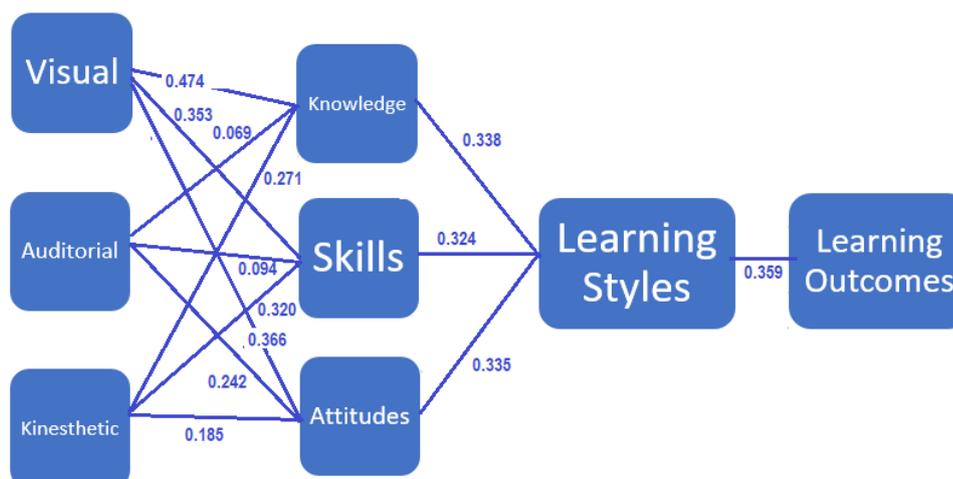


Figure 6. Relationship between Learning Styles and learning outcomes based on TAM Model

Several previous research results also show the same results as this study, including moderate learning styles that affect learning outcomes (Black & Kassaye, 2014) and learning styles that affect student response abilities (Hsieh et al., 2011). It has a strong positive correlation with learning outcomes (Ogundokun, 2011), can improve the ability to solve HOT questions (Nitriani et al., 2022), and influence student achievement (Yilmaz-Soylu & Akkoyunlu, 2009). Besides using learning styles, improving learning outcomes can also be done with several methods, media or other learning models, including using problem-solving learning models (Alqurashi, 2019), interactive-invention teaching strategies (Ukoh, 2022), and generative learning models with virtual lab. (Li et al., 2019), the Inquiry learning method (Razali et al., 2020), the community science technology approach (Mulyanti et al., 2021), including discovery learning-based SWS (Junina et al, 2020), ELSE-based STEM training (Ulfa et al., 2021), virtual Lab-based SWS. PhET simulation (Halim et al., 2021), and the NHT model (Rahayu & Cahyadi, 2019).

Conclusion

It turns out that the aspect of learning style that highly contributes to student learning outcomes is in the realm of knowledge, namely the realm of attitudes with the lowest contribution in the realm of skills. If we relate to the results obtained in Figure 1, it can be said that the students who were respondents in this study were more dominant in the visual learning style compared to other types of learning styles. In other words, these students prefer to learn by using the five senses of seeing or observing. In addition, students with visual learning styles focus on sight. When learning something new, it is usually necessary to see something visually to make it easier to understand. Based on the results of the data analysis shown in Figure 6, describes that the relationship between learning styles and learning outcomes is in the medium and positive categories.

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