Analysis of Students’ Collaboration Skills through Project-Based Learning Model

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Abstract

Student collaboration can be trained by implementing a project-based learning (PjBL) model because this model has great potential to produce a meaningful learning for students and can be a provision for them to face the future when they enter the world of work. This research aimed to obtain the level of students’ collaboration skill so that it can be used as a reference material to explore the potential of students. The type of this study is descriptive using a quantitative approach. The instrument used is an observation sheet to observe student collaboration skills during learning by applying PjBL to Fluid material which consists of 5 indicators and 10 descriptors. Data analysis uses the average percentage of students’ collaboration skills indicators. The average percentage of collaboration skills indicators is 76.33%. Collaboration skills possessed by students during learning by applying the PjBL model are classified as collaborative in accordance with the assessment criteria reference. So it is concluded that to foster student collaboration skills, students can apply the PjBL model in physics learning activities.

Keywords: Collaboration, PjBL, Students

INTRODUCTION

Science and technology are developing very fast in the industrial era 4.0. The young generation is the main component in utilizing technology for human progress in the industrial era 4.0. This requires the next generation to be formed capable of solving problems, like to deliberate, make wise decisions, can convey creative ideas, and can work efficiently both individually and in groups (Simanjuntak et al., 2019). There are four competencies that must be possessed by the younger generation in the industrial era 4.0, namely: critical thinking in solving problems, communication skills, creativity, and collaboration skills in solving problems (Greenstein, 2012).

Collaboration skills can improve students’ ability to work in groups and cooperate more efficiently in solving problems so that they are able to achieve common goals. Students will be able to come up with better conclusions when working collaboratively rather than working in person (Kathleen, 2016; Kropp et al., 2016). Collaboration skills are needed so that students are able to play an active role in every activity so that there is a good relationship between groups, mutual respect, and teamwork in order to achieve goals (Le et al., 2018). Collaboration ability can be viewed from the contribution of students in the group, helping each other among groups, accepting the opinions of all members, respecting the differences of each individual, having responsibility and being on time for assignments (Lai et al., 2017).

The results of field observations made of students taking Basic Physics courses to find
preliminary information, show that student collaboration skills have not been formed. Students still work individually on assignments or practices and have not prioritized the interests of teamwork. If this is allowed, it will affect their careers in the future. As students, they are required to be competent in their fields in order to provide updates to the surrounding environment. When students enter the world of work that requires students to be able to work in teams then thus students are required to have good collaboration skills.

The project-based learning (PjBL) model can be applied to train collaboration skills because this model has great potential to produce meaningful learning for students as a provision to face the future in the world of work. Students must have collaboration skills because they are useful in managing learning activities in the classroom. The PjBL model is a learning model that can encourage students to be more attractive and creative. The PjBL model fosters students' ability to discuss with peers, communicate and express, teamwork, and effective thinking for work planning and production, and increases cognitive and affective creativity (Lou et al., 2017). This is in line with the statement of the National Research Council Washington which emphasizes that collaboration needs to be taught to students (college students) with other communities who have different cultures and values. Students need to be guided to be able to collaborate with their classmates to gain information and create meaning. Students need to be taught to respect each other's strengths and adjust appropriately in working on projects (Pellegrino & Hilton, 2013).

Project-based learning can be a provision for students to face real-world problems and produce new insights. Learning with this model makes students active or student-centered to find, understand the subject matter. The PjBL model is able to lead students to find and create their own insights (Setyowati & Mawardi, 2018). Through the implementation of the PjBL model, students are trained to develop logical, critical thinking skills, and foster student curiosity, find answers and ask others to convey results to others. This is proven through research conducted by (Tekad & Pebriana, 2022) found that applying the PjBL model affects students' communication skills, students have full responsibility for completing the project and have good cooperation with their group members.

According to the description above, the researchers are interest to analyze student collaboration skills in Basic Physics lectures by applying the PjBL model. With this research, researchers can find out the level of student collaboration skills so that it can be used as a reference material to explore student potential. Other benefits expected through this research, educators both teachers and lecturers a reference to find solutions in order to improve student collaboration skills.
METHOD

The type of this study is descriptive with a quantitative approach. The percentage and explanation of the results of the analysis of students' collaboration skills in making products are explained descriptively. The subjects in this study were students of the Electrical Engineering study program in semester 1, totaling 30 students. This research instrument is an observation sheet to observe student collaboration skills during lectures by applying PjBL to Fluid material.

The researchers observed students' collaboration skills while applying the PjBL model. The PjBL syntax that researchers use based on (The George Lucas Educational Foundation, 2005) namely:
1) determine the fundamental question;
2) Design project planning;
3) draw up a project creation schedule;
4) Monitor the progress of the project;
5) testing results;
6) evaluate the experience.

Observations were made for three meetings and each meeting was allocated 3x50 minutes. Research data in the form of observations of students’ collaboration skill were analyzed based on indicators of collaboration skills. The collaboration skills indicators consist of 5 indicators, each indicators has 2 descriptors. The indicators of collaboration skills are presented in Table 1.

Table 1. Indicators of Collaboration Skills

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Descriptor</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bond each others</td>
<td>Working on tasks through sharing and bonding with group members (not working alone)</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Look for learning resources from the internet or books when doing project work.</td>
<td>B</td>
</tr>
<tr>
<td>2</td>
<td>Interaction</td>
<td>Does not stay away from group of friends</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Playing cell phone during group work</td>
<td>D</td>
</tr>
<tr>
<td>3</td>
<td>Individual responsibility</td>
<td>Take responsibility for completing tasks on time</td>
<td>E</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Make every effort to complete the assignment on time.</td>
<td>F</td>
</tr>
<tr>
<td>4</td>
<td>Communication skills</td>
<td>Discuss with a group of friends</td>
<td>G</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ask a group of friends</td>
<td>H</td>
</tr>
<tr>
<td>5</td>
<td>Teamwork skills</td>
<td>Actively participate in doing assignments</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Project tasks are completed in accordance with standard operating procedures.</td>
<td>J</td>
</tr>
</tbody>
</table>

Source: (Meilinawati, 2018)
Each descriptor is given a check mark if the appropriate behavior is seen in students to get a score. Then the value of student collaboration skills is calculated using the following formula:

\[
P = \frac{\text{score obtained}}{\text{total score}} \times 100\%
\]

Description:

\( P = \) percentage of collaboration ability

Then, the data were classified based on the indicators of collaboration skills and determines the category of collaboration skills. The category of collaboration skills in students is determined by referring to the criteria from (Riduwan, 2014) as retrieved in Table 2.

Table 2. Categories of Student Collaboration Skills

<table>
<thead>
<tr>
<th>Value</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \leq 20 )</td>
<td>Very uncollaborative</td>
</tr>
<tr>
<td>21 - 40</td>
<td>Not collaborative</td>
</tr>
<tr>
<td>41 - 60</td>
<td>Collaborative enough</td>
</tr>
<tr>
<td>61 - 80</td>
<td>Collaborative</td>
</tr>
<tr>
<td>81 - 100</td>
<td>Very collaborative</td>
</tr>
</tbody>
</table>

If the category of student collaboration skills is known, then the researcher analyzes descriptively the collaboration skills of the students.

RESULTS AND DISCUSSION

The results of the observations during the implementation of the PjBL model, students looked enthusiastic in working in groups to complete project tasks. Data on the observation of students’ collaboration skills are taken according to the results of observations. Based on the observation results, the percentage data of students' collaboration skills on each descriptors are presented in Figure 1.

Figure 1. Student Collaboration Score on Each Descriptor
Students actively participate in completing project tasks and take fully responsible. This can be seen through the observation results on each descriptor obtained successively are 73.3%, 76.7%, 90%, 43.3%, 76.7%, 80%, 90%, 73.3%, 86.7%, 73.3%. The PjBL model in learning Basic Physics is able to foster student collaboration skills. In line with research (Saldo & Walag, 2020) that the utilization of the PjBL model is able to develop student collaboration skills. Students will be eager to learn science and work in groups by having collaboration skills and caring about fellow group members. The percentage data of students' collaborative skills on each indicators are presented in Figure 1.

![Figure 1. Average Percentage of Collaboration Skills Indicator](image)

The average percentage of student collaboration skills from five indicators can be seen in Table 3.

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator</th>
<th>Percentage</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Bond each others</td>
<td>75%</td>
<td>Collaborative</td>
</tr>
<tr>
<td>2.</td>
<td>Interaction</td>
<td>66.67%</td>
<td>Collaborative</td>
</tr>
<tr>
<td>3.</td>
<td>Individual responsibility</td>
<td>78.33%</td>
<td>Collaborative</td>
</tr>
<tr>
<td>4.</td>
<td>Communication skills</td>
<td>81.67%</td>
<td>Very collaborative</td>
</tr>
<tr>
<td>5.</td>
<td>Teamwork skills</td>
<td>80%</td>
<td>Collaborative</td>
</tr>
<tr>
<td></td>
<td><strong>Average</strong></td>
<td><strong>76.33%</strong></td>
<td><strong>Collaborative</strong></td>
</tr>
</tbody>
</table>

The PjBL model can train students' collaboration skills through the stages in this model. At the stage of designing a project plan, students discuss with their group members, jointly search for references from various sources and then equalize perceptions to determine the product to be worked on. This activity supports collaboration skills, especially in the bond each others indicator. The average percentage score on indicator 1 is 75% and are in the collaborative category. Students do projects on the basis of task sharing and bond on each other. In line with research (Sufajar & Qosyim, 2022), the PjBL model makes students actively discuss with their group members, convey ideas to solve the problems that presented and openly accept the opinions of their members.

Indicator 2 "interaction" are in the collaborative category (66.67%).
results showed that during the project, each member worked together and did not separate themselves from their group mates. The result of the research conducted by (Buda et al., 2022), the application of PjBL produces a positive influence on group interaction where cooperation in groups is increases and students did not distance themselves from the group and they did not busy themselve. It also shows that students are responsible in completing the project. The average score of indicator 3 "individual responsibility" are in the collaborative category (78.33%). All students completed the project tasks with fully responsible, submitting the project according to the schedule that had been discussed. In line with research (Susetyarini et al., 2019) through the application of the PjBL model in each research cycle conducted, it was found that student responsibility increased in carrying out tasks and obligations. The attitude of student responsibility will appear when students have to complete task in the form of project within a predetermined period of time (Schwartz et al., 2013; Takeda, 2016). Students' responsibility in completing the project is supported by the establishment of good communication between group members who discuss actively.

Indicator 4 "communication skills" are in the highly collaborative category (81.67%) and has the higher score than other indicators of collaboration skills. In line with research (Sagala et al., 2019) PjBL model when applied in learning is able to upgrade collaboration and communication skills, and the more collaboration skills improve then communication skills will be better. Communication between group needs to be established to avoid conflict when conducting group discussions. In learning activities by applying PjBL, students' communication skills can be grown through the stages of testing results and evaluation, each group tests the feasibility of their project and provide opportunities for other group members to provide responses to their projects. At this stage, students are trained to communicate well, how to respond and ask questions to other groups. Communication skills are the main skills of the non-technical "soft skills" that students must have (Patacsil & Tablatin, 2017). Communication skills in discussing with group mates and being willing to ask questions related to the task show students' active participation and their ability to work in groups.

The results of data analysis on indicator 5 "teamwork skills" are in the collaborative category (80%). Each member in the group actively participates in completing tasks, helping each other when other members have difficulties, finding solutions together to solve these difficulties. (Jalinus et al., 2020) in his research found that teamwork increased through project tasks given to students, each group member had a high contribution to achieving their goals, student-centered learning that made students work together to find solutions when facing problems during testing the results of their projects. The PjBL model applied in physics learning is able to foster collaboration and communication skills and is able to provide an improvement
of students' creativity skills and critical thinking skills. Based on facts in the field found by researchers, activities in PjBL are able to foster students’ collaboration skills because learning activities focus on students.

CONCLUSION

The PjBL model can foster students’ collaboration skills. Indicators of collaboration skills, bond each others are in the collaborative category (75%), interaction are in the collaborative category (66.67%), individual responsibility are in the collaborative category (78.33%), communication skills are in the highly collaborative category (81.33%), and teamwork skills are in the collaborative category (80%). The average score of collaboration skills is 76.33% or in the collaborative category. Communication skills and collaboration skills are 21st century skills or 4C’s (creative, communication, collaboration, critical thinking). For educators who want to improve 4C skills can apply the PjBL model in learning activities.

REFERENCES


