JPF | Volume 10 | Number 1 | 2022 | 22 - 31

p - ISSN: 2302-8939
e - ISSN: 2527-4015

Jurnal Pendidikan Fisika
https://journal.unismuh.ac.id/index.php/jpf
DOI: 10.26618/jpf.v10i1.6720

Effectiveness of Team-Based Learning-Inquiry Learning Tools on Online Learning

Darmansya A. Mustapa[1)], Asri Arbie [2)], Trisnawaty J. Buhungo [3)*], Abd. Wahidin Nuayi[4)]

[1,2,3,4)] *Department of Physics, Gorontalo State University, Gorontalo, 21752, Indonesia*

**Corresponding author: trisnawaty.buhungo@ung.ac.id*

Received: October 12,2021; Accepted: December 19, 2021; Published: January 30, 2022

Abstract *–The learning process carried out online today is still less effective, which makes it difficult for students to understand the material and concepts being taught. The purpose of this study was to find out how effective the use of team-based learning-inquiry devices is in online learning with WhatsApp assisted and zoom meetings. The research was conducted at SMAN 1 Telaga Biru, and class X MIPA3 was selected as the research sample using simple random sampling. The results showed that the average percentage of student activity for four meetings after being implemented in team-based learning-inquiry tools reached 86.60%, with high criteria. In addition, there was an increase in student learning outcomes in the cognitive domain individually at the first and second meetings with an N-gain score of 0.71 and for the third and fourth meetings with an N-gain score of 0.74. In the cognitive domain as a group, at the first and second meetings, they achieved an N-gain score of 0.95, and at the third and fourth meetings, they obtained an N-gain of 1. The average student learning outcomes for the affective and psychomotor domains during the four meetings reached 86.60% and 86.61%, with a high category. This study concludes that the physics learning device developed with the team-based learning model is effective in increasing students' activities and learning outcomes in physics.*

Keywords: *inquiry learning; online learning; team-based learning*

I. INTRODUCTION

Currently, Indonesia is facing the problem of the spread of the 2019 coronavirus pandemic or COVID-19, which certainly has its own impact and challenges, especially for educational institutions in Indonesia (Alea et al., 2020). COVID-19 has made threats that are not only a threat to the health sector of each country but also threaten the economic sector (Zulkarnaen et al., 2020). To overcome this, many efforts are made by the government to anticipate the transmission of the virus, such as social distancing, physical distancing, to large-scale social restrictions. This condition requires people to stay at home, study, work, and worship at home. With this policy, face-to-face learning in schools must be stopped. Instead, the teaching and learning process is recommended to be carried out from home through online

learning (Kemendikbud, 2020). Online learning is expected to help overcome problems that occur during pandemic times, especially in the field of education.

Online learning is a learning solution during the covid-19 pandemic because online learning has many advantages, for example, learners can follow learning anywhere (Sa'diyah & Rosy, 2021). This is in line with the research conducted by (Sobron et al.,. 2019), which states that online-based learning produces very positive results for students. Online learning is also formal learning carried out by educational institutions whose learners and educators are in separate locations, so they need a telecommunications system to connect the two. Zoom meeting is a medium that can be used directly with anyone, so it is suitable for distance learning during this pandemic. Using this zoom media will greatly help teachers and students in the learning process because they can interact and communicate face-to-face even in different places (Marsiding, 2020; Saputra et al., 2021). Through Zoom, teachers can directly communicate visually by providing various subject matter with direct instructions to their students (Faisal, 2020). WhatsApp is an application used as an online communication medium that can make it easier for users to send messages, images, sounds, videos, documents, and so on. This is in line with the opinion of (Ratnasari et al., 2020) that Whatsapp is one of the favorite social media because of the advantages of features that can be used, such as chat, telephone, and video calls.

Based on the results of observations made during the introduction to school field program, it is seen that learning conducted online is still doing teacher-centered learning methods. This method makes students less active in learning, even many students only listen to the material delivered by the teacher and turn off the camera. The use of inappropriate learning models can cause student boredom in following the learning process, lack of understanding of the material, and make learning monotonous (Wijanarko, 2017). In addition, the learning process carried out without simple experiments makes students less understanding of the concepts of the material being taught, as stated by (Shoum et al., 2014; Nurazmi & Bancong, 2021) that by using the experimental method, students will be more actively involved in the learning process. Therefore, learning must be transformed into student-centered learning, both in terms of understanding the concept, the learning media used, and the subject matter (Nur, 2019; Riskawati & Marisda, 2020).

The key to the effectiveness of an online learning system is how a teacher remains creative in presenting learning in a fun and easy to understand so that learners do not feel bored and remain productive at home. As educators, teachers are required to be more creative and innovative in determining the models and learning media to be used. There

needs to be the development of models and methods that can be media that can help build students' understanding in following the learning process that is in accordance with the current circumstances. Team-based learning is active learning that is student-centered by applying science to real-world problems (Michaelsen et al., 2014). According to (Rotgans et al., 2019), team-based learning has three stages of learning, namely preparation, readiness assurance, and application of course concept. Some of the benefits of team-based learning, according to (Pardamean et al., 2014), are that it can improve the cognitive skills of high-level students in large classes, provide social support, promote the development of interpersonal and team skills, and build and nurture the enthusiasm and role of teachers for teaching. The team-based learning model that will be applied in the classroom will be collaborated with the inquiry learning method. Broadly speaking, the inquiry method is a learning method that relates the learning material to the student experience (Fauziyah, 2004). With this method, it is expected that students will find material independently in accordance with their experience and be able to actively participate in the learning process.

The team-based learning model collaborated with inquiry learning is certainly more effective if applied in the classroom. This is in line with the research conducted by (Lewis et al., 2019) that team-based inquiry learning is a promising format to apply in the classroom. A strong team-based inquiry learning structure can make students more active during learning. Based on this description, this study aims to determine how effective the use of the team-based learning-inquiry tools is in online learning during the covid-19 pandemic.

II. METHOD

The design used in this study is a pre-experimental design with a one-group pretest-posttest design model. This design is used because there are initial tests before treatment and final tests after treatment (Fitrianingsih & Musdalifah, 2015). The treatment results are said to be accurate if the results after being given treatment are higher than before the treatment.

The population in this study were all students of class X MIPA SMAN 1 Telaga Biru, while the research sample was students of class X MIPA 3 SMAN 1 Telaga Biru, which consisted of 32 students. The research sample was taken using the purposive sampling technique. This technique is sampling with certain considerations.

The instrument used in this study was an observation sheet of student activities during the learning process. Learning outcomes tests were also used in this study which consisted of 3 domains, namely attitudes, skills, and cognitive. For the attitude domain, we used attitude observation sheets, self-assessment

sheets and peer assessments. For the skill domain, it is measured using a skill observation sheet, while for the cognitive domain, using a learning outcome test sheet.

Data collection techniques in the study were carried out using observation sheets of learners' activities during the learning process. Learning outcome tests are used to find out the extent of achievement of learners' learning outcomes after learning using team-based learning-inquiry tools. The learning results of learners in this study include learning indicators including cognitive (knowledge), which uses test sheets of learning results with a total of 15 problem numbers of essay problems. For the affective domain (attitude), we use attitude assessment sheets, self-assessment sheets, and peer assessments. The attitude assessment sheets are carried out by observers during the learning process, while self-assessment sheets and peer assessments are given when the learning process is carried out. For the psychomotor domain, we use the learning skills review sheet carried out by observers during the learning process.

Student activity data were analyzed in 8 aspects. Each aspect has 3 descriptors. If 3 descriptors are observed, then it is given a value of 3, if 2 descriptors are observed, then it is given a value of 2, and if only 1 descriptor is observed, it is given a value of 1. Enhanced competence consists of 3 areas, namely affective (attitude), psychomotor (skill), and cognitive (knowledge). For affective and psychomotor domains were measured using attitude and skills assessment sheets which each consist of 7 aspects assessed. The results of affective learning are also seen from self-assessment and peer assessment sheets. Self and peer-assessment sheets are spelled out in 40 statements, each consisting of positive and negative statements and using a Likert scale. The cognitive domain is given through a test consisting of 9 essay numbers for meetings 1 and 2, and for meetings 3 and 4 consisting of 6 essay numbers. The test is given before learning (pre-test) and after learning (post-test). Improvements in cognitive domains were measured using N-gain analysis.

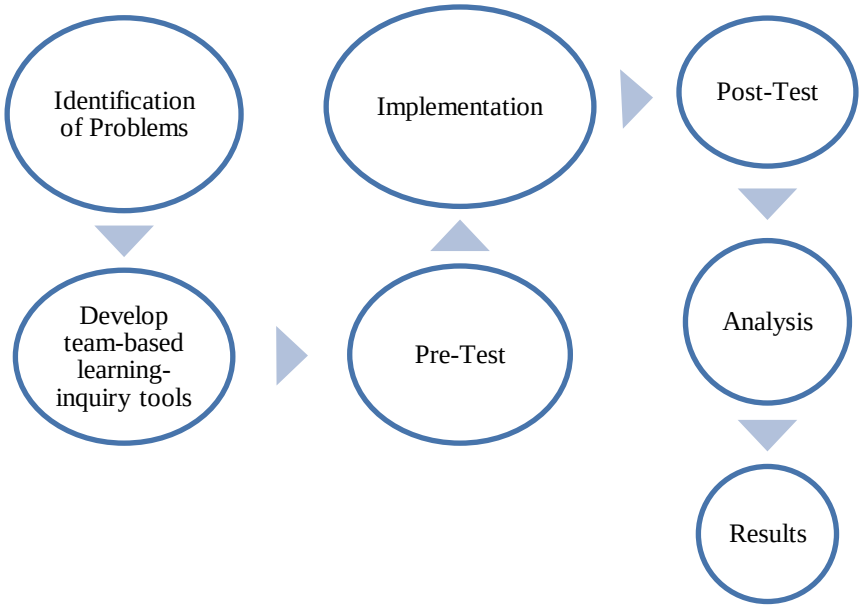

Figure 1. Research procedure

III. RESULTS AND DISCUSSION

The effectiveness of learning tools using the team-based learning that has been developed is seen from student activities during learning activities and improving students' learning outcomes which consist of 3 areas, namely attitudes, skills, and cognitive. The results for effectiveness can be spelled out as follows:

Student activities

There are 10 student activities observed in the learning process that takes place during 4 meetings. Meeting 1 and 3 started from the preparations stage to the readiness assurances stage, while meeting 2 and 4 was the aplication of the course concept stage. Each aspect has 3 descriptors, if 3 descriptors are observed, then it is given a value of 3, if 2 descriptors are observed, it is given a value of 2, and if only 1 descriptor is observed, it is given a value of 1. The results of observing student activities are shown in Table 1.

Table 1. Percentage of student activity

Meeting	Percentage (%)	Criterion
1	86.58	Very active
2	89.06	Very active
3	89.45	Very active
4	88.54	Very active
Average	88.41	Very active

Table 1 shows the percentage of student activity during the learning process. The first meeting percentage amounted to 86.58%, with very active criteria. The second meeting had a percentage of 89.06% with very active criteria, the third meeting was 89.45% with very active criteria, and the fourth meeting was 88.54% with very active criteria. Based on the average of the four meetings, 87.65% was obtained with very active criteria. This shows that learning devices using team-based learning that was developed are quite

effective when viewed in terms of learners' activities.

Learning outcomes

The affective domain was measured using an observation sheet that was observed by observers for 4 meetings. The affective domain consists of 7 assessed aspects, where each aspect has 3 descriptors. The following table 2 shows the percentage of student learning outcomes in the attitude aspect.

Table 2. Percentages of learning outcomes in the affective domain

Meeting	Percentage (%)	Criterion
1 and 2	88.39	High
3 and 4	84.82	High
Average	86.60	High

Table 2 shows that at the first and second meetings, an average percentage of 88.39% was obtained with high criteria. For the third and fourth meetings, the percentage was 84.82%, with high criteria. The average percentage of four meetings is 86.60%, and high criteria are obtained.

The results of affective learning are also seen from self-assessment and peer assessment sheets. Self and peer-assessment sheets are distributed to learners at the learning stage of applying the course concept. Self and peer-assessment sheets are spelled out in 40 statements, each of which consists of a positive statement and a negative statement.

Table 3. Percentage results of self and peer-assessment

Meeting	Self Assessment (%)	Peer Assessment (%)	Criterion
1 and 2	82.73	78.78	High
3 and 4	83.22	81.66	High
Average	82.97	80.22	High

Based on Table 3 above, the average results of attitude learning using self-and peer assessment sheets are in the high category. This shows that team-based learning-inquiry learning tools are effective to use. This is in line with the research conducted by (Riwahyudin, 2015), which says that the attitude of learners has a positive effect on learning outcomes, meaning that a positive student attitude in learning will lead to good learning outcomes.

The psychomotor realm was measured using observation sheets observed by observers during 4 encounters. The psychomotor domain consists of 7 aspects that are assessed. Each aspect has 3 descriptors, where each aspect has 3 descriptors. The following table 2 shows the percentage of student learning outcomes for psychomotor aspects.

Table 4. Percentage of learning outcomes in the psychomotor domain

Meeting	Percentage (%)	Criterion
1 and 2	85.27	High
3 and 4	87,95	High
Average	86,61	High

Based on Table 4 above, the percentage of psychomotor scores is included in the high criteria and increases every meeting. For the

first and second meetings, an average percentage of 85.27% was obtained, while for the third and fourth meetings, the percentage was 87.95%. The average percentage of psychomotor scores was 86.61%, with high criteria.

Furthermore, the increase in learning outcomes is seen in the cognitive domain. The cognitive realm is given through a test consisting of 9 essay numbers for meetings 1 and 2 and for meetings 3 and 4 consisting of 6 essay numbers. Tests are given before learning (pre-test) and after learning (post-test). Improvements in the cognitive realm were measured using N-gain analysis. Here is a table of average pre-test scores, post-tests, differences in both, and N-gain cognitive learning outcomes for individual activities.

Table 5. Average score of pre-test, post-test, and N-gain for individual activities

Meeting	Pre-test (%)	Pos-test (%)	Difference (%)	N-gain	Criterion
1 and 2	39.06	82.69	43.63	0.72	High
3 and 4	41.12	85.13	44.00	0.74	High

As shown in Table 5 above, the pre-test value at the first meeting was 39.06%, while the post-test value at the second meeting was 82.69%, with an increase in N-gain value of 0.72, including high N-gain criteria. The pre-test value at the third meeting was 41.12%, and the post-test value at the fourth meeting was 85.13%, with an increase in the value of N-gain by 0.74, including high N-gain criteria. Table 6 present the average pre-test scores, post-tests, differences in both, and N-gain cognitive learning outcomes for individual activities

Table 6. Average score of pre-test, post-test, and N-gain for group activities

Meeting	Pre-test (%)	Post-test (%)	Difference (%)	N-gain	Criterion
1 and 2	62.72	98.18	35.46	0.95	High
3 and 4	41.12	100	58.88	1.00	High

As we can see in Table 6, the pre-test value at the first meeting was 62.72%, while the post-test at the second meeting was 98.18%, with an increase in N-gain by 0.95 including the N-gain criteria. The pre-test value at the third meeting was 41.12% and the post-test value at the fourth meeting by 100%, with an increase in the value of N-gain by 1.00, including high N-gain criteria.

The results of this study indicate that learning devices using the team-based learning-inquiry model are very effective to be applied in the learning process. The results obtained are in line with the study conducted by (Islamarida et al., 2019) that team-based learning has an effect on increasing knowledge and can improve critical thinking skills, especially in solving complex problems. According to (Dwirahayu et al., 2019), team-based learning is one of the learnings that encourage students in groups or in social interaction to solve a given math problem actively. (Buhungo et al., 2021) also revealed that team-based learning tools that have been developed and applied in the

learning process had received positive responses from teachers and students.

Based on the theory expressed by (Fatmawati, 2016), which said that a learning device in the study is said to be effective if 75% of learners are complete in working on test problems. So it can be interpreted that the learning tools that have been developed in this study using team-based learning can be said to be very effective. This is in line with the research conducted by (Ramadhani, 2017) that the percentage of completion of learners exceeds 75% and shows the level of achievement of learning goals and can be declared effective. According to Yusal et al., (2021), learning devices that meet the criteria of "high" gain are effective for use in the learning process. Other research was also conducted by (Oktaviani et al., 2021), which states that the increase in team-based learning is effective in learning, evidenced by a significant improvement in cognitive learning outcomes.

As stated by (Lewis et al., 2019), team-based inquiry learning is a promising format to apply in the classroom. A strong team-based inquiry learning structure can make students more active during learning. The research was also conducted by (Arbie et al., 2021), which states that team-based learning tools can be an innovation for teachers to do learning in times of pandemic. Therefore, the results of this study can be an alternative in physics learning to improve activities and learning outcomes during online learning.

IV. CONCLUSION

This study concludes that team-based learning-inquiry tools are effective to be applied in the online learning process. This is evidenced by an increase in student activity during learning and also an increase in post-test results after the implementation of the team-based learning-inquiry model during the covid-19 pandemic.

Team-based learning-inquiry tools can be a solution for teachers in conducting the online learning process. However, behind the results obtained in this study, it is necessary to pay attention to several things, such as optimizing the learning time of students in order to improve the quality of physics learning. Further research also needs to be done to strengthen the results that have been obtained, especially analyzing qualitatively student activities during learning.

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