

Needs Analysis of Discovery Learning Model in Physics Learning for Students

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ABSTRACT

Education is a basic need that must be done by every human being. In education, the Discovery Learning model is one of the innovative and appropriate models used in physics learning because this model prioritizes student discovery of the knowledge gained. The identification of problems expressed include: 1) The application of the learning model is not yet fully perfect; 2) Some students do not provide feedback to the teacher who teaches; 3) Student learning outcomes are still fairly low; 4) Student errors in understanding physics material; 5) The mechanics material used is momentum and impulse, and simple harmonic vibrations. Furthermore, the problem limitations used include: 1) Some students do not give feedback to the teacher; 2) Student learning outcomes are still fairly low; 3) The mechanics material used is momentum and impulse, and simple harmonic vibrations. This type of research is descriptive research that aims to determine the needs of the discovery learning model in the school under study. The research instrument was made with a questionnaire addressed to 2 physics teachers and students of class X Natural Science 1 - X Natural Science 6, an interview sheet addressed to 2 physics teachers. The data obtained that the discovery learning model has been applied and to determine the need for discovery learning models in learning, it is analyzed through student responses and teacher readiness with existing facilities and infrastructure. The advantages are effective to increase student activeness and the weaknesses are not all physics material that can be applied with the learning model, some students are still passive, limited time and student understanding is still low.

Keywords: Learning model, Discovery learning, Learning model analysis, Physics learning.



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I. INTRODUCTION

Education is a basic need that must be done by everyone. With education, humans can run their daily lives with various beneficial advantages. Education can be obtained formally, namely in educational institutions and non-formally, namely in the education of parents from an early age and the surrounding environment. Education in physics can be applied to the right learning model and is suitable to be applied in learning. The focus of this research is based on an effective and efficient learning model towards the physical sciences. If an educator is not able to apply the learning model well, then the learning objectives also cannot be achieved perfectly.

The Discovery Learning learning model is one of the innovative and appropriate models used in science learning because this model prioritizes the results of student discovery of the knowledge obtained. The Discovery Learning learning model is a model for developing learning by actively discovering, investigating independently so that the results obtained will last in the memory of students [1]. From this learning model, students are expected to be able to understand the material in the form of concepts, facts and procedures from the material learned.

The results of interviews with teachers revealed that learning has applied the discovery learning learning model. This choice is based on its effectiveness and significant influence on student learning outcomes. This learning model is also very limited in its application due to insufficient time and supporting tools for experimenting are also inadequate. Furthermore, students' understanding in analyzing material such as solving problems is very lacking so that students do not master the discovery learning learning steps. The advantages are found that this learning model can increase student activity, make effective learning, increase student understanding in terms of cognitive aspects, and make difficult material easy to understand.

The results of questionnaires filled out by teachers show that in the discovery learning learning model, teachers rarely apply a scientific approach by using illustrations or phenomena around students. In addition, teachers also rarely invite students to make initial guesses and claim problems with the material being studied. Furthermore, teachers rarely involve students in collecting information related to the results that have been obtained. As a result of this, some students take the initiative to do it themselves, while other less motivated students accept only what teachers and peers teach them.

Because the discovery learning learning model has been applied, to see the initial problem, data is taken based on the results of questionnaires conducted by students. Questionnaires were filled out from all students of grade X Natural Science 1 - X Natural Science 6 to see the feedback given by teachers to students during the learning process with 150 student respondents from 217 students. This questionnaire contains questions in the form of Discovery Learning learning model syntax. From the results obtained from each point, 42.29% of students always follow the syntax of the discovery learning model well, 39% of students often follow the syntax of the discovery learning model well, 16.78% of students rarely follow the syntax of the discovery learning model well, and 1.83% of students never follow the syntax of the discovery learning model well.

Real conditions based on observations from several relevant studies, one of the research data that made observations was by looking at student test results on momentum and impulse material where there were 68% of students experiencing concept errors, 60% of students experienced calculation errors, 48% of students experienced marking errors, 36% of students experienced strategy errors, and 84% of students experienced translation errors. [2]. Furthermore, research the results of learning physics on simple harmonic vibration material conducted once 2016/2017 school year based on Daily Test scores obtained 7.8% of students have not met the Minimum Completeness Criteria that have been set [3].

Based on these real conditions, of course, there are several solutions offered in this research plan. Seeing the effectiveness of the Discovery Learning learning model as one solution in learning. Therefore, the learning model is very suitable to be applied by educators. This learning model can also be seen from the research that has been conducted by Jayadiningrat et al which from the results of the study revealed that there is a significant influence on student activities and learning outcomes. With the application of the Discovery Learning learning model, it is expected to be more active in learning. With active students in learning, student learning outcomes will have a positive impact [4].

The application of learning models in the learning process is needed, which is called the readiness of educators to apply it and students are physically and mentally ready to learn. Educators need to prepare learning tools that support a learning process. Furthermore, before learning takes place students need to be asked about the initial conditions experienced. This condition can be referred to as a learning condition. Student learning conditions have two aspects, namely internal aspects and external aspects. Internal aspects come from students themselves such as motivation and external aspects come from the environment around students such as classroom conditions [5]. With the application of the learning model, the teacher also needs to determine the method that is suitable and recommended on the learning model used. Therefore, the method that is in accordance with the recommended learning model is the problem solving method or commonly referred to as the case method.

This method is very supportive in student activeness in learning and can train student understanding in finding new knowledge. In its application, this method is used in discussion groups where students will actively participate in learning through group discussions. There are 5 (five) steps that can be done by the teacher in this method is the teacher divides the class into pairs or groups; the teacher divides the problem; groups conduct discussions; the group conveys the results of the discussion to other participants; The teacher gives conclusions–reflections–evaluations. Referring to research conducted by Bisri et al which in the study revealed that there was an increase in positive student learning activities and an increase in learning outcomes was fairly high with the application of these problem-solving methods [6]. Furthermore, referring to research conducted by Jana and Fahmawati which in the study revealed that the discovery learning model can improve mathematical problem solving skills in students and learning outcomes have improved [7].

Based on the explanation above, starting from ideal conditions, observations that have been made, and solutions provided. Research strongly recommends the application of the Discovery Learning model as an alternative solution that is suitable for use in learning science, especially physics subjects. The learning model is very suitable and proven to improve student activeness and learning outcomes. Furthermore, the material studied in this study has two Basic Competencies used, namely Momentum and Impulse, and Simple Harmonic Vibration. The material is very suitable because the discussion of the material will require more understanding to improve student learning outcomes. This can be seen in research conducted by Simatupang and Simamora there

is an increase in student activity and learning outcomes at each meeting of momentum and impulse material [8]. Furthermore, in research conducted by Islamiyati in the results of her research, the Discovery Learning model is very effective in influencing learning outcomes on vibrational material [9].

The identification of problems expressed include: 1) The application of the learning model is not completely perfect; 2) Some students do not give feedback to the teacher who teaches; 3) Student learning outcomes are still relatively low; 4) Students' errors in understanding physics material; 5) The mechanical materials used are momentum and impulse, and simple harmonic vibrations. Furthermore, the limitations of the problems used include: 1) Some students do not provide feedback to the teacher who teaches; 2) Student learning outcomes are still relatively low; 3) The mechanical materials used are momentum and impulse, and simple harmonic vibrations. With the identification of the problems described, This study aims to determine the need for the discovery learning model in the learning process.

II. METHOD

This research was conducted by distributing questionnaires in the form of interviews and questionnaires to teachers, questionnaires to students of grades X Natural Science 1 - X Natural Science 6 and several reviews of articles on physics learning outcomes on simple harmonic momentum, impulse and vibration materials. Interview data and teacher questionnaires are needed to see the effectiveness and readiness of teachers in the learning process and student questionnaire data is needed to determine student responses in learning. Filling out questionnaire questionnaires through a Likert scale with values 1-4 with selected criteria starting from Never, Rarely, Often and Always. The statistics used to see the results of the study are descriptive statistics in the form of interpretations given, such as describing and providing an overview of the frequency distribution of variables in a study conducted. Descriptive statistical analysis also aims to collect, process, and analyze data so that the data can be presented properly [10].

Based on the data obtained in this study, it will be seen how much the discovery learning learning model needs to be applied in learning by relating the actual conditions in the form of teacher readiness, facilities and infrastructure and also student responses in being given treatment during learning. The data collected will be a benchmark in providing solutions for improving the learning system so that the problems collected in the research data can be resolved.

The research data collected is displayed in the form of graphs and to see how much student questionnaire data each indicator is used percentage values. For the formula in determining the percentage value of data per indicator can be seen as follows:

$$Indicator = \frac{Number\ of\ steps\ per\ activity}{Number\ of\ steps\ per\ activity} \times 100\%$$

Based on this formula, it can be seen the level of influence of student responses through indicators selected on the questionnaire based on the percentage value obtained so that the problem can be analyzed.

III. RESULTS AND DISCUSSION

To determine the urgency of the discovery learning learning model, data was collected through interviews with teachers. For interview questions about the learning model that has been used and how much discovery learning model is needed in learning. The information obtained is that the discovery learning-based learning model has been used and the learning model has been applied to physics learning. Furthermore, compared to other learning models, the application of learning for student activity is very good using the discovery learning model because it really prioritizes students to explore information that is fairly newly obtained so that in problem solving it is hoped that the discovery learning model can be applied in the learning process. However, there are several weaknesses of this learning model, namely that not all physics material can be applied with the learning model, some students are still not actively involved, limited time and students' understanding is still low on what has been learned even though they have used the discovery learning learning model. According to Hosnan stated that "Some shortcomings of the discovery learning model, namely (1) take a lot of time because teachers are required to change teaching habits which are generally as informers to become facilitators, motivators, and guides, (2) students' rational thinking skills are still limited, and (3) not all students can follow lessons in this way" [1].

According to Suherman, et al in Suherti said that "The advantages of the discovery learning model are 1) Students are active in learning activities, because they think and use the ability to find the final result; 2) Students understand the subject matter correctly, because they experience the process of finding it themselves" [11]. According to Hosnan stated that "Some of the advantages of the discovery learning model are as follows; (a) Assist students to refine and improve cognitive skills and processes; (b) The knowledge gained through this model is highly personal and powerful because it strengthens understanding, memory, and transfer; (c) May improve students' ability to solve problems; (d) Help students strengthen their self-concept, as they gain confidence in cooperating with others; (e) Encourage active student involvement; (f) Encourage students to think intuitively and formulate their own hypotheses; (g) The student is active in teaching and learning activities, because he thinks and uses the ability to find the final result" [1]

Of the several weaknesses of the discovery learning model, there are several workable solutions as shown in Table 1.

Table 1. Solutions to the Weaknesses of the Discovery Learning Model

Author	Topic Article/Book	Problem	Solution
Iliana and Mona Furi in 2016 [12]	<i>Efektifitas Penggunaan Metode Discovery Learning Berbantuan Media Benda Konkret terhadap Pencapaian Hasil Belajar IPA pada Siswa Kelas IV SD Negeri 04 Banjarejo Kecamatan Gabus Kabupaten Grobogan Semester II Tahun Ajaran 2015/2016</i>	To improve student learning outcomes in science material in terms of student activeness	<ul style="list-style-type: none"> • The grouping of students must be adjusted and grouped between the less intelligent and the clever (blended) • Teachers as facilitators by providing LKS as worksheets that are given instructions for use

Author	Topic Article/Book	Problem	Solution
Berlin Sani in 2014 [13]	<i>Strategi Pembelajaran didalam Kelas</i>	How discovery learning models are effectively implemented	<ul style="list-style-type: none"> • The learning process is carefully structured • Students have the initial knowledge and skills to learn • Teachers provide students with the support they need to conduct investigations
Hadi Susanto in 2016 [14]	<i>Model Pembelajaran Discovery Learning</i>	Language learning as a communication tool	<ul style="list-style-type: none"> • Direct students to interact with others • Accommodating students' needs to use language as a means of communication
Nurin Afdillah in 2018 [15]	<i>Meningkatkan Hasil Belajar Siswa Dengan Metode Discovery Learning Tentang Tumbuhan dan Fungsi Bagian-bagiannya Di kelas IV Madrasah Ibtidaiyah Muhammadiyah 3 Penatar sewu Tanggulangin Sidoarjo</i>	Improve student learning outcomes seen from student activeness in the learning process	<ul style="list-style-type: none"> • Provide media in the form of teaching aids to students • Establish teamwork to facilitate learning

Table 1 above, it can be said that in a learning can apply the learning model well and there is a solution that is done to a lack of learning models.

To see the implementation of the suggested learning model, questionnaires were distributed by teachers and students. Furthermore, this questionnaire is arranged in the form of questions according to the steps of the learning model starting from the introduction, stimulus / stimulation, problem identification, data collection, data processing, data proof, conclusions and closing. Furthermore, respondents chose a scale from 1-4 with criteria in order, namely Never, Rare, Often and Always. From the results of the responses filled in by teachers and students, the data is analyzed through the number of frequencies according to the criteria given.

The learning activities that have been implemented by teachers as well as the interpretation of the results of the responses to the questionnaires that have been filled in can be seen in Table 2.

Table 2. Teacher Respondents

Action	Activity	Number Percentage				Problem
		Never	Rarely	Often	Always	
Introduction	Preparing for learning				100%	Activities have been carried out well
	Attendance check				100%	
	Apperception				100%	
	Motivation				100%	
	Submission of material points				100%	
Stimulus	Presenting the Phenomenon		100%			The teacher has difficulty in presenting phenomena due to media and materials that do not always show phenomena that occur.
	Observing the Phenomenon			100%		
	Reading Relevant Sources			100%		
	Asking Questions				100%	
Problem Identification	Identifying the problem			100%		The teacher rarely invites students to express hypotheses because students do not understand how to express hypotheses. However, the teacher does not limit students who will express their hypotheses.
	Formulating the problem			100%		
	Hypothesis		100%			
Data Collection	Collecting information through objects			100%		Teachers do not always invite students to experiment due to ineffective implementation time and inadequate practicum tools.
	Collecting information through reading sources				100%	
	Collecting information through the internet			100%		
	Collecting information through experiments		100%			
	Copying the information obtained			100%		
Data Processing	Categorizing information			100%		On average, teachers have often implemented
	Tabulating data			100%		
	Analyzing data			100%		
	Interpreting data			100%		

Action	Activity	Number Percentage				Problem
		Never	Rarely	Often	Always	
						the actions of these activities.
Proof/clarification	Comparing data with hypothesis			100%		The average teacher has often implemented the actions of the activity.
	Connecting data with hypothesis			100%		
	Comparing data with relevant sources			100%		
Conclusion	Summarizing the data obtained				100%	The average teacher has implemented all the actions of the activity well
	Student presentation				100%	
	Make a report of the results			100%		
	Responding to presentation results			100%		
	Make a summary				100%	
Closing	Giving follow-up assignments			100%		The average teacher has implemented all the actions of the activity well
	Informing the next activity				100%	
	Conducting learning evaluation				100%	

Based on Table 2, it can be concluded that teachers need to make improvements to actions during the learning process with the need for innovations raised by teachers such as the use of interactive media, efficient utilization of time, and providing understanding to students to be able to carry out learning activities properly.

To compare the aspect of application from the teacher, student respondent data were also obtained from students in grades X Natural Science 1 to X Natural Science 6 with a total response of 150 students. The responses obtained can be seen in Table 3.

Table 3. Student Respondents

Action	Activity	Number Percentage				Problem
		Never	Rarely	Often	Always	
Intruduction	The teacher relates the previous material	2%	4%	36%	58%	Some students still think that the teacher never or rarely relates to the previous material
	Students are motivated towards the learning objectives conveyed by the teacher	1,3%	10,6%	41,3%	46,6%	Some students lack interest in learning

Action	Activity	Number Percentage				Problem
		Never	Rarely	Often	Always	
	Students understand the material points conveyed by the teacher	1,3%	6%	38%	54,6%	Some students do not understand the meaning of the material points given by the teacher because the approach used is still lacking
Stimulus	Teacher provides illustrations	2%	4%	41,3%	46,6%	Some students still think that teachers never or rarely provide illustrations as examples in learning
	Listening to the teacher's explanation	1,3%	4%	31,3%	63,3%	Some students pay less attention to the teacher in explaining the material
	Reading reference books	1,3%	32,7%	38,7	27,3%	Some students never or rarely open or read reference books because students do not have handbooks when learning
	Asking questions	4%	30%	34%	32%	Some students lack confidence in asking questions
Problem Identification	Problem identification	2%	30,7%	36%	31,3%	Some students are not good at identifying problems because students prefer to memorize formulas rather than looking for problems.
	Formulate a problem	3,3%	29,3%	40,7%	26,7%	Some students are less good at formulating their own problems so that students only accept actions that have been taken by peers in a class
	Hypothesize	4,7%	24,7%	41,3%	29,3%	Some students lack the initial understanding to express the

Action	Activity	Number Percentage				Problem
		Never	Rarely	Often	Always	
Data Collection	Gathering information through books	1,3%	17,3%	42%	39,3%	solution to the problem obtained Some students do not have reading books so that students only rely on friends who have books and look for relevant sources of information
	Conducting experiments	1,3%	6%	31,3%	61,3%	Some students think that experimental activities are complicated and take a long time so that students only participate and can only accept their friends' work.
	Writing down the information obtained	1,3%	16,7%	36,7%	45,3%	Some students lack initiative in writing down information
	Filing the information properly such as in a notebook.	2%	13,3%	44%	40,7%	Some students lack initiative in archiving information so that the information obtained only until the learning process.
Data Processing	Analyzing data	1,3%	17,3%	39,3%	42%	Some students lack skills in analyzing data, especially mathematically.
	Understand the data analyzed	1,3%	7,3%	42%	49,3%	Some students because they do not analyze data, so students do not understand the analysis of the data obtained.
Proof/clarification	Relating the data obtained with the hypothesis and reading sources	2%	14%	50%	34%	Some students because they do not propose hypotheses and do not have reading sources, students lack skills in linking data with

Action	Activity	Number Percentage				Problem
		Never	Rarely	Often	Always	
	Considering the results of the data obtained	2%	11,3%	48,7%	38%	hypotheses and reading sources. Some students are less good at considering the data obtained so that the student only follows the results of consideration by his friend
Conclusion	Summarizing information	1,3%	13,3%	42%	43,3%	Some students lack understanding in summarizing information
	Making a presentation	0,7%	23,3%	36,7%	39,3%	Some students lack confidence in making presentations and do not even want to speak in front of friends and teachers
	Copying the data obtained	3,3%	19,3%	36%	41,3%	Some students lack initiative in copying data
	Teacher responds to the presentation	2%	6,6%	40%	51,3%	Some students think that the teacher never or rarely responds to their presentations
	Responding to fellow friend's presentation	2%	24,7%	38%	35,3%	Some students lack confidence in asking questions or suggestions and criticism to students who make presentations
Closing	Giving follow-up assignments	0,7%	4,6%	29,3%	65,3%	Some students never or rarely do follow-up assignments so that some students are sometimes billed by the teacher to do.
	Teacher reminds the next learning activity	0,7%	2,6%	28,6%	68%	Some students think that the teacher never or rarely reminds them of the next

Action	Activity	Number Percentage				Problem
		Never	Rarely	Often	Always	
						activity.
	Teacher gives evaluation	0,7%	1,3%	24,6%	73,3%	Some students think that the teacher never or rarely evaluates learning activities such as the assigned tasks

Based on Table 3, it can be concluded that some students seem less active in participating and also some students still think that the teacher does not take certain actions from a learning step so that the solution that can be taken is to implement a structured learning system.

After obtaining these data, it can be seen that students in various learning processes are still categorized as not fully playing an active role. According to Usman revealed that "student learning activities can be classified into several things, namely 1) Visual activities such as reading, writing, conducting experiments and demonstrations; 2) Oral activities such as telling stories, reading rhymes, questions and answers, discussions, singing; 3) Listening activities such as listening to teacher explanations, lectures, briefings; 4) Motor activities such as gymnastics, athletics, dancing, painting; 5) Writing activities such as composing, making papers, making letters. [16]. Desmita revealed that "In the context of the learning process, there is a phenomenon of students who are less independent in learning, which can cause mental disorders after entering further education, and poor study habits" [17]. Therefore, the discovery learning learning model is needed in the learning process and needs to revamp the way students learn which is still fairly passive.

IV. CONCLUSION

In this study, it can be concluded that the discovery learning model has been applied in physics learning and this model is needed to be applied in the learning process. However, the discovery learning model also has some advantages and disadvantages that make the discovery learning model can be applied as well as possible and provide some solutions to these weaknesses. The advantages that exist in the discovery learning model by obtaining information from teachers who have taught are very effective in learning to improve student learning activities and outcomes. Furthermore, the weaknesses of the discovery learning model are that it cannot be applied to all physics materials, limited time, students are still less active and low student understanding of physics materials.

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