The Effectiveness of Hybrid Guided Inquiry for Optimizing HOTS and Communication Skills in Circular Motion Concepts

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Abstract

This research was conducted to analyze the effectiveness of Hybrid Guided Inquiry on HOTS and students' communication skills in Circular Motion material. The method used in this research is quantitative research with a quasi-experimental. 10th-grade students of MIPA in SMA Negeri 1 Malang were used as the observed population; the samples taken were students 10 MIPA 2 and 10 MIPA 4. The MANOVA test is a technique used to test hypotheses and then analyze the effectiveness of H-GI in optimizing HOTS and students' communication skills. Analysis of the results of this study found that the HOTS score for the experimental class was 78.4 while for the control class was 71.1. Meanwhile, the communication skills results between the experimental class and the control class were 78 for the experimental class and 72 for the control class. Thus, H-GI is effective in optimizing HOTS and communication skills of students compared to direct learning, which uses PBL. The research results could be the basis for making learning more effective in physics material, especially the Circular Motion concepts.

Keywords: Circular Motion; HOTS; Communication Skills; Hybrid Learning

How to cite: Jufriadi, A., Rahayu, W. A., & Ayu, H. D. (2022) The effectiveness of hybrid guided inquiry for optimizing hots and communication skills in circular motion concepts. *Jurnal Ilmiah Pendidikan Fisika*, 6 (2), 215-223.

INTRODUCTION

Revolution 4.0 has brought digitalization that automatically integrates with the internet (Suwardana, 2017). The existence of this digitization can refer to changes in education in Indonesia. The current learning process cannot be separated from the developing technology. Like the covid-19 pandemic that is currently sweeping around the world, without exception, Indonesia has had a very significant impact. Lockdown and Large Scale Social-Restriction have been implemented in Indonesia. This has caused the learning process to be carried out online. However, online learning will be more effective if it is accompanied by face-to-face (direct) learning. Indonesian Minister of Education and Culture, explained that online learning without direct learning is not optimal, but combining direct learning with online
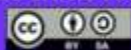
learning is much more effective. The application of various learning methods adjusted to the materials or teaching materials used is one of the alternatives in learning physics to make it more exciting and have an active role for students (Apriliani, Budiarti and Lumbu, 2015).

Physics is a learning subject containing concepts, facts, principles, scientific methods, and attitudes. Several of the subjects had low results, one of them was physics (Hanna, Sutarto and Harijanto, 2016). Students face many problems in mastering physics concepts. This is due to the many abstract physics concepts, limited media to assist the teaching and learning process, an unpleasant teaching and learning atmosphere, and the lack of students' mathematical abilities (Ayu *et al.*, 2017). At the time of learning, the problem that often arises is applying the learning system that is not quite right (Saregar, Diani and Kholid, 2017). To minimize existing problems, educators should adjust the use of learning models with the materials and objectives used. of several learning models that have been developed, the guided inquiry is one of the learning models that can improve scientific thinking skills, the quality and student learning outcomes (Zain and Jumadi, 2018). The combination of inquiry with science learning requires educators to guide students, especially guidance to students who do not have a learning experience with discovery activities (Yusro and Sasono, 2016).

The guided inquiry learning model also follows the demands of Revolution 4.0, which prioritize the level of effective communication skills, and critical thinking (Zain and Jumadi, 2018). The main targets of inquiry learning are (1) learning activities to fulfil learning objectives that are more directed logically and systematically; (2) in learning activities, students are maximally involved; and (3) students

who develop a trusting attitude about what is found in the inquiry process (Trianto, 2007). There are 5 phases used in the guided inquiry learning model, including (1) asking questions or problems; (2) conceptualization; (3) investigations; (4) conclusion; and (5) discussion (Pedaste *et al.*, 2015). The guided inquiry learning model has several weaknesses. One of the disadvantages of guided inquiry is limited time. Due to limited time it impacts the learning stages that have not been completed while the learning time allocation has run out (Akhmalia, Suana and Maharta, 2018). To minimize this problem is to combine guided inquiry learning with hybrid learning.

Combining two superior teaching-learning processes, which are done face-to-face and virtual or online, means blended learning or so-called hybrid learning (Akhmalia, Suana and Maharta, 2018). Blended-based learning is usually beneficial in the learning process (Barikhlana *et al.*, 2019). In implementing hybrid learning, educators still use direct learning as usual and add an activity with the help of the internet to help complete the direct learning that has not been completed (Pratiwi *et al.*, 2018). One widely used application to improve the quality of the learning process is Schoology.

Schoology is a web-based learning application with simple features that make it easy to apply in learning (Suana *et al.*, 2017), and one of the Learning Management System (LMS) program that facilitates educators and students in exchanging information and interacting online (Murni and Harimurti, 2016). Students are directed through Schoology to apply communication technology in the learning process (Rosy, 2018). Through Schoology, educators can collaborate with students when the online learning process is carried out (Wiwik Suci Ambar Ningsih, Wayan Suana, 2018). The convenience of students to

discuss with educators, not tied to places and opportunities to help students solve the difficulties they have, is very large (Suwono, Susanti and Lestari, 2016). Thus, HOTS and also the communication skills of students can increase.

Today's, educators in Indonesia have developed and are leading to higher-order thinking skills and then known as Higher Order Thinking Skills (HOTS) (Trianggono, 2017). Skills to analyze, evaluate, and create are the definition of HOTS. These three skills are the top-level thinking skills in the revised Bloom's Taxonomy (Hodiyanto, 2019). HOTS can be measured using three indicators, including (1) analyze, which is to solve the problem into several constituent parts, then the relationship between the parts is detected; (2) evaluate, namely evaluating standards on criteria that have been made previously; and (3) create is place parts to produce something new or original (Anderson and Krathwohl, 2001).

Communication in learning can be interpreted as a discussion process between students or educators through direct or indirect interactions that have the subject matter of learning materials. Teachers and educators have used technology to strengthen students' communication skills. Assessment of students' communication skills can be measured through several parameters, namely: responsibility and respect for discussion partners, thoughts are conveyed according to conditions, thoughts are communicated with words and body gestures, understanding is built by considering shared feelings and experiences, and clarity of the theme of the conversation (Alberta , 2016).

Physics can be found in our daily lives, but often physics is considered a difficult subject (Desy, Desnita and Raihananti, 2015). Students often experience misconceptions because of differences in understanding of physics. Regular circular motion is one of the

physical materials often difficult to imagine by students (Noviansyah, Mursyid and Sirait, 2015). An object moving in a circle at a constant speed along a circular arc is a regular circular motion (Karyono, Palupi and Suharyanto, 2009).

The application of hybrid learning has been widely carried out, especially during the COVID-19 pandemic. However, the measurement of the effectiveness of implementing Hybrid Guided Inquiry (H-GI) learning for optimizing HOTS and students' communication skills is still little done. Thus, this study was conducted to determine the effectiveness of HGI in optimizing HOTS and students' communication skills on CM concepts.

METHOD

The method used in this research is quantitative with the type quasi-experimental. Two classes are used in this study, namely the experimental class (H-GI) and the control class (PBL). Posttest, only group, is used to obtain data on students' higher-level thinking skills. To see the level of communication skills, students use a questionnaire filled out as a form of assessment as learning (self-assessment) and an assessment observation sheet filled out by observers. The research sample is all students of class 10 MIPA II and 10 MIPA IV SMA Negeri 1 Malang.

HOTS instrument in the form of multiple-choice questions argued, firstly tested and then tested statistically using SPSS 24 to test the validity and reliability of the items and also using Ms Excel 2016 to test the distinguishing power and the level of difficulty of the questions. Meanwhile, to test the instrument of communication skills in the form of a questionnaire using SPSS 24 to test the validity and reliability of the items. After being statistically tested, the instrument can be used as a HOTS score and communication skills. While the effectiveness of H-GI in this study was

measured utilizing the MANOVA test using SPSS 24 for windows. The stages of the research carried out are shown in Figure 1.
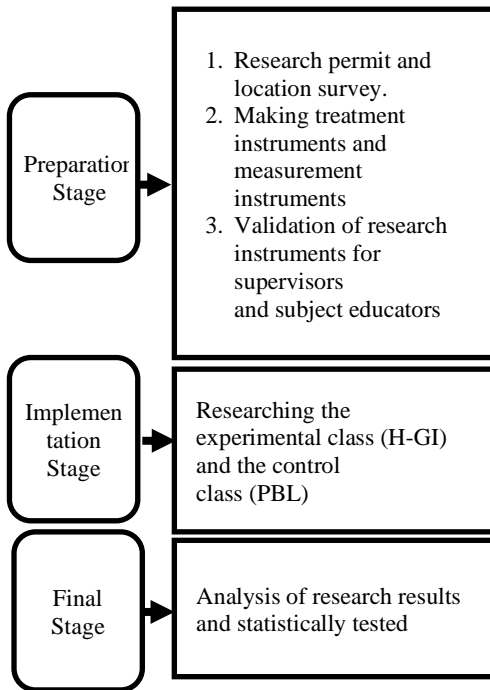

Figure 1 Research stages

The data collected was carried out by the prerequisite test for HOTS scores and the students' communication skills using the normality test and the homogeneity test using SPSS 24. Then the data that was declared normal and homogeneous, the hypothesis test could be done using the MANOVA test. Consider the chart of the stages in carrying out the following research.

RESULTS AND DISCUSSION
The HOTS results of the two classes used as the study sample experienced differences; see table 1. The experimental class has higher statistical test results than the control class. In the experimental class, the learning model used is the H-GI learning model. Educators carry out an online system using the Schoology application to provide material and questions to test students' ability to analyze, evaluate, and create the

questions given. So, learning is stated to be more optimal with the online or face-to-face system.

Whereas in the control class, the learning model is used in PBL. PBL is done in person or face to face using predetermined phases without the help of a hybrid approach. Thus, those students are asked to only learn face-to-face with educators, without any communication from outside the classroom. This causes students to be less than optimal in understanding the material, so analyzing, evaluating and creating questions, it will be difficult to solve for students. The students' HOTS scores are listed in Table 1 and Figure 2.

Table 1 Students' scores of HOTS

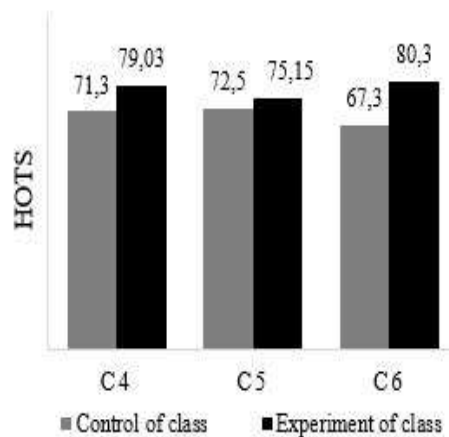| Class	N	The score of HOTS		Mean
		Max	Min	
H-GI	33	89.3	64	78
PBL	30	78.7	64.0	71.1

Figure 2 Students' scores of HOTS

Lack of time in learning is also a factor that can lead to less than optimal learning. Therefore, the hybrid approach can minimize the lack of time. The phases used in learning can be carried out through online learning. So that in face-to-face learning, educators will not run out of time to carry out all phases that

have not been carried out in online learning. The difference in HOTS scores based on each indicator between the experimental class and the control class is presented in Figure 2. HOTS indicators used in this study include: (1) analyzing; (2) evaluating; and (3) creating.

The results of the communication skills of the two classes used as the study sample experienced differences. The experimental class has higher statistical test results than the control class, as shown in Table 2. In the experimental class, the learning model used is the H-GI learning model. Using this H- GI, students still communicate with educators at school and outside of school. Educators carry out an online system using the Schoology application to communicate with students. Students can carry out discussions and questions and answers with other students and educators. By using the discussion method, the ability of students to be more active in learning can increase (Lumbu and Budiarti, 2015). Thus, an increase in students' communication skills can occur if the communication is carried out continuously during learning, either through online or face-to-face modes.

Table 3 Students' scores of CS

Class	N	The score of CS		Mean
		Max	Min	
H-GI	33	92.5	55.75	74
PBL	30	88.25	56.75	72

CS: Communication Skills

Communication skills of students who have implemented PBL learning show less than optimal results. Because PBL learning is only done face-to-face based on the stages that have been made. Then, the communication process between students and educators is very little done, namely only in the classroom. The results of students' communication skills based on each indicator are presented in Figure 3 below. Indicators of communication skills used in this study include 1) responsibility and respect for partners in the discussion, 2) thoughts are conveyed according to conditions, 3) thoughts are communicated with words and body gestures, 4) understanding is built by considering shared feelings and experiences, 5) clarity of the theme of the conversation, 6) understanding of conversation and discussion, and 7) use of appropriate terms to describe thoughts.
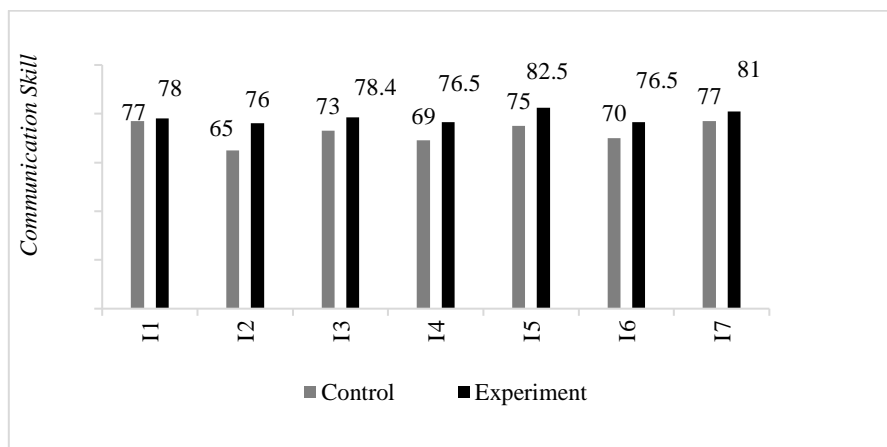

Figure 3 The value of each indicator of students' communication skills

The HOTS scores and students' communication skills showed significant

differences in Table 4. The hypothesis data showed a value of 0.010, smaller

than the 0.05 significance level. In addition, based on significant results, it is known that the effectiveness of using H-GI can optimize HOTS and students' communication skills.

Tabel 4 Result of MANOVA t*est*

Tests of Between-Subjects Effects		
Source	Dependent Variable	Sig.
Class	HOTS	0.003
	Communication	0.004

The development of indicators in learning that is very important is HOTS because in solving problems that are not routine, students need to develop top-level thinking skills (Hodiyanto, 2019). After learning using the H-GI model was carried out, the HOTS level of the students seemed to increase. It can be seen how students analyze, evaluate, and create questions on their answers. For example, in working on the relationship of quantities that apply to regular circular motion, students can analyze by drawing known quantities. The direction of the rope tension force, the direction of gravity, and the direction of the centripetal force are drawn before starting the work and getting the required formula. Students have drawn the forces acting on the system to solve and get the applicable formula, as shown in Figure 4. Derivation of the formula is a problem for students in general. So that it needs regular training for students. This is one of the processes to increase the HOTS of students.

Communication skills can also be improved using H-GI learning. To improve scientific reading and writing skills and scientific learning skills, scientific communication skills are required (Spektor-Levy, Eylon and Scherz, 2008). With H-GI learning, it can be seen how students can communicate scientifically through verbal and nonverbal communication. Examples of verbal communication skills are how students communicate with others, and

how to choose the language used when speaking in group discussions and during presentations. Whereas an example of nonverbal communication is when students answer test questions. First, students write down what is known and asked before answering. Also, the writing of physical symbols and their units in the matter of regular circular motion is correct, such as writing the centripetal force (F_s) in Newton, the angular velocity (ω) in rad/s, centripetal acceleration (a_s) in rad/s^2, or linear velocity (v) in (m/s).

$$\Sigma F_y = 0$$
$$T + F_s - W = 0$$
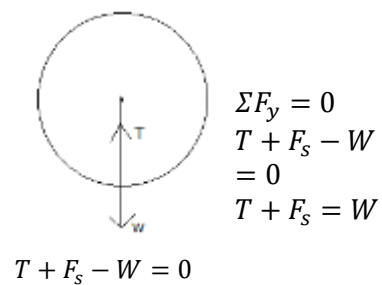$$T + F_s = W$$

$$T + F_s - W = 0$$

Figure 4 Student analysis of the case of circular motion

The use of inquiry learning results in increased thinking skills (Jariyah, 2017). Critical thinking is a skill that can be improved by using a combination of guided inquiry with blended learning, where indicators of critical thinking are top-level thinking skills (Zain and Jumadi, 2018). Using blended or just in time learning is very helpful in the physics learning process (Barikhlana *et al.*, 2019). In the communication skills of students, the use of hybrid learning is more influential than conventional learning (Bainamus, Hartanto and Abdullah, 2017). Likewise, the results of other researchers stated that students' communication skills would be better using e-learning than conventional learning (Supianti, 2014). So that the combination of guided inquiry learning with e-learning can improve the

cognitive abilities of students (Suwono, Susanti and Lestari, 2016).

CONCLUSION

The application of H-GI learning has shown more effective results in optimizing HOTS and communication skills compared to the implementation of face-to-face PBL learning. There are several problems and obstacles when carrying out learning in this study, so the suggestions given by researchers include subject educators to control better and guide the online learning process. The obstacle faced during research was that learning online was not optimal because many students did not understand how to use the Schoology application. Students did not maximize online learning guided directly by educators.

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