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Application of the Guided Inquiry Model to Improve Psychomotor Skills and Interest in Learning Physics

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Abstract: This study aims to find out how to apply the guided inquiry learning model to improve the ability of psychomotor skills and learning interests of grade X students of TKPI SMKN Fisheries Riau Province. This type of research is a Classroom Action Research Physics model of Kemmis and Mc Taggart which consists of 2 cycles, where each cycle includes stages of planning, action and observation, as well as reflection. In cycle I, students learn about temperature and heat, and cycle II, students learn about dynamic electricity. Data collection techniques include observation sheets of teacher and student activities, performance tests, and interest questionnaires. The subjects of this study were grade X TKPI students, totaling 16 male students.The data were analyzed in descriptive, qualitative and quantitative manners. Observations are made by peers to observe the implementation of teacher and student activities in accordance with the learning steps in RPP. Performance tests are carried out at the end of each cycle. Filling out the learning interest questionnaire at the end of cycle I and cycle II. The results of research on how to apply the guided inquiry method are by the way the teacher makes an orientation of a problem that will be formulated by students to attract students' attention, then involves students directly in making hypotheses, conducting experiments, analyzing data to train students' psychomotor skills, so that students are happy in making conclusions for the theories they get. The research data showed that teacher activities and student activities were carried out according to the RPP, with very good criteria, students' psychomotor skills at the level of imitation, manipulation and precision trained in each learning meeting, increased by 25%, from 69% classical completeness to 94%, and students' interest in learning physics after applying the guided inquiry learning model increased by 16% from 65% with sufficient criteria to 81% with very good criteria. Students have a feeling of pleasure being actively involved in the learning process, so they are interested and more attentive to learning.

Keywords: Guided inquiry; Interest in Learning Physics; Psychomotor Skills

Introduction

One of the subjects at the Vocational High School (SMK) level is physics, which can support vocational subjects on an ongoing basis. Physics is a study that investigates the non-living phenomena of nature and all that accompanies them, discussing nature and its phenomena logically, empirically and rationally with a scientific attitude (Padalkar et al., 2022; Rizkiyatullah et al., 2019). Good physics learning emphasizes providing direct experience to students to actively participate in the learning process. Students make hypotheses, predict, test hypotheses, manipulate objects, solve problems, uncover questions, express ideas to form new knowledge, so that students will be able to apply them in everyday life (Istiyono & Kadarisman, 2017). But in reality physics learning still uses conventional methods that are less effective and abstract, making it difficult for students to understand (Siregar, 2018).

Proper learning needs to be applied in teaching physics at school, so that students can understand physics concepts fundamentally so that physics learning

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objectives can be achieved. Student understanding of the teaching material will be more effective if students not only acquire the concept but students are also able to find the concept themselves (Wijayanti, 2020). Confucius stated that "what I do, I understand", what I do, I understand (Mandolang et al., 2022). This means that when teachers often provide learning activities that are skillful, students will better understand them and can only be obtained, among others, through practicum.

Practicum is carried out with the aim that students can experience formulating problems, proposing and testing hypotheses through experiments, designing and assembling experimental instruments, collecting, processing, and interpreting data, and communicating experimental results orally and in writing (Fahrurrozi, 2020). The reason for the importance of practicum is that it can generate motivation and interest in learning, can develop basic skills in conducting experiments/psychomotor skills, become a learning vehicle for scientific approaches and support the understanding of subject matter (Nooijen, 2017). Psychomotor skills are related to human physical activity, the skills themselves indicate a person's level of expertise in doing things (Mandolang et al., 2022; Susilawati, 2017). In addition, the psychomotor aspect according to Dove is a realm whose measurement can be seen from the level of competence such as imitation, manipulation, accuracy of movement, articulation, and naturalization (Haristo Rahman, 2020).

Some problems in the learning process, among others: learning that is still teacher centered; lack of student response in the learning process, tends to be passive; students do not participate in learning; many students make assignments by cheating such as the many similarities in answers between one another; if working in groups only one student works the other only rides; students tend to memorize the material given instead of mastering concepts; practicum activities are rarely carried out because of the lack of adequate facilities and infrastructure. This results in low psychomotor competence of students. As a result, interest in learning physics is also reduced.

These problems must be overcome immediately, among others, by improving the learning process, namely improving learning models and learning media so that teachers are expected to be able to teach cognitive, psychomotor and affective skills to their students better (Yani et al., 2020). To bridge and develop psychomotor abilities in students, a learning model is needed that can increase interest in learning better physics. The learning model that can be applied to solve learning problems is the guided inquiry model (Prahani et al., 2016).

The guided inquiry model is a learning model whose activities involve students making observations, questions, finding sources of information, designing investigations, conducting experiments, analyzing data, formulating answers, and presenting experimental results (Elselia, 2023; Leli & Sipayung, 2019). While the teacher as a facilitator in the learning process. The advantages of guided inquiry are helping students develop mastery of students' cognitive skills and processes Sutoyo et al. (2019), being able to form and develop fundamental concepts in students, so that they can understand concepts and ideas better; fostering students' confident attitudes towards the results obtained; Can provide opportunities for students to learn on their own; and Can develop individual skills (Sudiatmika, 2022).

Interest in learning also needs to be cultivated from within students, because it shows that they are motivated to learn more about the topic being studied. Interest in learning is often shown by students who are happy when learning, show a lot of attention while learning, and are involved in the material taught (Wati et al., 2021). Students who have an interest in a lesson will study it seriously because of the attraction to it, so it can be defined that interest in learning is a condition that shows a tendency to be attentive or interested in a particular lesson (Russell & Martin, 2023).

Based on the description above, it explains that the importance of psychomotor skills to be mastered by students and attract students' interest in learning physics based on the basic competencies that have been set. The purpose of this study was to analyze psychomotor skills and interest in learning physics of vocational students in Dumai City, Riau Province.

Method

The type of research is the Kemmis and Mc Taggart model of Classroom Action Research (CAR) which is carried out as many as 2 cycles, with temperature and heat material, and dynamic electricity. The methods used in this CAR are qualitative and quantitative analysis. The stages in this CAR consist of planning learning tools and research instruments, actions, observations, and reflections (Lari et al., 2019). Broadly speaking, it can be seen from Figure 1.

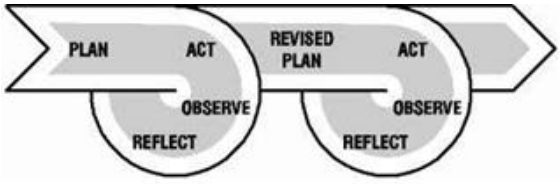

Figure 1. Kemmis and Tagart Model Class Action Research Cycle (Arikunto, 2006)

Planning Phase

The planning stage consists of making learning tools using guided inquiry methods in the form of Learning Implementation Plans and Student Worksheets, as well as making psychomotor skills instruments and learning interest questionnaires. Validation of devices and instruments is carried out for the validity of research data retrieval tools.

Implementation Phase

Teachers carry out activities that can direct students to be psychomotor skilled and interested in learning. Teachers carry out activities that can direct students to be psychomotor skilled and interested in learning.

Stage of implementation

The implementation / action stage is for teachers to conduct learning using validated leasson plan and student worksheet tools. The implementation is carried out following the learning stages of the guided inquiry method. Students will be trained in psychomotor skills aspects of imitation, manipulation and precision at the inquiry stage, conducting experiments and analyzing data.

Observation/evaluation stage

The observation / evaluation stage is the stage where analyzing weaknesses and strengths to be taken into consideration to enter the next cycle. Data collection techniques are carried out by assessing teacher and student activities through observation sheets, conducting performance tests and providing questionnaires of interest in learning at the end of each cycle. Teacher and student activity sheets are arranged with a grid in Table 1, if the activity is carried out by the teacher or student check in the column "Yes", value 1 and if the activity is not carried out, check in column "No", value 0.

Table 1. Teacher and Student Activity Grid

Activities	Yes	No
Ask questions related to the material		
Formulate a problem		
Creating hypotheses		
Collect experiment data		
Collect experiment data		
Drawing conclusions		

(Adapted from Septi Budi Sartika &; Noly Shofiyah (2020)

Psychomotor skills are measured at the level of imitation, manipulation and precision. Students conduct an experiment, which consists of 3 questions for each cycle. The results of the student performance test if more or equal to 75, are declared passed, while scores below 75 are declared not passed. The average psychomotor skills abilities of students at the level of imitation, manipulation and precision are calculated according to the formula 1.

$$\text{Average} = \frac{\text{Number of scores obtained from all students}}{\text{Maximum score x number of students}} \times 100 \quad (1)$$

The learning interest questionnaire consists of 20 questions, using a scale of 4, there are negative and positive questions and the reliability score is 0.89. The learning interest questionnaire grid used is as shown in Table 2.

Table 2. Questionnaire grid of interest in learning physics

Dimension	Indicators	Statement Item		Total Grains
		Positive	Negative	
Feelings of pleasure	Students' views/opinions on physics lessons.	1, 2	3	3
	The feelings of students during physics lessons.	4	5	2
	Opinions of students about physics teachers.	6	7	2
Student Engagement	Activeness during physics learning	8, 9	10	3
	Awareness of learning physics at home.	11, 12	0	2
Interest	Student response to assigned assignments.	13	14	2
	Curiosity towards physics lessons.	15, 16	17	3
Attention	Attention of students while studying in class.	18,19	20	3

Questionnaires that have been filled in by students are converted into student answer choices to assessment rubrics in Table 3.

Table 3. Learning Interest Questionnaire score rubric

Criterion	Statement Score	
	Positive	Negative
Totally Agree	4	1
Agree	3	2
Disagree Less	2	3
Disagree	1	4

The data obtained calculated the percentage of learning interest value in each aspect, and categorized the final value according to Table 4.

Table 4. Student Physics Learning Interest Category

Value	Interval Categories
80 – 100	Very Good
66 – 79	Good
56 – 65	Enough
<55	Less

Source: Arikunto (2006)

The value obtained from the interest questionnaire, compared to the percentage of students' interest in learning physics at the end of each cycle to determine changes in students' interest in learning physics after being trained with a guided inquiry model during the learning process.

Result and Discussion

Planning stage to develop and validate learning tools and research instruments. The recapitulation of the validation assessment by lecturers is shown in Table 5.

Table 5. Recapitulation of Validator Values

Validated Devices/Instruments	Value			Average	Recommendation
	V1	V2	V3		
Leasson Planning	91.6	82.8	86.5	86.96	Can be used with minor revisions
Student worksheet	94.4	91.6	93.0	93.0	Can be used without revision
Teacher Observation Sheet	85	85	90	86.7	Can be used with minor revisions
Student Observation Sheet	87.5	91.7	95.8	91.7	Can be used without revision
Psychomotor Therapy Instrument (Performance Test)	87.5	85	93.7	88.73	Can be used with minor revisions
Learning Interest Questionnaire	95	95	87.5	92.5	Can be used without revision

Table 5 data shows that learning tools are ready for use, as well as research instruments. Researchers coordinate with colleagues to become assessors or observers, recording the implementation or not of learning by teachers or students.

The learning implementation stage starts from the steps of formulating problems, making hypotheses, conducting experiments to obtain data, analyzing data and making conclusions. The implementation of learning uses experiments every meeting. The first meeting of the first cycle of experiments investigated the effect of heat on changes in the temperature of objects. The second meeting of cycle I, investigating the effect of heat on changes in the form of substances. The third meeting of cycle I, conducted experiments on heat transfer by conduction and convection.

In the observation stage, colleagues fill out observation sheets of teacher and student activities. The first meeting in cycle I, teacher activity was only carried out 90%, while students only 85%, as shown in Figure 2.

At the beginning of learning, students are not familiar with the application of this guided inquiry model, so it takes a lot of time to guide students to adjust. Students are still embarrassed to ask, unable to answer the teacher's questions. And it is not unusual to do a physics experiment. Teachers should always guide students in doing step by step inquiry steps. The teacher also did not have time to carry out the closing activity, namely concluding the material and reflecting on the first meeting.

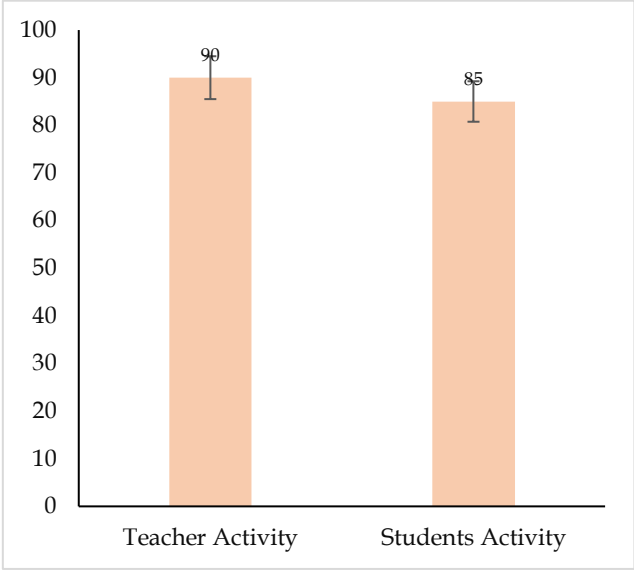

Figure 2. The value of implementing learning activities using the guided inquiry model

The reflection stage is carried out by discussing with observers about the shortcomings of the implementation that has been carried out, to improve the learning process of the next meeting. Improvements that need to be made are summarized in Table 6.

Table 6. Reflection on the application of the guided inquiry model

Phase	Deficiency	Repair
Formulating Problems	The teacher has not maximally guided students to contribute ideas for the formulation of hypotheses.	Teachers maximize motivation for students to gather information from various sources for formulations and hypotheses.
Collecting Experiment Data	Teachers have not maximally monitored students working together to compile experimental results at student worksheet.	Teachers maximally monitor students working together to compile experimental results at student worksheet.
Making Conclusions	Students are not precise in concluding the results of investigations that have been carried out.	Teachers provide guidance and encouragement to students seeking information from a variety of sources.

Psychomotor skills are trained during learning and tested at the end of each cycle. The results of students' psychomotor abilities in cycles I and II can be seen in Figure 3.

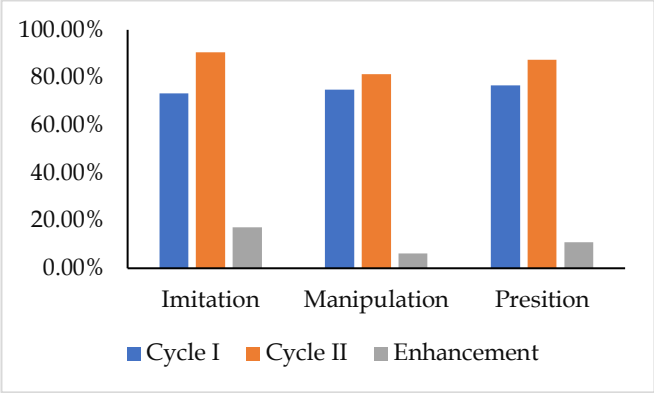

Figure 3. Psychomotor Skills Cycle I and II

An increase in the imitation rate, 17.02, an increase in the manipulation rate of 6.30 and an increase in the precision rate of 10.90. This shows that students have excellent psychomotor skills after being trained using a guided inquiry model, so that students become more interested in actively learning to experiment in finding a concept. Psychomotor skills based on student completeness also increased, where from 16 students, in cycle I only 5 people were incomplete, and decreased in cycle II only 1 person was incomplete. Classically, the average completeness increased by 25% of students in cycle I to 69%, increasing in cycle II to 94%. Surely this is a proud achievement in the implementation of learning. The guided inquiry model is an appropriate treatment implemented to improve students' psychomotor skills (Patimapat et al., 2019; Reswanto et al., 2021).

The results of this study are in accordance with research by (Alfiani, 2022; Becerra-Labra et al., 2012; Dewanda & Dwikoranto, 2022), which concluded that In guided inquiry, students explore their own ideas, develop explanations through discussion, and articulate their thoughts. While the teacher facilitates the learning process, guides student discussions, and responds to student questions (Sholihah & Pertiwi, 2021). In group work, students work together in small groups to complete learning tasks.

The results of students' interest in learning physics after students are actively involved in learning through the inquiry model conducting experiments, students become more happy, interested, and attentive in learning (Alim et al., 2019). Data on students' interest in learning physics after cycle I and cycle II are shown in Figure 4.

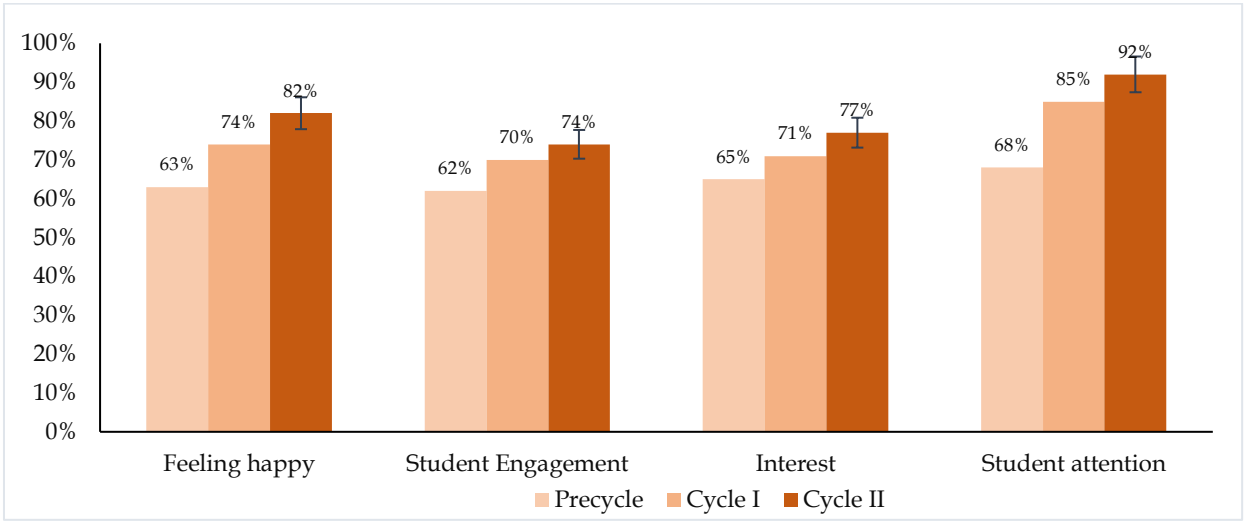

Figure 4. Student Physics Learning Interests

Students' interest in learning physics before learning using a guided inquiry model is in the sufficient category (Muhali et al., 2021). However, after the implementation of learning using a guided inquiry model, students' interest in learning physics increased from 65% in the precycle to 75% in the first cycle.

Increased interest in learning, because students are more actively involved in the learning process, students not only hear the teacher's lectures, but directly conduct experiments. In cycle I, students are new to the steps of guided inquiry, namely formulating problems, making hypotheses, conducting experiments to collect data, analyzing data and making conclusions. Students still need to adjust to dare to ask questions, express their ideas, opinions, and be actively involved in learning.

Habituation trained to students through a guided inquiry model in cycle I, students are increasingly interested in learning physics, as evidenced by the increase in the results of the interest questionnaire in cycle II to 81% with a very good category. So it can be concluded that the application of the guided inquiry model can increase the interest in learning physics of students of X TKPI SMKN Fisheries Riau Province. The results of this study are in line with the results of research by Karlina et al. (2019), namely student interest using the guided inquiry learning model increased from 74 with good criteria to 82 with very good criteria.

The results of this study are also in accordance with research by (Hefri & Suhartini, 2023; Karlina et al., 2019; Susilawati, 2017; Yu, 2022), which concluded that the guided inquiry model gives full freedom to students to conduct experiments like scientists so that students' skills can be optimized, students become happy, interested and attentive to learning physics.

Conclusion

The research data that has been submitted, it can be concluded that the guided inquiry learning model can improve psychomotor skills and learning interests of grade X TKPI students at SMKN Perikanan Riau Province, by means of students who are directly involved in the learning process, namely students who make problem formulations, make hypotheses, conduct experiments to collect data, analyze data and discuss making conclusions in their respective groups. Psychomotor skills that are always trained in every meeting, are carried out to familiarize students with applying inquiry steps in finding a material concept or solving daily problems. Students who are actively involved in the inquiry steps, become happy to learn, have more attention and interest to read many sources of information.

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Conflicts of Interest
The authors declare no conflict of interest.

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