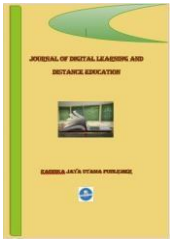

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Psychomotor and Scientific Attitude Assessment to Simple Plane Materials Through Application of Direct Instruction Learning Model

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Abstract

The purpose of this study was to analyze the psychomotor learning outcomes and scientific attitudes of students. This type of research is pre-experimental in the form of a shoot case study. The data analysis technique used is a descriptive analysis by assessing the psychomotor and scientific attitudes of students. The result of this research is that the students' psychomotor absorption ability is classified as good (80.67%). The effectiveness of learning is classified as effective (80.67%). Learning outcomes are classified as complete (88.8%) and classically, psychomotor learning objectives are declared incomplete (63.63%). The scientific attitude of students is classically categorized as high (74.27%). Analysis of psychomotor assessment and scientific attitude can help students achieve the target of completeness that has been set.

Keywords: assessment, direct instruction, elementary school, psychomotor assessment, scientific attitude

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Introduction

Indonesian National Education is carried out in a sustainable manner and by the nation's cultural values and the nation's philosophy. The goals of Indonesian National education have been

stated in Law Number 20 of 2003, namely educating the nation's life, making Indonesian people believe, fear God, have a noble character, physical health, good personality, independence, responsibility, social, national, knowledge, and skill. The goals of Indonesian National educationare in line with the goals of the 2013 Indonesian education curriculum, namely improvement and balance between the affective, psychomotor, and cognitive domains. Indonesia's success in increasing knowledge in the era of Education 4.0 is determined by the quality of teachers. Teachers must have the expertise, be able to adapt to new technologies and be ready toface global challenges (Dzulkifli Isadaud et al., 2022). Therefore, schools must prepare themselves for new literacy and data literacy in the field of education, namely the ability to read, analyze, and use information from datain the digital world (Raffaghelli et al., 2020); (Meyers et al., 2013). In addition, teachers must be able to use digital learning media and conduct good assessments of student learning outcomes.

The assessment aims to determine the level of student ability and collect information in achieving the learning objectives that have been set. Observation and analysis of student work, such as assessing homework, tests, essays, reports, practices, procedures, and class discussions on problems are also included in the assessment (Dwivedi et al., 2023). In conducting the assessment, the teacher analyzes student work based on learning outcomes in the affective, psychomotor, and cognitive domains (Sajidan et al., 2022). In line with the implementation of the assessment in the 2013 Curriculum where teachers conduct holistic assessments in three domains, namely cognitive, affective, and psychomotor.

A good assessment by the teacher can be used as a benchmark for learning success (Schildkamp et al., 2020). On the other hand, teacher errors and misunderstandings in conducting assessments can cause invalidity in obtaining information on student learning outcomes. Therefore, various training on assessment has been carried out so that teachers can assess student work. However, in reality, there are still many teachers who do not understand and have difficulty assessing student learning outcomes as a whole (Magaji & Ade-Ojo, 2023). This condition occurred in Segati 005 ElementarySchool, Pelalawan Regency, Riau Province, Indonesia. During learning the teacher only focuses onthe cognitive domain without ignoring the psychomotor domain and student attitude skills. In addition, the teacher still uses the lecture method in learning so that the learning outcomes of 5th-grade students are low in Physics learning (Simple Plane material) (Yhonara et al., 2022).

One of the factors that influence the learning process of Physics is the psychomotor assessment and scientific attitude skills of students. Psychomotor and scientific attitudes of students toward Physics are positively correlated with learning achievement so students' positive attitudes toward Physics lessons must be improved (Diana et al., 2020). Therefore, a change is needed in creating new experiences for students in obtaining information to improve psychomotor and student attitudes in receiving subject matter, especiallyin the Simple Plane material. One of the efforts made by applying the Direct Instruction (DI) learning model on Simple Plane material (Spencer, 2021). The purpose of the study was to analyze learning outcomes in the psychomotor domain and students' scientific attitudes on the Simple Plane material through the application of the DI learning model. The DI learning model is very relevantto be applied to learn Simple Plane material that explains concepts and procedures. Through the application of the DI learning model, psychomotor learning outcomes and students' scientific attitude skills can be obtained. The DI learning model on the Simple Plane material should providestudents with cognitive pleasure and a scientific attitude in unraveling the intricacies of a puzzle and improving scientific concepts and attitudes or skills that are still wrong and students undergoa process of changing conception.

Methodology

This type of research is pre-experimental, namely by applying the DI learning model. The experimental design used is pre-experimental in the form of A shoot case study. The subjects ofthis study were 5th-grade students, totaling 18 people at the 005 Segati Elementary School, Pelalawan Regency, Riau Province, Indonesia. This study was conducted in three meetings and used two research instruments, namely 1) student psychomotor observation sheets in the form of performance tests, and 2) student scientific attitude observation sheets (aspects of curiosity, hard work, responsibility, concern, be careful, persistent, and discipline). Data collection techniques for psychomotor assessment were obtained from performance tests. The data analysis technique was carried out by descriptive analysis by assessing students' psychomotor and scientific attitudes.

Psychomotor assessment

Psychomotor assessment of students, namely students' psychomotor absorption, learning effectiveness, student learning completeness, and completeness of Simple Plane material.

Student's psychomotor absorption

The formula to determine student absorption:

$$\text{Psychomotor absorption} = \frac{\text{Scores obtained by students}}{\text{Maximum Score}} \text{ X } 100\%$$

To find out the psychomotor absorption of students after learning, the categories in Table 1 are sourced from the Indonesian Ministry of Education and Culture (1995).

Table 1. The result of student psychomotor absorption

Student psychomotor absorption (%)	Category
85-100	Very good
70-84	Good
50-69	Pretty good
0-49	Not good

Learning Effectiveness

After teaching and learning activities are carried out, must be known the effectiveness of student learning. Guidelines for knowing the effectiveness of student learning can be seen in Table 2.

Table 2. The result of learning effectiveness

Learning effectiveness (%)	Category
91-100	Very effective
70-84	Effective
81-90	Very effective
71-80	Less effective
< 60	Ineffective

Student Learning Completeness

a. Individual completeness, individual completeness can be calculated using the following formula:

$$\text{Individual completeness} = \frac{\text{Number of completed LO}}{\text{Number of LO}} \text{ X } 100\%$$

Information:
LO = learning objectives

The Indonesian Ministry of Education and Culture, (1995) states that the criteria of one indicator are declared complete if ≥ 70% of the number of completed students in the measured indicator.

b. Classical completeness and individual completeness can be calculated using the following formula:

$$\text{Classical completeness} = \frac{\text{Number of completed students}}{\text{Total Students}} \text{ X } 100\%$$

Furthermore, the Indonesian Ministry of Education and Culture, (1995) stated that the criteria fora class to be declared complete if it has reached 85% of students who have completed it as a whole.

Completeness of Simple Plane material

a. Completeness learning objectives (LO), can be calculated using the following formula:

$$\text{Completeness of LO} = \frac{\text{Number of students who completed 1 LO}}{\text{Total students}} \text{ X } 100\%$$

The completeness of a LO item with the criteria of each LO is completed if the student answers correctly ≥ 75%.

b. Completeness of lesson materials can be calculated using the following formula:

$$\text{Completeness of lesson materials} = \frac{\text{Number of completed LO}}{\text{Total LO}} \text{ X } 100$$

The criteria for determining the completeness of the subject matter is the completeness of classical learning objectives > 75%.

Scientific Attitudes Assessment

The data collection techniques for the assessment of students' scientific attitudes were obtained from observational data on students' scientific attitudes during the learning process. The data analysis technique was carried out by descriptive analysis by calculating the student's scientific attitude observation score. (Table 3).

Table 3. The result of student scientifi attitude

Student scientific attitude (%)	Category
67-100	High
34-66	Medium
0-33	Low

Results

Learning outcomes are defined as knowledge, skills, and attitudes obtained from learning activities that are manifested in the form of behavior (competence). Consequently, learning in schools is expected to provide students with various experiences that allow them to provide relevant scientific searches. Students are also encouraged to explain their observations in class through writing. Learning Physics, especially on Simple Planes, must provide cognitive pleasure and a scientific attitude for students in dismantling the ins and outs of a puzzle and correcting scientific concepts and attitudes or skills that are still wrong. Physics learning becomes more meaningful when it is taught in such a way that students undergo a process of conceptual change. The results of the psychomotor assessment and scientific attitudes of fifth-grade elementary school students on the Simple Plane material through the application of the Direct Instruction learning model are as follows:

Psychomotor assessment

The psychomotor assessment was obtained from performance tests conducted by fifth-grade elementary school students 005 Seganti during learning. The results of the descriptive analysis of the data obtained information on several assessments:

Student psychomotor absorption

The results of the analysis of students' psychomotor absorption through the application of the DI learning models on Simple Plane material can be seen in Table 4.

Table 4. The result of student psychomotor absorption

Interval	Category	First meeting	Second meeting (%)	Third meeting (%)
85-100	Very good	0	44,44	44,44
70-84	Good	88,88	33,33	50
50-69	Pretty good	11,11	22,22	5,55
Average		81.94	77,08	82,99
Category		Good	Good	Good

In Table 4, it can be seen that the psychomotor absorption of students at the first meeting was categorized as good with a score of 81.94%, in the second meeting the psychomotor absorption of students was categorized as good with a score of 77.08%. The third meeting of the psychomotor

absorption of students is categorized as good with a value of 82.99%. Overall, the average psychomotor absorption of students is classified as good with a value of 80.67%.

Learning Effectiveness

The effectiveness of learning is obtained by calculating the average psychomotor absorption of fifth-grade elementary school students 005 Seganti on the Simple Plane material through the application of the DI learning model (Table 5).

Table 5. The result of learning effectiveness

Interval	Category	First meeting (%)	Second meeting (%)	Third meeting (%)	Total (%)
91-100	Very effective	27.77	5.55	16.66	50
81-90	Effective	16.66	38.88	50	40
71-80	Pretty effective	27.77	33.33	22.22	10
61-70	Less effective	16.66	0	0	-
< 60	Ineffective	11.11	22.22	11.11	-
Average		81.94%	77.07 %	93.30 %	80.67 %
Category		Effective	Pretty effective	Very effective	Effective

In Table 5 it can be seen that the effectiveness of learning at each learning meeting is not the same. The first meeting was in the effective category with a percentage of 81.94%. At the second meeting, it was quite effective with a percentage of 77.07%. At the third meeting, it was in the very effective category with a percentage of 93.3%. Overall learning effectiveness is in the effective category with a percentage of 80.67%.

Student Learning Completeness

The analysis of student learning completeness by fifth-grade elementary school students 005 Seganti in Table 6 shows that 77.77% of students did not complete the Simple Plane material at the 1st and 2nd meetings. At the 3rd meeting, student learning completeness reached 94.44%, which means all students completed learning the Simple Plane material.

Table 6. The result of completeness of student learning

Implementation	Number of students	Percentage	Category
The first meeting	14	77.77	Not complete
Second meeting	14	77.77	Not complete
Third meeting	17	94.44	Complete
Classical completeness		88.80	Complete

The average result of student learning completeness is 88.8% and all students are complete in mastering the learning objectives.

Completeness of Simple Plane Material

The learning objectives are said to be complete if 85% of the students have completed the learning objectives. The results of the learning mastery analysis can be seen in Table 7.

Table 7. The result of the completeness of simple plane material

Learning objectives number	Number of students who completed (person)	Completeness (%)	Category
1	15	83.33	Completed
2	14	77.77	Completed
3	13	72.22	Medium
4	14	77.77	Completed
5	15	83.33	Completed
6	15	83.33	Completed
7	13	72.22	Medium
8	17	90.0	Completed
9	13	72.22	Medium
10	13	72.22	Medium
11	15	83,33	Completed
Average		63.63	Not complete

Based on Table 7, it can be seen that of the 11 psychomotor learning objectives 7 learning objectives have been completed, while the other 4 learning objectives are declared incomplete. Therefore, classically the objectives of psychomotor learning in the Simple Plane material are declared incomplete (63.63%).

Scientific Attitude Assessment

The results of the analysis of scientific student attitudes on the Simple Plane material through the application of the DI learning model are shown in Table 8.

Table 8. The result of the student scientific attitude assessment

Scientific attitude	Meeting			Scientific attitude class average	Category
	1	2	3		
Curiosity	60	60	70	73.3	High
Hard work	60	70	80	82.0	High
Responsible	90	60	70	73.3	High
Concern	50	70	70	63.3	Medium
Be careful	70	70	100	80.0	High
Persistent	80	70	90	80.0	High
Discipline	80	100	100	90.0	High
Average				74.27	High

Table 8 shows that the average score for each scientific attitude indicator varies for each meeting. The average score of classical students' scientific attitudes is categorized as high, namely 74.27%.

Discussion

Assessment of learning outcomes aims to determine the level of student ability and collect information in achieving the learning objectives that have been set. The results of the assessment analysis are used to identify student errors in understanding the concept of learning so that teachers can improve the next learning process. In addition, psychomotor assessment analysis and scientific attitudes can assist students in achieving the predetermined targets of completeness.

Psychomotor assessment analysis results

Psychomotor is a person's skill that involves the senses and muscles in the learning process. In this study, the psychomotor applied was at the level of imitation. This is because the fifth-grade elementary school students have not been trained to do scientific work, so higher levels will encounter difficulties and of course, take a lot of time. Skills at the level of imitation are the ability to perform simple and similar activities to those seen or noticed before. The results of the analysis of students' psychomotor assessment on the Simple Plane material through the application of the DI learning model can be described as follows:

Student's psychomotor absorption

The results of the analysis of students' psychomotor absorption in Simple Plane material through the application of the DI learning model were classified into good categories in all meetings (Table 4). This means that the psychomotor absorption of students is complete in performing the Simple Plane material. Psychomotor mastery of students is supported by the suitability of the learning model used with the learning material (Simple Plane). The DI learning model is designed to teach psychomotor skills or procedural knowledge in addition to well-structured declarative knowledge which is taught step by step. This learning model was developed based on the theory that people learn through imitating the behavior of others who are interested. On that basis, the special feature of this learning model is the existence of modeling, where the model models the behavior or skills that must be imitated by students. The DI model is practically very closely related to theapplication of the demonstration method, which is a method used to show a process, mechanism,or working method of a tool related to learning materials. Therefore, the Simple Plane material isvery suitable to be taught with the DI model. According to (Ritonga et al., 2023), students' psychomotor absorption is influenced by student participation, satisfaction, methods, and learningmodels used.

Psychomotor learning outcomes are the main priority in Physics but not for other subjects (Alhashem & Agha, 2020).Physics is the study of events in nature, which allows research by experiment, a measurement obtained, mathematical representation, and based on general rules. Psychomotor learning outcomes need to be carried out in Physics learning to determine students' absorption and ability to absorb teaching material in the psychomotor domain during the learning process. Zulhelmi's research results show that the psychomotor absorption of students in Physics (Dynamic Electricity) learning is 92.03%. Psychomotor education should begin in the early childhood education process to train psychomotor development and understanding of science.

Learning Effectiveness

In general, the learning process by fifth-grade elementary school students at 005 Seganti School was effective with an effectiveness score of 80.7% (Table 5). This is because theapplication of the DI learning model allows students to be more active and the teacher is only a facilitator. It's just that in this study the effectiveness could not reach the very effective category because the psychomotor assessment was still considered a new thing by students. Through the DIlearning model, students are directly involved in the learning process. Students can conduct experiments, observe things, analyze, prove, and draw conclusions about an object/condition. Learning is said to be effective if it can give students real experience so that the knowledge gainedis more durable and competence occurs between students. The effectiveness of learning can be assessed from students' understanding of physics, students experience the process of training theirpsychomotor skills so that they are more skilled.

In addition, the learning model that is considered the most relevant for learning the psychomotor aspect is the DI learning model. Similar research has been carried out by (Gambar et al., n.d.), namely the application of the DI Learning Model on the Simple Plane material to improve the learning outcomes of fifth-grade elementary school students. The DI learning model is specifically designed to develop the learning process so that procedural knowledge and declarative knowledge are well structured. The DI learning model focuses on learning approaches that can help students learn basic skills and get information. Basic skills are procedural knowledge, namely how to do something and declarative knowledge about knowledgeof something. The DI learning model has four activities, namely presentation, practice, assessment, and evaluation, as well as monitoring and feedback. The DI learning model is systematic, provides meaningful learning, and systematic experience, keeps students engaged, is designed for the whole group learning-oriented with an emphasis on factual knowledge, and emphasizes teacher/student interaction at every point in the lesson.

Student learning completeness

A student is said to be complete if he has mastered 75% of the learning objectives that have been given. Student learning completeness can be measured through the level of achievement of student learning objectives, either individually or classically. Classically, all fifth-grade elementary school students 005 Seganti are complete in mastering the learning objectives with a completeness score of 88.8% (Table 6). Mastery of psychomotor learning of students is achieved because learning takes place through performance. The performance test is carried out with a turn system and a predetermined working time limit, which varies depending on the level of complexity of the questions. Through performance, students can experiment, experience, and prove for themselves what they have learned. Performance can provide opportunities for students to follow a process, observe an object, analyze, prove, and draw conclusions about an object and situation. Performance can help students understand Physics lessons on Simple Plane material.

With performance, students can prove to themselves the theories that have been taught in class. Fair and representative performance and assessment instruments for Physics practicum can improve students' psychomotor skills. Psychomotor skills are related to motor development, muscle coordination, and physical skills. Especially in natural sciencesubjects, the psychomotor domain is concerned with outcomes involving ways of manipulating instruments. The psychomotor domain in natural science learning can be divided into fourcategories, namely moving, manipulating, communicating, and creating. Science learning is always related to practical activities and performance to

assess students' psychomotor skills (Nurafiati et al., 2018). Assessment is carried out to determine the achievement of competence and completeness of learning outcomes achieved by students.

Completeness of Simple Plane Material

Learning objectives are said to be complete if 85% of the number of students have completed achieving these learning objectives. The learning material is said to be complete if the number of fifth-grade elementary school students 005 Seganti in one class has completely mastered the learning material. The results of the analysis of the classical psychomotor learning objectives on the Simple Plane material were declared incomplete with a value of 63.63% (Table 8). This is because students are less careful in using tools, the order that students should do in assembling tools, and lack caution in arranging tools. This is understandable because compiling a series of Simple Plane experimental tools is a bit complicated. Therefore, it is necessary to have repeated psychomotor skills training in preparing experimental tools.

A simple machine is a tool used by humans to make work easier so that by using a simple machine a heavy load can be lightened. Simple planes are one of the physics subjects studied in elementary school. Science education is taught starting at the elementary school level and plays an important role in the entire educational process. Science education is a challenge that must be faced and strived for so that it gains an equal position with all stages in the world of children's education and provides broader insight. (Vartiainen & Kumpulainen, 2020), defines science for children as observing what happens, trying to understand the object being observed, using new knowledge ofwhat will happen, and testing predictions under conditions to find out the truth of the predictions.According to (Strat et al., 2023), the purpose of science education in elementary schools is to provide knowledge and science concepts that are useful in everyday life,generate curiosity and a positive attitude, and process skills to investigate nature and its surroundings.

Scientific Attitude Assessment

The assessment of the scientific attitude of fifth-grade elementary school students 005 Seganti is classically high, namely 74.27% (Table 8). This proves that the application of the DI learning model can train students' scientific attitudes. A scientific attitude is an attitude that must be owned by a researcher when he encounters scientific problems. Students' scientific attitude toward Physics is positively correlated with learning achievement so students' positive attitudes toward Physics lessons must be increased. Nine aspects of scientific attitudes can be developed in elementary school students, namely curiosity, the attitude of wanting to get something new, the attitude of not despair, the attitude of not being prejudiced, introspective, responsible attitude, free-thinking attitude, and self-discipline attitude. Students' scientific attitudes can be assessed through performance activities. Through performance activities. In the laboratory, natural phenomena and physical concepts are discussed in class and proven. The process of introducing and experiencing science directly has a positive effect on students' scientific attitudes.

Scientific attitude assessment is an assessment of the affective domain that aims to determine students' attitudes toward science learning. The assessment of scientific attitudes in this study was in the form of observation sheets of students' scientific attitudes during the learning process. The scientific attitude of students in science learning must be developed so that students can respect the work of others and respect themselves (Fahmidani & Rohaeti, 2020). Similar research has also been carried out by (Muaziyah et al., 2023), that researching the Analysis of Scientific Attitudes in the Implementation of Science-Biology Learning Practicum for Class VIII Students in Junior High School. According to (Artaga, 2021), researched Mastery of Science Concepts Improves

Scientific Attitude in Elementary School Students. (Eugenio-Gozalbo et al., 2020) researched Students' scientific attitudes during the Implementation of innovative green garden-based education. The scientific attitude of students is formed by science teachers who have competence in learning science. Scientific attitudes are very meaningful in social interactions, science, and technology (Mao et al., 2021). The scientific attitudethat already exists in students will form good students in performing and interacting with their environment.

Conclusion

Assessment of learning outcomes aims to determine the level of student ability and collect information in achieving the learning objectives that have been set. The psychomotor assessment and scientific attitude of elementary school students 005 Seganti, Pelalawan Regency, Riau Province, Indonesia on simple Plane material through the application of the DI learning model have been successfully carried out. The results show that the psychomotor assessment of students' psychomotor absorption is classified as good with a value of 80.67%. This means that the psychomotor absorption of students is complete in performing the Simple Plane material. The effectiveness of learning is in the effective category with a percentage of 80.67%. This is because the application of the DI learning model allows students to be more active and the teacher is only a facilitator. The average result of student learning completeness is 88.8% and all students are complete in mastering the learning objectives. Mastery of psychomotor learning for fifth-grade elementary school students 005 Seganti is achieved because learning takes place through performance. Through performance, students can experiment, experience, and prove to themselves what they have learned. This is because students are less careful in using tools, the order that students should do in assembling tools, and lack caution in arranging tools. classically the purpose of psychomotor learning in the Simple Plane material is declared incomplete (63.63%). The scientific attitude of students is classically categorized as high, namely 74.27% on the Simple Plane material. This proves that the application of the DI learning model can train students' scientific attitudes.

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