Physics Online Learning during the Covid-19 Pandemic uses a Guided Inquiry Model with Experimental Methods on teamwork Ability and Student Learning Outcomes

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Abstract: This study aims to determine the level of teamwork in online learning using a guided inquiry model with experimental methods, and the effectiveness of a guided inquiry learning model with experimental methods in online learning on student cognitive learning outcomes. The material used is dynamic fluid. The type of this study was a quasi-experiment with a research design is one group pretest-posttest design. This research was conducted at SMAN 2 Tanggul Jember in October 2020. The research sample used was 36 students of class XI MIPA 1. Data collection techniques are using tests and non-tests. Teamwork data collection techniques use a questionnaire given to students after learning via a google form, while the data on the effectiveness of the guided inquiry model was seen from the students' cognitive learning outcomes obtained from the pre-test and post-test scores. Teamwork data analysis techniques use Microsoft Excel to determine the description of data analysis, while the learning effectiveness data were analyzed using the N-gain test. The results of the data analysis showed that the level of teamwork ability after online learning was carried out using the guided inquiry model with the experimental method was mostly classified as medium and the guided inquiry learning model with the experimental method which is effectively used in online learning on student cognitive learning outcomes with an N-gain score of 0.514.

Keywords: Guided Inquiry Model; Teamwork ability; Learning outcomes.

Introduction

Learning is an interaction between teachers and students in the process of providing information or transferring knowledge. In the learning process, the teacher plays an important role in creating a conducive learning atmosphere. Learning is said to be of quality if all the material or information presented is able to change the attitudes, thoughts, and knowledge of students from not knowing to know (Puspita 2018). So that the role of the teacher as a facilitator is needed and students are expected to play an active role in learning activities.

Physics is the study of natural phenomena (Pratama and Istiyono, 2015). Dynamic fluid is one of the physical materials in which most of the concepts are involved in everyday life. Dynamic fluid material discusses the velocity of fluid flow, the principle of continuity, Bernoulli's law, and others. By learning the concept of dynamic fluids will train students to think, find, and solve problems in everyday life related to dynamic fluids with relevant concepts.

Learning that makes students hear more explanations from the teacher will reduce student activity in teamwork so that passive learning occurs. The passive attitude of students in learning will certainly have an impact on their low teamwork ability.
This is supported by the results of interviews with physics teachers at SMA Negeri 2 Tanggul-Jember who said that physics learning is still dominated by teachers, where learning is carried out through the provision of material from the teacher, question and answer, discussion, and practice questions. Learning that makes students tend to be passive will affect the learning outcomes obtained.

In physics learning, practicum or experimental activities have an important role in encouraging students to be more active in teaching and learning activities. During practicum activities, students will feel happy, not easily bored, and train students to work together. These activities can improve student learning outcomes. However, Facts in the field show that until now practicum activities are still rarely carried out. Based on the results of interviews with a physics teacher at SMA Negeri 2 Tanggul-Jember, it was said that the laboratory and practicum tools were adequate, but practicum activities were rarely carried out with various kinds of obstacles, one of which was time constraints. Especially during the Covid-19 pandemic, physics learning was carried out online using google classroom and WhatsApp group, practicum activities were replaced with assignments because teachers found it difficult to do the virtual practicum.

The rarity of practicum activities makes students' experimental abilities low. In addition, learning that is one-way will make teamwork abilities low which will have an impact on student learning outcomes. Supported by the statement of Turgut (2018) which states that teamwork in learning has an influence on student learning outcomes. Teamwork is a combination of individual attitudes that each student has and the attitudes of different groups (Rahayu et al, 2020). By teamwork, will enable someone to do more things than if they work alone.

In learning activities, teachers can create scientific attitudes in students, one of which is teamwork (Puspita, 2018). Teachers play an important role in the teamwork process in learning (Gillies, 2016). Teamwork among students can grow and develop with the application of learning models and methods according to student needs, one of which is the guided inquiry learning model with the experimental method. The guided inquiry model is a learning activity that focuses on the intellectual development process of students in discovery activities (Sadia, 2014). The guided inquiry model emphasizes the process of finding a concept so that a scientific attitude will emerge in students (Dewi, 2013). The learning steps for the guided inquiry model begin with formulating problems, making hypotheses, and conducting experiments (Llwellyn, 2013).

In learning using a model of guided inquiry, students are given the freedom and activity to develop the concepts that are learned under the guidance of the teacher during the learning process. Students are given the opportunity to solve problems in groups. In addition, students can also improve social relations with their peers to exchange information between groups. Inquiry is a series of learning activities that involve all students' abilities to fill and search, so they can find knowledge, attitudes, and abilities as a form of behavior.

The application of the guided inquiry model modified by the experimental method can make the learning process more enjoyable because students can interact with each other to carry out experiments to make learning more meaningful (Ural, 2016). The experimental method is a method that provides opportunities for students individually or in groups to conduct experiments (Hastuti, 2018). The use of this experimental method aims to make students able to find and find various problems by conducting their experiments.

**Method**

This type of research is quasi-experimental research. The research design used was One Group Interpretation-Posttest Design (Creswell, 2014). The research design can be seen in Table 1 below:

**Table 1. Research Design**

| O₁ | X | O₂ |
|---|---|---|
| O₁ | X | O₂ |

| O₁ | : Student Cognitive Learning Outcomes Test before being treated |
|---|---|
| O₂ | : Student Cognitive Learning Outcomes Test after being treated |
| X | : Online Learning using Guided Inquiry Model |

The research was conducted in October 2020 at SMA Negeri 2 Tanggul-Jember. The population in this study were all students of class XI MIPA. The sampling technique uses a simple random sampling technique, where all samples are considered homogeneous so that all members of the population have the opportunity to be sampled (Budiyono, 2015). The sample in this study was class XI MIPA 1 as many as 36 students. The research was conducted online, namely on online learning using the Whatsapp applications and Google Classroom. The learning model used is the guided inquiry model with the experimental method. Data collection techniques in this study were using tests and non-tests. teamwork data collection techniques use questionnaires given to students after learning through a google form, while the data on the effectiveness of the guided inquiry model is seen from the student's cognitive learning outcomes obtained from the pre-test.
scores obtained before the sample is given treatment and the post-test is carried out after the sample given treatment. Before being given to students, the test instrument is validated first to 3 expert validators and 2 practical validators to test the quality of the instrument using a validation sheet with a scale of 1 to 4. The data obtained is in the form of quantitative data from a questionnaire which is then calculated the average score then categorized. The instrument validation category can be seen in Table 2 below.

### Table 2. Instrument Validation Score Category

| No | Interval Skor          | Category   |
|----|------------------------|------------|
| 1  | $\bar{X} > 3.4$        | Very Good  |
| 2  | $2.8 < \bar{X} \leq 3.4$ | Good      |
| 3  | $2.2 < \bar{X} \leq 2.8$ | Good Enough |
| 4  | $1.6 < \bar{X} \leq 2.2$ | Not Good  |
| 5  | $\bar{X} \leq 1.6$     | Not Good   |

Based on the validation results, it is known that the teamwork questionnaire instrument got a validation score of 3.72, this indicates that the questionnaire validation was included in the very high category, and the student's cognitive learning outcome test instrument got a validation score of 3.62 which was included in the very high category. So that the instrument questionnaire and test questions for student cognitive learning outcomes can be used in research.

The form of the questionnaire used was a closed questionnaire with 4 alternative answers. The questionnaire uses a Linkert scale. The scoring of questionnaire answers with a Linkert scale can be seen in Table 3 below.

### Table 3. Questionnaire Answers Scoring

| Answer      | Positive Statement (+) | Negative Statement (-) |
|-------------|------------------------|------------------------|
| Very Agree  | 4                      | 1                      |
| Agree       | 3                      | 2                      |
| Disagree    | 2                      | 3                      |
| Very Disagree| 1                     | 4                      |

The questionnaire given consists of 25 items that refer to the indicators of cooperation according to Isjoni (2013) which consists of 1) Communicating effectively, 2) Role in groups, 3) Leadership, 4) Solving problems. Data on teamwork abilities were analyzed using Microsoft Excel to determine statistical descriptions of the data.

The test instrument for student cognitive learning outcomes is in the form of multiple-choice questions consisting of 20 questions with 5 alternative answers. Effectiveness data obtained from the pretest and posttest scores were analyzed using N-gain to determine the cognitive learning outcomes of students before and after learning.

The data analysis technique for the effectiveness of learning uses the N-gain test with the following formula.

$$ g = \frac{s_f - s_i}{s_{max} - s_i} $$

Information:

- $g$ = Gain
- $s_f$ = Post-test mean value
- $s_i$ = Pre-test mean value
- $s_{max}$ = Maximum value

The results of the N-Gain score are divided into three categories, namely:

### Tabel 4. N-Gain criteria

| No | Interval         | Criteria |
|----|------------------|----------|
| 1  | N-gain $\geq 0.7$ | High     |
| 2  | $0.7 > N$-gain $\geq 0.3$ | Medium   |
| 3  | N-gain $< 0.3$   | Low      |

Hake (Zaka dan Supraptono, 2020)

## Result and Discussion

The objectives of this study were (1) to determine the level of teamwork ability in online physics learning using guided inquiry models using experimental methods, and (2) to determine the effectiveness of guided inquiry learning models using experimental methods in online learning on student cognitive learning outcomes.

Learning physics uses a guided inquiry model with an experimental method consisting of 5 steps. namely identifying and formulating problems, formulating hypotheses, conducting experiments, interpreting data, and making conclusions. In this study, learning was carried out online through the Whatsapp group application and Google classroom, while experimental or experimental activities were carried out virtually using the Phet Simulation virtual laboratory application. The following is an overview of learning activities and practicum in research.
The statistical description of the data on student cooperation abilities can be seen in Table 5 below.

**Table 5. Description of teamwork Data**

| No | Component | Pre-test | Post-test |
|----|------------|----------|-----------|
| 1  | Total Student | 36.00    | 36.00     |
| 2  | Max        | 65.00    | 90.00     |
| 3  | Min        | 40.00    | 60.00     |
| 4  | Mean       | 50.83    | 75.83     |

Based on Table 7 above, it is known that the average pretest and posttest scores have increased from 50.83 to 75.83. Furthermore, the data were analyzed using the N-gain test and categorized according to the criteria based on table 4 to determine the effectiveness of learning. The results of the calculation of the N-gain test are shown in Table 8.
test or data recapitulation of the effectiveness of student learning can be seen in table 8 below.

| Table 8. Recapitulation of Student Learning Effectiveness Data |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                | Pre-Test | Post-Test | Difference | N-Gain | Category |
| Min Score                      | 40       | 60        | 20           | 0,514  | Sedang   |
| Max Score                      | 65       | 90        | 25           | 0,514  | Sedang   |
| Mean                            | 50,83    | 75,83     |              | 0,514  | Sedang   |

Based on table 8, it can be seen that the N-gain score obtained is 0.514. This data belongs to the medium category. So it can be seen that the guided inquiry model with the experimental method in online learning is quite effective in improving student cognitive learning outcomes. Supported by the results of research by Said et al. (2019) which shows that the application of the experimental method in science learning can improve student learning outcomes with a percentage of 83% completeness. The research results of Natalija et al. (2020) show that the application of the guided inquiry learning model can improve the cognitive learning outcomes of class XI students of SMAN 4 Baubau on elasticity and Hooke law. Yulian et al. (2015) stated that guided inquiry with the experimental method had increased results on student activity and cognitive learning outcomes. Said et al. (2020) stated that the application of guided inquiry models to basic chemistry can provide better learning outcomes. Kusuma et al. (2019) stated that the guided inquiry learning model impacts on student learning outcomes topic of static fluid at senior high school PUSRI grade XI Palembang. Wahyuni et al. (2016) stated that the N-gain value of the class with the guided inquiry model was significantly better than the class with the direct learning model. This is because in learning using a guided inquiry model with experimental methods students can build their own knowledge through investigations that follow scientific procedures.

The success of research cannot be separated from the obstacles. Some of the obstacles that occur when carrying out online learning using the guided inquiry model with the experimental method include not all students understand the learning process which requires them to do virtual experiments, and not all students can access the virtual laboratory shown by the teacher. The limited learning time during the Covid-19 pandemic also made the teamwork carried out by students during online learning also less than optimal.

Conclusion

Based on the results of data analysis, it can be concluded that the level of teamwork ability after learning physics online using a guided inquiry model with an experimental method is classified as medium, and a guided inquiry model with an experimental method in online learning quite effectively used to improve student cognitive learning outcomes. Based on the research that has been done, the researchers suggest how easy it is, the teacher provides clear and directed information about the learning steps and the experimental steps that are carried out virtually, so that students can follow the learning well, and it is necessary to research direct or face-to-face learning so that the results obtained are more varied.

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