Video tracker analysis: a strategy for measuring students' communication and collaboration skills

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Abstract. Students must have communication skills to communicate their ideas and thoughts. The communication skill of students plays a role in physics learning because it can change the learning situation in a better direction. In addition to communication skills, collaboration skills must also be owned by the students in the learning of physics, one of which is used to conduct observations in groups. The purpose of this research is to know the relationship between communication skills and students' collaboration skills, especially in physics. This research is experimental and the sample was taken by purposive sampling technique. In the results, there is a very high relationship between communication skills and students' collaboration. The score of students' communication skills was 0.876, indicating that there was a direct relationship between students' communication and collaboration skills, where students' communication skills increase with the increasing of collaboration skill. Additionally, learning used of video tracker software created new knowledge and skills.

1. Introduction
In the 21st century, we are faced with the demands of the importance of quality human resources produced by quality education can be a major force to overcome the problems. One of the ways is through to improve the quality of education. Skills that must be possessed by students to meet the challenges of the 21st century including problem solving skills, critical thinking, creativity, information literacy, communication, and collaboration.

Communication is the ability to deliver information. This ability must be possessed by students to convey and possess ideas in the learning process. Communication is the most prominent digital literacy skill, followed by problem solving and collaboration [1]. Communication is used as the most important skill needed for job success [2]. The communication skills of students play an important role in physics learning because they can change the learning situation for the better by appearing in social interactions between students and students and students and teachers. Student communication skills must be stimulated by learning that is able to explore the ability of students. Communication is important in education [3]. Education needs a training to teach communication skills, form child to adult. By good communication skills lead to an ability to understand the new information will be able to get information that is well available. Communication is the most important literacy skill that has a relationship to the ability problem solving and collaboration [1].

In addition to communication skills, collaboration skills are also mandatory for students, especially in physics learning, where physics learning is a learning process studying phenomena in nature through a series of scientific processes. Collaboration skills are needed by students, one of which is used for group observations. Collaboration can be developed by looking at the level of difficulty of tasks that
involve students working in groups [4]. To develop students' collaboration skills, learning is needed that involves students playing an active role, especially learning that uses information and communication technology. Group learning by utilizing IT can optimize student learning collaborative [5].

One learning model that invites students to take part in performance and collaboration to express ideas is Problem Based Learning (PBL) model. PBL can help students with non-routine problem solving processes by maintaining uncertainty and increasing critical and creative abilities [6]. PBL model is one of the learning models that emphasizes students to be more active in learning. PBL can improve students' skills in utilizing technology, namely designing power points and making videos, which are one of the important components in learning [7]. In this study, PBL model will be integrated with video tracker software that aims to find out the improvement of communication skills and collaboration of students and to find out the relationship between communication skills and student collaboration.

Simply, the Tracker has the ability to track the motion of an object so that it can obtain various information needed in the analysis of a motion event. Through the recording activity of a real motion phenomenon using a video recorder, the results of the recording can be processed in the Tracker application. The use of the Tracker must be integrated into teaching/learning topics such as kinematics, dynamics and work, and energy. This research will be applied to the material of momentum and impulses [8].

2. Method
This was experimental research and data collection techniques was purposive sampling technique. The study was conducted in class X MIPA 4 and X MIPA 6 SMA N 3 Demak. Data analysis techniques were quantitative and qualitative analysis. Techniques to analyzed qualitative data were normality test, homogeneity test, average similarity test, classical completeness test, Gain increase test and correlation test. The data were students' communication skills obtained from pretest and posttest data, moreover, observation data of collaboration skills were taken in class for three meetings.

3. Result and Discussion
Learning is carried out in the control class and experimental class which were previously given a pretest and posttest. The results of the communication skills test of the control class and experimental class students were shown in Figure 1.

Figure 1. The average value of the pretest and posttest of the control class and the experimental class

Figure 1 showed differences in the improvement of students' communication skills through the application of PBL models assisted by video tracker software rather than PBL models without the help of video tracker software. The average score of the increase in the pretest and posttest communication skills of students in the experimental class was 56.5% and in the control class was 40.3%. The data showed quite good results, so that the use of PBL models assisted by video tracker software was effectively used in learning. The application of PBL by utilizing technology became a means to improve communication in various fields [7].
In this study, testing the collaboration skills of students used observation sheets. The average results of assessing students' collaboration skills can be seen in Figure 2.

Figure 2 showed that the average student collaboration skills in the control class was 63.27 while in the experimental class was 70.31. Thus, there were differences in the average student collaboration skills between those taught with PBL models assisted by video tracker software and PBL models without the help of video tracker software. Technology in learning became a means to enhance student collaboration skills [8]. The use of technology involves students to learn collaboratively, so students contribute to decision making.

The effectiveness of learning by using a video tracker can also be seen from the improvement of students' communication skills in Table 1.

Table 1. Normalized Gain Test Results of Student Communication Capabilities

| Data Type         | Average score | N-Gain | Criteria |
|-------------------|---------------|--------|----------|
|                   | Pretest       | Posttest |          |
| Control class     | 0.24          | 0.69    | 0.46     | medium   |
| Experiment class  | 0.25          | 0.87    | 0.63     | medium   |

Table 1 show that the value of communication skills increased with moderate criteria in the control class were the score of control class was 0.46 and the score of experimental class was 0.63. This show that there was a significant difference between improving students' communication skills in the experimental class and the control class.

Tracker is an analysis software used to track the motion of an object. The tracker is designed to be used in physics learning specifically kinematics and dynamics material [8]. By using this video analysis, students can investigate the motion of objects so they know changes in position, speed, and acceleration experienced by an object [12]. Thus it can be concluded that the application of the PBL model assisted by the video tracker software effectively improves students' communication skills compared to the PBL model without the help of video tracker software. This was in line with research conducted by Kovalyova [7] revealing that PBL was able to improve students' skills by utilizing technology. This can increase students' confidence in using language as communication. In addition, learning by using video, especially video tracking can accelerate the process of data acquisition. By data tracking, there would be data numerical and graphical [10] Figure 3.
Figure 3. Analysis of video tracking position versus time

Figure 3 the result of tracking falling objects by using a video tracker, students were more active and collaboratively learning in solving problems, moreover, communication was created between students and teachers and among students. Tracking analysis, from the equation \( X = A \cdot t + B \). As explained in Okoro's research [2], communication determines the success of a performance. By good communication, students would be easier to solve problems. Communication can be developed with a training that can train students to be active in learning [14]. Research from Porlan [5] also supported this research which explained that the effective use of IT was used to optimize students' communication skills and enabled students to learn collaboratively. To observe the development of students' collaborative skills, learning by a project became an alternative. By project learning, differences in student creativity would be able to develop student communication and encourage student learning collaboratively [9]. Learning that uses real examples in daily life can foster student understanding, so that with good understanding students are able to develop communication skills well [15].

From the discussion above, there was a correlation between communication and collaboration skills. Finding out whether there was a correlation between communication skills and student cooperation can be seen from the results of calculations by using the correlation test shown in Table 2.

Table 2. Results of correlation analysis between students' communication and collaboration skills

| Average of communication skills score | Average of collaboration skills score | Correlation test | Category |
|--------------------------------------|--------------------------------------|-----------------|----------|
| 78.7                                 | 83.15                                | 0.876           | Very good|

Table 2 showed that the score of students' communication skills coefficient is 0.876, indicating that there was a direct relationship between students' communication skills and student collaboration, where if students' communication skills increase, the students' collaboration skills will increase, and vice versa.

Learning done through experiments can train students to improve student collaboration skills. Experimental education can enhance different attitudes in collaboration and can increase students' confidence in communicating [11]. Utilization of tracker can increase student learning interest, students can enjoy physics lessons [13]. With collaboration, students were able to express ideas to stimulate creativity in solving the problems. Students would be more confident in expressing their ideas when learning that required students to work together, so the higher confidence will improve student communication skills [7].

Learning by using video tracker software would form new knowledge and skills for students. Students' skills in terms of designing experiments required collaboration skills and communicating in group mates. Communication skills have increased both in quality and quantity. Quantitatively, it can be seen from the increase in the number of students who have finished working on students'
communication skills and the differences in skills when doing practicums between the control class and the experimental class.

4. Conclusion
From the discussion above, it can be concluded that the use of video tracker software effectively increased communication skills by 56.3% and effectively increased student collaboration skills by 70.3%. There was a relationship between communication and collaboration skills, seen from result of the correlation test of 0.876 in very good criteria.

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