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Characteristics of Students in Physics Learning: Learning Motivation, Learning Styles, and Learning Experiences at Senior High School in Padang City

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Abstract. This research aims to analyze the characteristics of students in physics learning, focusing on learning motivation, learning styles, and learning experiences. The research employs a descriptive method with a questionnaire as the instrument, distributed to 54 high school student respondents in Padang City. The data is analyzed quantitatively based on the percentage score for each indicator. The results show that students' learning motivation falls into the good category (73%), the most dominant learning style is kinesthetic (75%), and learning experiences indicate that the use of smartphones and whiteboards has the highest percentage (74%). It can be concluded that the characteristics of students demonstrate good learning motivation, diverse learning style preferences with kinesthetic and audio-visual tendencies, and learning experiences that have started to utilize information technology. It is suggested to develop more interactive learning strategies, integrate various learning media, and accommodate diverse learning styles to enhance the effectiveness of physics learning.

Keywords: learning motivation, learning styles, learning experiences, physics learning, student characteristics

1. Introduction

Physics learning is one of the branches of natural science that studies natural phenomena and their interactions. Physics learning plays a crucial role in the development of technology and the understanding of natural phenomena. The success of physics learning is influenced by various factors, one of which is the characteristics of students. Student worksheets that align with student characteristics can also enhance student engagement in the learning process, and facilitate concept understanding, and process skills [1]. Other factors that influence success in learning include the learning model, media used in learning, learning motivation, learning interest, and the learning environment [2–4]. Student characteristics have a significant role in determining the effectiveness of physics learning [5]. The attributes in question encompass learning motivation, learning styles, and learning experiences. Learning motivation is an internal and external drive for students to actively engage in the learning process to bring about a behavior change [6,7].

Learning motivation plays a crucial role in the physics learning process. It can influence students' engagement, persistence, and achievement in physics learning. Students with high learning motivation tend to be more active, diligent, and enthusiastic in participating in learning activities [8]. Students with high learning motivation are more likely to demonstrate better performance in physics learning [9]. Learning motivation can also affect students' learning outcomes. It has a positive influence on students' physics learning outcomes [10]. Learning styles refer to the preferred ways in which students process, absorb, and use information during the learning process [11]. Learning styles are also a factor that needs

to be considered in physics learning. Each student has a different learning style, such as visual, auditory, or kinesthetic [12]. Audiovisual media using a problem-based learning model can enhance the quality of students' understanding in learning and create a non-boring classroom atmosphere [13]. Understanding students' learning styles can assist teachers in designing appropriate learning strategies. Learning styles have a significant relationship with students' physics learning outcomes [14].

Learning experiences are all activities undertaken by students during the learning process that can influence learning outcomes. Learning experiences also play a crucial role in physics learning. Meaningful and enjoyable learning experiences can increase students' motivation and learning outcomes [15]. Learning experiences can be obtained through various learning activities, such as practicals, group discussions, and presentations. Varied learning experiences can improve students' understanding and physics learning outcomes [16].

Previous research has shown a relationship between learning motivation, learning styles, and learning experiences with physics learning outcomes. High learning motivation tends to result in better learning outcomes [6,8]. Learning styles that align with student characteristics can help improve understanding and learning outcomes [12,17]. Meaningful and enjoyable learning experiences can also enhance students' motivation and learning outcomes [15,16]. Although there has been research on student characteristics in physics learning, a more comprehensive and contextual study is still needed.

This study aims to analyze the characteristics of students in physics learning, focusing on three main aspects: learning motivation, learning styles, and learning experiences. The research results are expected to provide useful information for physics teachers in designing more effective learning that suits student characteristics. Based on this background, the formulation of the problems in this study are: (1) What is the learning motivation of students in physics learning? (2) What are the learning style preferences of students in physics learning? (3) What are the learning experiences of students in physics learning? This research is expected to contribute to the development of student-centered physics learning theory and practice.

2. Method

This research employs a descriptive research methodology. The purpose of descriptive research is to address real-world issues as they exist at the time of the study [18]. Descriptive research methods are used to examine a group of current events, a condition, a group of people, or an object [19]. The descriptive research method involves the following steps: (1) problem formulation, (2) identification of required data, (3) data collection, (4) data processing, and (5) conclusion drawing [20].

This study was conducted at public high schools in the city of Padang. The population in this study consisted of all 11th-grade students from three public high schools in Padang City. The sample consisted of 54 students selected using a purposive sampling technique, considering criteria such as active participation in physics classes and willingness to participate in the research. This sampling technique was chosen to ensure that the selected respondents could provide relevant information regarding their learning characteristics in physics education.

Data analysis in the research was performed quantitatively based on the results of questionnaires previously completed by students. The instrument used in this study was a questionnaire. Before being distributed to respondents, the questionnaire underwent a validation process by three experts in educational assessment and physics education. The validation process included content validation and construct validation to ensure that the questionnaire items accurately measured the intended aspects of student characteristics. The experts evaluated the questionnaire items based on several criteria, including relevance to the research objectives, clarity of statements, language appropriateness, and item formatting. The validation results showed that the questionnaire had a validity index of 0.85, which indicates good validity.

The questionnaire was created using Google Forms and contained various statements. The questionnaire used in this study covered three aspects to be analyzed: learning motivation, learning style, and learning experience. The questionnaire consisted of 40 statement items, with 23 items for the learning motivation aspect, 4 items for the learning style aspect, and 13 items for the learning experience aspect. Each statement item had 4 response options: strongly disagree with a score of 1, disagree with a

score of 2, agree with a score of 3, and strongly agree with a score of 4. The following is presented in table 1 of the student characteristics questionnaire instrument in physics learning used in the research.

Table 1. Indicators for student characteristics questionnaire instrument.

	Learning Motivation
1	I study physics in class earnestly
2	I actively ask questions during physics lessons
3	I try to complete physics assignments correctly
4	My classmates and I are given opportunities by the physics teacher to express our opinions
5	I enjoy getting the chance to answer questions from both teachers and peers
6	I ask the teacher if there are explanations I don't understand or if I have doubts
7	I like to be active in physics learning
8	I enjoy completing physics tasks with friends in a group
9	I don't give up easily when facing difficulties in learning physics
10	I remain enthusiastic about learning even when I get unsatisfactory grades or results that don't meet expectations
11	I never give up when facing challenges in completing physics tasks
12	I will continue to study repeatedly if I don't understand when the teacher explains
13	I understand the purpose of studying physics learning materials
14	I enjoy seeking information related to physics learning from various sources
15	I am interested in and enjoy solving various everyday problems with physics
16	I enjoy linking physics learning with everyday events
17	I enjoy receiving praise from the teacher when I'm deemed successful in answering questions
18	I study hard to become a top student
19	I always pay attention to the teacher's explanations to get good grades
20	A comfortable classroom makes me focus on learning physics
21	I understand the teacher's explanations well
22	I feel happy when the teacher provides physics lessons
23	I complete physics assignments willingly
	Learning Style
24	I understand physics learning materials more easily when the teacher writes on the board
25	I understand physics learning materials more easily when listening to explanations from the teacher
26	I understand physics learning materials more easily when I pay attention to and listen to explanations from the teacher
27	I understand physics learning materials more easily when I conduct experiments or direct trials
	Learning Experience
28	When learning physics, we use smartphones as physics learning aids
29	The teacher uses demonstrations like PhET or virtual laboratories when teaching physics
30	The teacher uses PowerPoint presentations when explaining physics material
31	The teacher uses a whiteboard when explaining physics material
32	The teacher uses the lecture method when explaining physics material
33	The teacher uses learning videos to explain physics material
34	The teacher presents everyday problems that we must solve when learning physics
35	We conduct experiments in the laboratory to solve problems
36	After learning physics, the teacher instructs us to work on project tasks
37	We conduct physics learning outside the classroom
38	I check my understanding of physics learning using worksheets containing physics practice questions
39	I use worksheets as a guide or instructions for carrying out practicals or observations outside the classroom
40	I use worksheets to facilitate the completion of project tasks

The analysis of results is conducted by determining the score obtained for each indicator. The formula for calculating the indicator is as follows:

$$\text{Percentage value} = \frac{score\ obtained}{maximun\ score} \times 100\% \quad (1)$$

Then, the percentage value obtained from data processing is analyzed using the categories in the following Table 2.

Table 2. Questionnaire value categories [21].

No	Category	Value (%)
1	Very Good	80-100
2	Good	70-79
3	Moderate	60-69
4	Less	50-59
5	Very Less	0-49

3. Result and Discussion

This study analyzes the characteristics of students in physics learning. The aspects examined in this research are learning motivation, learning styles, and learning experiences. Data were obtained through questionnaires distributed to and completed by 54 respondents.

3.1. *Learning Motivation*

Learning motivation is a crucial factor influencing the physics learning process. Data analysis results indicate that students' learning motivation in physics education tends to be positive, with an average value of 73.17%, which falls into the 'Good' category. Figure 1 below presents the average percentage of physics learning motivation for each measured indicator.

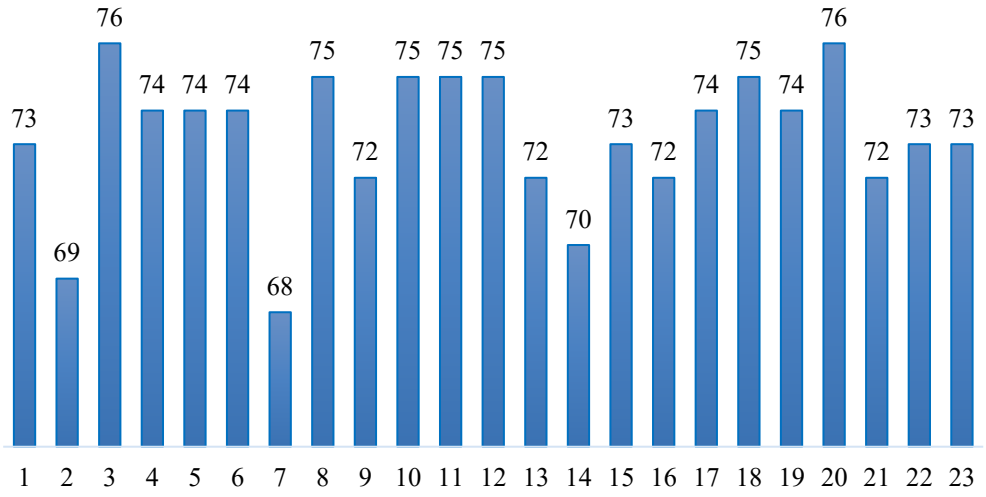

Figure 1. Average Percentage of Physics Learning Motivation per Indicator

Based on Figure 1, the most prominent aspects of learning motivation are indicators 3 and 20, with an average percentage of 76%. This percentage falls within the 'Good' category. Indicator 3 represents the desire to succeed, while indicator 20 concerns a comfortable classroom environment that fosters focus in learning. These are the primary indicators that enhance students' motivation in learning physics. This finding suggests that students possess a strong internal drive to achieve success in physics learning. This result aligns with motivation theory, which emphasizes the importance of achievement desire in the learning process. Student motivation to learn is crucial for educational success [22]. However, there are aspects that still need improvement, namely active participation in learning (indicator 7) with a percentage of only 68%, and active questioning with a percentage of 69%. Both indicators fall within the 'Moderate' category. These results indicate the need for learning strategies that further encourage active student participation. The use of interactive learning media can increase student motivation and engagement in physics learning [23,24]. Therefore, teachers need to develop engaging and interactive learning media to enhance student activity in physics learning.

Overall, the analysis of students' physics learning motivation shows good potential, with an average percentage across all indicators of 73%, falling within the 'Good' category. Nevertheless, further efforts are required to improve aspects of active participation in learning and active questioning. Teachers can design learning strategies that involve students more actively, such as using interactive media, group

discussions, or project-based learning. Thus, students' motivation to learn physics can be further optimized. Learning motivation can be enhanced through the use of varied learning strategies that involve students' active role in the learning process [8].

3.2. *Learning Style*

The analysis of learning styles shows that students have diverse preferences. The following presents the results of the analysis of students' learning styles, displayed in the form of a pie chart in Figure 2.

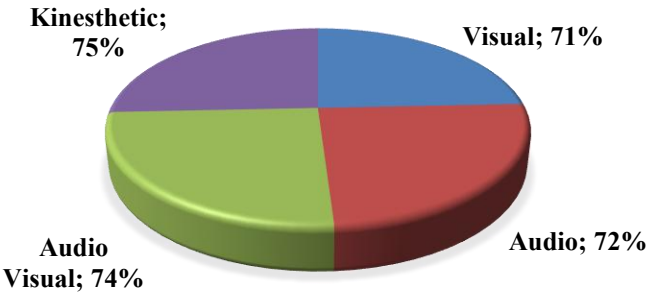

Figure 2. Percentage Distribution of Student Learning Styles

Based on Figure 2, the most dominant learning style is kinesthetic, with a percentage of 75%, falling into the 'Good' category. This result indicates that the majority of students find it easier to understand learning materials through physical activities and direct practice. Students with a kinesthetic learning style tend to comprehend material more easily through direct experience and active involvement in learning [25–27].

The second most prevalent learning style is audiovisual, with a percentage of 74%, also in the 'Good' category. Students with an audiovisual learning style find it easier to understand material through a combination of audio and visual media, such as instructional videos accompanied by audio explanations. The use of audiovisual media in learning can enhance students' attraction, understanding, creativity, and efficiency in learning, generate new ideas, and make learning more engaging and efficient [28,29]. The use of audiovisual media also significantly influences students' learning motivation [30].

The auditory learning style ranks third with a percentage of 72%, falling within the 'Good' category. Students with an auditory learning style find it easier to understand material through verbal explanations and discussions. These students tend to grasp material more readily through oral explanations and interactive discussions in learning. Therefore, teachers need to employ learning methods that involve discussions and presentations to accommodate students with an auditory learning style.

The learning style with the lowest percentage is visual, at 71%, which still falls within the 'Good' category. Although its percentage is lower compared to other learning styles, the visual learning style also needs attention in the learning process. Students with a visual learning style find it easier to understand material from what they see and prefer visual presentations through pictures, diagrams, or graphs [31]. Teachers need to integrate visual media into their teaching to facilitate understanding for students with a visual learning style.

3.3. *Learning Experience*

The following presents the results of the analysis of physics learning media usage, displayed in the form of a bar chart in Figure 3. Based on Figure 3, the use of smartphones as physics learning aids (indicator 1) and the use of whiteboards when explaining physics material (indicator 4) have the highest percentage at 74%, falling into the 'Good' category. These results indicate that smartphones and whiteboards remain frequently used media in physics education. The use of smartphones as learning media can increase students' interest, enthusiasm, and engagement in learning physics [32–34]. Meanwhile, whiteboards are effective media for explaining physics concepts visually and interactively.

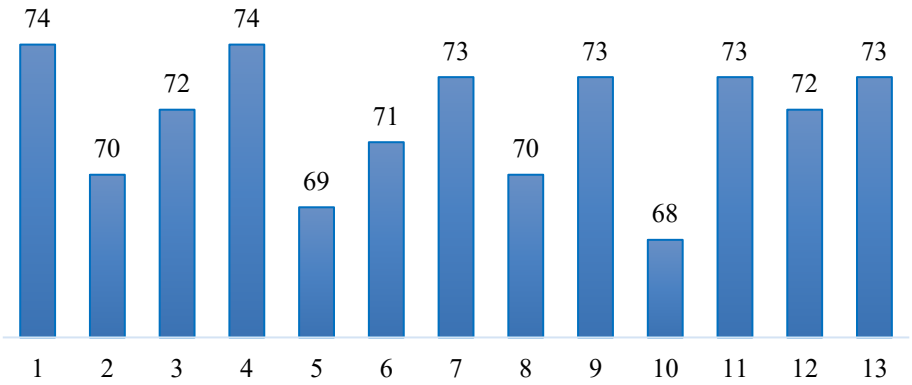

Figure 3. Average Percentage of Learning Experience per Indicator

The use of worksheets as guides or instructions for conducting practicals or observations outside the classroom (indicator 12) is also quite high, with a percentage of 72%. This indicates that worksheets play an important role in guiding students through practical activities or observations. Worksheets can be used as practical guides to enhance students' science process skills [35]. However, there are some aspects of the learning experience that still need improvement, such as conducting physics learning outside the classroom (indicator 10), with a percentage of 68%, falling into the 'Moderate' category. Physics learning outside the classroom can provide a more contextual and authentic learning experience for students. Outdoor physics learning can enhance students' problem-solving abilities and science process skills. Another aspect of the learning experience that needs attention is the use of lecture methods when explaining physics material (indicator 5), with a percentage of 69%. Although the lecture method is still frequently used, teachers need to combine it with more student-centered learning methods. Overall, the analysis of media usage and learning experiences in physics education shows that smartphones, whiteboards, and worksheets remain frequently used media. However, further efforts are needed to increase physics learning outside the classroom and to combine lecture methods with more student-centered learning approaches to optimize students' understanding and skills in learning physics.

4. Conclusion

Based on the results of this study, it can be concluded that the characteristics of students in physics learning demonstrate good learning motivation, diverse learning style preferences with a tendency towards kinesthetic and audio-visual styles, and learning experiences that are beginning to utilize information technology. To enhance the effectiveness of physics education, it is recommended to develop more interactive learning strategies, integrate various learning media, and accommodate diverse learning styles.

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