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ORIGINAL RESEARCH

Application of the guided inquiry learning model based on contextual approach to the subject of parabolic motion to students' learning outcomes in SMA Negeri 2 Indramayu

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Abstract

The research problem was obtained by the low average value of physics from the results of the midterm assessment of students at SMA Negeri 2 Indramayu and less interested in learning physics, so the research focused on the learning outcomes of cognitive abilities of students in class X-1 MIPA with an average score of 46.00 had not reached the target the minimum set is 75. This action research aims to improve the learning outcomes of SMA Negeri 2 Indramayu students by applying a guided inquiry learning model based on a contextual approach to the subject of projectile motion. The action model consists of three cycles carried out from September to October 2022. Each action cycle consists of planning, implementation and reflection. The instruments used were cognitive ability assessment and observation sheets. Based on the results of the research and discussion, gradually in each cycle the learning outcomes of students' cognitive abilities increase so that it can be concluded that the application of the guided inquiry learning model based on a contextual approach to the subject of projectile motion can improve student learning outcomes at SMA Negeri 2 Indramayu.

Keywords: *Guided Inquiry · Contextual Approach · Parabolic Motion*

INTRODUCTION

Education is starting to return to normal conditions like the situation before the Covid-19 pandemic, the learning process is carried out face-to-face with the guidelines and curriculum set by the government. Learning activities of students interacting with teachers and friends bring new enthusiasm, students begin to adapt to face-to-face learning activities and begin to be reapplied. Get used to getting up early to go to school, and study according to a predetermined schedule of lessons. During this adaptation period, researchers found a problem with the low average score for class X MIPA physics in the odd semester assessment for the 2022/2023 academic year of 46.00. These results certainly become one of the thoughts and look for the root of the problem and try to restore self-confidence and interest in studying physics more actively so that they can answer all cognitive abilities problems properly and precisely.

The problems of learning physics that are faced and experienced by students are due to a lack of interest and motivation to study physics material, besides that the teacher-centered

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learning process also causes students to experience difficulties in learning physics (Khoiri et al., 2020). The low value of learning outcomes based on observations is due to the teacher's learning activities in conveying learning material limiting students' ability to find information and knowledge on their own so that they only memorize and work on questions according to the formula (Sari et al., 2020).

One way to overcome various problems in the learning process that occurs by applying the guided inquiry learning model is a learning model that can improve student learning outcomes by designing and discovering physics concepts themselves which will make the material stored longer in students' memories. The role of students in the guided inquiry learning model is more dominant and students are more active while the teacher directs and guides students in the right or right direction. This is in accordance with the results of relevant research and discussion that the physics learning outcomes of X MIA 5 students at SMA Negeri 3 Gowa who were taught using the guided inquiry learning model experienced an increase (Pertiwi, 2018). Understanding the concepts of students who use the PhET-assisted guided inquiry learning model is better than students who use direct instruction (Rais et al, 2020).

The use of a contextual approach in learning that students learn by presenting a concept and linking the subject matter to the context (relevance and benefits) of the subject matter is used. Based on the conclusions of the research results, it is suggested to teachers to make the contextual approach based on Gardner's multiple intelligences an alternative in learning science, because the contextual approach based on Gardner's multiple intelligences has proven to be effective in growing students' interest in learning and has a positive effect on student learning outcomes (Yogiswari, 2019).

The implementation of contextual learning causes teaching not only to transform knowledge from a teacher to students by memorizing a number of concepts that seem to be separated from real life but places more emphasis on facilitating students to seek the ability to live (life skills) on what they learn, then (Suastika, 2019) understanding the concept is a skill or expertise, especially in physics which is expected to be achieved by demonstrating an understanding of the physics concepts being studied, explaining the interrelationships between concepts and applying the concepts appropriately in solving problems. The success of understanding the concept can be measured through the learning outcomes of students in the cognitive domain according to Bloom's taxonomy which includes C2 (understanding) (Febrianti et al., 2022). This is supported by the implications of the results of the study that the use of physics comics teaching materials based on a contextual approach can facilitate students in increasing their understanding of concepts in Newton's law material (Febrianti et al., 2022).

Based on some of these studies, improving learning outcomes in cognitive abilities or conceptual understanding is using a guided inquiry learning model based on a contextual approach, so in this study, researchers are interested in making efforts to improve learning outcomes in the cognitive abilities of students at SMA Negeri 2 Indramayu by using a learning model guided inquiry based on a contextual approach to the subject of the parabolic motion. This study aims to improve learning outcomes in the cognitive abilities of SMA Negeri 2 Indramayu students by applying a guided inquiry learning model based on a contextual approach to the subject of parabolic motion.

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METHODS

The research methodology uses classroom action research, the actions taken in this study consist of three cycles which are carried out from September to October 2022. Implementation of research activities in the computer laboratory of SMA Negeri 2 Indramayu, each group uses a PC computer to carry out PhET simulation virtual laboratory activities Colorado projectile motion. Each action cycle consists of planning, acting, observing, and reflecting (Kemmis, Taggart, & Nixon, 2014).

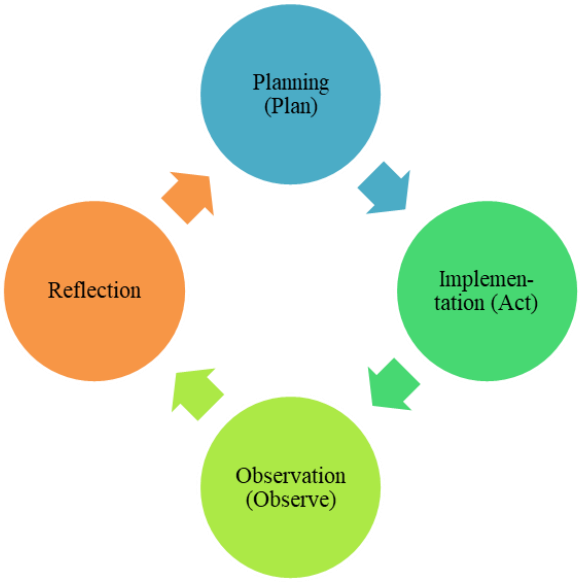

Figure 1 . Kemmis & MC Model Research Cycle. Taggart

At the planning stage, learning tools for the subject of parabolic motion were developed using guided inquiry learning models based on a contextual approach, student worksheets, student observation sheets and cognitive ability instruments. In the implementation stage, learning is carried out in accordance with the stages of the guided inquiry learning model based on a contextual approach to the subject of parabolic motion assisted by one observer teacher as an observer of student activity. After learning is complete, they are given a cognitive ability test. At the reflection stage, the teacher and observer hold discussions about the results of learning observations and process the results of cognitive ability tests in accordance with the purpose of reflection, namely reviewing, reflecting on (reflecting) to find out whether the process and learning outcomes in each cycle are in accordance with expectations, there are those that are not appropriate or something needs to be fixed (Arikunto et al., 2021).

The data collection technique in this study was to use technical triangulation, meaning that researchers used different data collection techniques to obtain data from the same source, namely: observation of teacher and student activities, learning outcomes on cognitive abilities and documentation of activities during the implementation of the action (Putra et al., 2022). Meanwhile, the data analysis technique uses a combination model method that combines qualitative and quantitative research methods by mixing the two methods in a balanced way (50% quantitative method and 50% qualitative method). Researchers can compare all the data obtained from the two methods, which can then be concluded as mutually reinforcing,

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weakening or contradicting (Arikunto, Suhardjono, & Supardi, 2021). The total rating score can be found using the following formula (Febrianti et al, 2022):

$$Final\ Score = \frac{Score}{Total\ Indicators} \times 100\% \quad (1)$$

The success of the minimum target of cognitive ability learning outcomes if students get an average score of learning outcomes of more than or equal to 75.

RESULT AND DISCUSSION

This research begins with pre-cycle activities. This activity was carried out in September 2022 at SMAN 2 Indramayu class X-1 MIPA with 30 students to find out the initial learning conditions before the action treatment. The initial state of students is classically passive, lacks confidence in working on or answering problems on the average value data of cognitive learning outcomes in the odd midterm assessment of 46.00, this shows that the average value of cognitive learning outcomes has not reached the target minimum criteria that have been set of 75. The findings at the pre-cycle stage as a whole students have not mastered optimally so it needs to be improved. These problems then become the basis for research by applying a guided inquiry learning model based on a contextual approach to the subject of parabolic motion which is expected to improve student learning outcomes.

The findings at the pre-cycle stage of the researcher took corrective action starting with the first cycle treatment by applying a guided inquiry learning model based on a contextual approach to the subject of parabolic motion with PhET simulations projectile motion virtual laboratory learning media which was held on Monday 03 October 2022 at the computer laboratory. The learning activity begins with the formation of groups in a random way to form five groups consisting of six group members to carry out parabolic motion practicum activities using PhET Colorado simulation learning media about projectile motion with bullet mass as an independent variable then carry out actions by applying the guided inquiry learning model based on a contextual approach with steps including identifying and determining the scope of the problem, making hypotheses (selection), designing experiments (exploration), conducting experiments for collecting data or information (formulation), interpreting data and developing conclusions (collection) as well as communicating experimental results (presentation) (Pertiwi, 2018) can be seen in Table 1.

Table 1. Stages of the Guided Inquiry Learning Model

Learning Stages	Teacher Activities	Student Activities
Identification and determination of the scope of the problem	Identify the quantities that include control, independent and dependent variables. Proposing a problem to solve or a statement to investigate	Distinguishing the quantities that include control, independent and dependent variables. Defines the nature and parameters of the problem
Making a hypothesis (selection)	Provide opportunities for students to brainstorm (Brainstorm) in forming hypotheses. Guiding students in determining hypotheses that are relevant to the problem and prioritizing which	Conduct brainstorming (Brainstorm) hypotheses to be prioritized. Determine which hypotheses are relevant to the problem and

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Learning Stages	Teacher Activities	Student Activities
	hypotheses are the priority of investigation	prioritize which hypotheses are the priority of the investigation
Designing Experiments (exploration)	Provide opportunities for students to determine the steps that are in accordance with the hypothesis to be carried out. Guiding students to sequence the experimental steps. Encourage students to choose the right independent variables and control variables related to the formulation of the problem	Brainstorm (brainstorming) about alternative procedures and problem-solving solutions that are in accordance with the hypothesis. Choose or design a problem-solving strategy (trial steps) Choosing the right independent variables and control variables related to the formulation of the problem
Conducting experiments to collect data/information (formulation)	Guiding students in conducting investigations and encouraging individual responsibility of group members Directing students to utilize other information resources for problem-solving	Implement a plan to solve the problem. Uses the science process to collect data communicate and collaborate with other group members
Data interpretation and developing conclusions (collections)	Guiding students to organize data and make conclusions	Make observation notes. Create patterns and relationships in data to answer questions. Draw conclusions and formulate explanations
Communicating experimental results (presentation)	Guiding the way students communicate their findings and explanations	Communicate the results of the investigation

Learning activities are observed and evaluated using observation sheets that have been prepared. Teacher and student activities were observed with observation sheets, cognitive ability tests and student worksheets, followed by reflection together with the observer conducting discussions on the results of the teacher and student observation sheet data. At each stage of the contextual-based guided inquiry learning model, the teacher's activity is more dominant. Some of the learning stages applied by the teacher are not optimal, the implementation time exceeds the specified time allocation. The activities of students in the guided inquiry learning model in the laboratory room were very enthusiastic and eager to conduct experiments. Practicum activities using one PC computer for six people per group are too many so in just a few minutes students respond well to learning activities. The results of processing cognitive ability test data obtained an average value of cognitive ability learning outcomes of 59.60, these results still do not meet the minimum target criteria of 75.

The findings in the first cycle became the basis for taking corrective actions at the next meeting. The stages of the second cycle were carried out on October 10, 2022 starting with the division of group members reduced to four students per group to carry out parabolic motion practicum activities using PhET colorado simulation learning media about projectile motion with elevation angles as the independent variable then carried out the actions by applying the model guided inquiry learning based on a contextual approach with the same stages and improvements in the stages that were not carried out in the first cycle. The observer observes the activities of the teacher and students during the learning process and reflects on the

observations that the teacher has carried out at each stage but are still not optimal and students have been able to formulate problems, but there are still some groups who still ask a lot of questions in designing experiments and there are still students who not yet focused on group discussion activities, playing cellphones, playing games on PC computers. Obtained an average value of cognitive learning outcomes of 68.29 these results still do not meet the minimum target criteria of 75. The findings in the second cycle are the basis for taking corrective action at the next meeting.

In the third cycle, it was carried out on October 17, 2022, starting with the division of groups reduced to two to three students to carry out parabolic motion practicum activities using PhET Colorado simulation learning media about projectile motion with the initial velocity of the bullet as an independent variable then carried out the action by applying the model guided inquiry learning based on a contextual approach with the same stages as well as an increase in the stages that were not maximized in the previous cycle. The observer observes the activities of the teacher and students during the learning process and reflects on the observations that the teacher has carried out each stage. The responses of the students were focused on learning and discussing with their groups. Student activities have been able to formulate problems, make hypotheses, design their own experiments well up to conclusions and present experimental results. Students are familiar with the learning activities of the guided inquiry learning model based on a contextual approach to the subject of parabolic motion using PC computers and discussions in groups and between groups are carried out well. The teacher just goes around supervising and directing it. The result is that the average value of cognitive abilities learning outcomes is 77.53, these results have met the minimum target criteria of 75. The following is the documentation of the state of students in each cycle.

Figure 2. Photo Documentation of Student Conditions in Each Cycle

Following are the results of observations of teacher activity, according to previous researchers that the teacher who acts as a guide in the guided inquiry learning model greatly influences student learning, especially when learning focuses on learning on students (Fajriyati et al., 2021). Based on Table 2 shows an increase in the average value of teacher activity gradually starting from 47 in cycle I, 77 in cycle II to 87 in cycle III. The increase in teacher activity shows that in the application of the contextual-based guided inquiry learning model, the role of the teacher is urgently needed in accordance with the statement of previous research results that the teacher must monitor the learning process, especially when entering core learning, namely in designing experiments, the teacher always reminds and explains in advance how to make steps work and how to analyze data so that students are not confused during the process of designing experiments and make it easier to make conclusions from the results of

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experiments that have been carried out. The application of the guided inquiry learning model can be improved in the planning of learning time so that learning goes according to plan and does not exceed the specified time (Puspitasari et al., 2017).

Table 2. Results of Observation of Teacher Activities

No	Learning Stages	Average value		
		Cycle I	Cycle II	Cycle III
1	Identification and determination of the scope of the problem	60	80	100
2	Making a hypothesis (selection)	60	80	100
3	Designing Experiments (exploration)	60	80	80
4	Conducting experiments to collect data/information (formulation)	60	80	80
5	Data interpretation and developing conclusions (collections)	20	80	80
6	Communicating experimental results (presentation)	20	60	80

The following are the results of observations of student activities, according to previous researchers that the learning activities of students during learning took place using the Guided Inquiry learning model on temperature and heat material in class X semester II at SMA Negeri 1 Percut Sei Tuan, TA 2016/2017 Increases every meeting with the average value of 71.8 which is classified as active (Sari et al., 2020).

Table 3. Observations on Student Activities

No	Learning Stages	Average value		
		Cycle I	Cycle II	Cycle III
1	Identification and determination of the scope of the problem	60	60	80
2	Making a hypothesis (selection)	40	60	80
3	Designing Experiments (exploration)	40	60	80
4	Conducting experiments to collect data/information (formulation)	40	40	80
5	Data interpretation and developing conclusions (collections)	20	60	80
6	Communicating experimental results (presentation)	20	40	60

Based on Table 3, it shows an increase in the average value of student activity in participating in guided inquiry learning based on a contextual approach gradually starting from 37 in cycle I, 53 in cycle II to 77 in cycle III, this is in accordance with the results of previous research that the guided inquiry learning model more effectively improve students' cognitive learning outcomes, students are more active because students are guided to find their own concepts from experimental observations so that students are easier to abstract into their minds (Iswatun, Mosik, & Subali, 2017).

Table 4. Average Value of Cognitive Ability Learning Outcomes

Cycle	The Average Value of Cognitive Learning Outcomes
Cycle I	59.60
Cycle II	68.29
Cycle III	77.53

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Based on Table 4, it shows an increase in the average value of cognitive ability learning outcomes gradually starting from 59.60 in cycle I, increasing to 68.29 in cycle II and 77.53 in cycle III already meeting the minimum target criteria of 75. This shows that applying the guided inquiry learning model based on a contextual approach to the subject of parabolic motion can improve student learning outcomes at SMA Negeri 2 Indramayu. This is consistent with previous research that the physics learning outcomes of students X MIA 5 SMA Negeri 3 Gowa who were taught using the guided inquiry learning model experienced an increase (Pertiwi, 2018)and the inquiry skills of students in class X MIA 1 SMAN 1 Wongeduku on the subject matter of parabolic motion through the use of learning models PhET simulation assisted discovery is on the rise (Mangidi, Sukariasih, & Mangkito, 2019).

CONCLUSION

The results showed a gradual increase in the results of observations of teacher activity, student activity and the average value of cognitive ability learning outcomes in each cycle. In the third cycle, it has reached 77.53, which has reached the minimum target above 75. So it can be concluded that applying the guided inquiry learning model based on a contextual approach to parabolic motion can improve student learning outcomes at SMA Negeri 2 Indramayu.

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