The Effect of PjBLL Online Platform on Student Collaboration Skills and Basic Science Process Skills During the Covid-19 Pandemic

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Abstract: The purpose of this research to describe the effect of Project Based Laboratory Learning (PjBLL) on collaboration skills and basic science process skills of students. This type of research is quasi-experimental with one group pretest-posttest design. The subjects of this study were 60 first year students from two different classes who were enrolled in the Basic Physics course at the Department of Chemistry, Universitas Negeri Surabaya Indonesia. The collaboration ability test on kinematics and particle dynamics was used to measure students' collaboration skills, the basic science process skills test was used to measure students' science process skills as a pre-test and post-test. The analysis of the results showed that students' collaboration skills were complete on all indicators with gain scores in the high and sensitive categories, while basic science process skills were completed on all indicators with gain scores in the medium and high criteria. PjBLL Online platform can be used for lectures during the COVID-19 pandemic.

1. Introduction

Project Based Laboratory Learning (PjBLL) as one of the innovative learning models, accommodates the needs of 21st century skills and basic literacy and enters the industrial revolution era 4.0 [1] towards a society era 5.0 which must be able to solve various challenges and social problems by take advantage of various innovations. Innovation in terms of internet on things, artificial intelligence, robots to improve the quality of human life, and big data. Society 5.0 can also be interpreted as a concept of a human-centered and technology-based society in solving various problems to improve the quality of human life. The 21st century education era considers every student to be a learning community, learning is obtained from various sources, not only from books, but also from the internet, various technology and information platforms and global curriculum developments.

Internet on things and mobile phones to improve the quality of human life have changed habits and brought a big influence in student life, changing the mindset, personality, and behavior of students [2]. The negative effect causes introvert, antisocial and difficult nature to join the real world [2]. The influence of these behaviors will have an impact later when they are in matters related to work, where students are required to interact with other people competently and respect each other [3,4]. To deal with these problems is to foster collaboration skills in students. The importance of having these skills so that students are able to socialize, are sensitive to the surrounding environment, and control ego and emotions [5,6].

Collaboration skills as the ability to participate in every activity to build relationships with other
people, respect each other's relationships and teamwork to achieve the same goal play an important role in the industrial revolution era 4.0 and society era 5.0 [7,8]. The indicators of collaboration skills in this study are (1) actively contributing, (2) working productively, (3) showing flexibility and compromise, (4) showing responsibility, and (5) showing respect. In order for students to have these abilities, they can be trained through lectures by providing challenging problems that exist in real life [3-9].

In physics courses on college level, these skills are important to give students supporting information from observations and experiences. Students also can develop their skills [10]. When taught using constructivist strategies physics learning becomes more effective combined with development of process skills and conceptual understanding will facilitate students [11,12]. Some education experts state that its can be classified into integrated process skills and basic process skills [13-16]. The two process skills, namely integrated science process and basic skills, should taught and trained for students [7].

For students from the Department of Chemistry the basic ability aspects used in this study are: (1) observing real objects or events; (2) classifying, there is an opportunity to look for or find similarities, differences or certain criteria are given to do the grouping or determine the number of groups that must be formed; (3) communicating there is a certain form of statement to be changed to another form of presentation, for example the form of a description to a chart form, or a table to a graphic form; (4) inferring draw conclusions based on data, tables obtained; (5) predicting must have clear patterns or tendencies to be able to make predictions or predictions [13-16]. These basic ability are not hands-on skills using tools but process thinking used scientific processes so that the use of the Online platform during the COVID-19 pandemic is suitable to be applied in lectures [17].

The action given to first-year students whose effect will be analyzed on collaboration skills and basic science process skills is in the form of implementing Project Based Laboratory Learning Online platforms using Google Meet combined with WhatsApp and Google Form. The purpose of this research is to describe the effect of implementing PjBLL online platform using Google Meet combined with WhatsApp and google form on collaboration skills and basic science process skills.

2. Method
This study used a quasi-experimental one group pretest-posttest design which is presented in Figure 1. The effect of PjBLL (Project Based Laboratory Learning) on students' collaboration skills and basic science process skills was replicated with the available classes, namely class B* and class C*. The replication was carried out to see the consistency of the effect of using PjBLL.

| Class B* | O₁ | X | O₂ |
|----------|----|---|----|
| Class C* | O₁ | X | O₂ |

**Figure 1.** Replication research design [18]

Information:
O₁ = Pretest conducted before the implementation of PjBLL Online platform
O₂ = Final test is carried out after the implementation of PjBLL Online platform
X = Treatment using PjBLL Online platform

In this class, learning begins with an initial test [O₁] in which class B* and class C* students take tests of basic science process skills and tests of collaboration skills. With the PjBLL Online platform lecturers carry out the learning process (X) the lecturer carries out learning for 30 class B* students and 30 class C* students. Activity of learning ends with final test [O₂] students in both classes take two test, basic science process skills and collaboration tests.

The subjects were students of class B* and class C* of the chemistry department at the Universitas Negeri Surabaya who took general physics courses as many as 60 students. Research implementation in the 2019/2020 school year. Because the online lecture platform, the instruments used are observation
sheets, basic science process and collaboration skills tests. Collaboration skills, basic science process skills from students are assessed through videos made by students as a means of control that the process is really carried out by students by doing the test entries provided. The data obtained through the test instrument was then analyzed descriptively and N-gain analysis [19].

3. Results and Discussion

3.1. Student collaboration skills

Based on the research data obtained and the analysis of two (2) class, the results of student collaborative skills are shown in Table 1 for class B and Table 2 for class C below. Completeness of learning outcomes from class B and class C as the replication class is calculated and described based on the specified benchmark.

Table 1. Collaborative skills class B

| Indicators*                      | Description                  | Pre-test | Post-test |
|----------------------------------|------------------------------|----------|-----------|
|                                  |                              | ΣN       | x̅        | ΣN       | x̅         |
| Actively contribute C            | 12                           | 40.00    | 56.40     | 26       | 86.67      | 80.50     |
| Work productively NC             | 18                           |          | 4         |          |            |           |
| Demonstrate flexibility and NC   | 10                           | 33.33    | 68.60     | 27       | 90.00      | 89.60     |
| Compromise, C                    | 14                           | 46.70    | 68.50     | 24       | 80.00      | 80.20     |
| Show responsibility NC           | 16                           |          | 6         |          |            |           |
| Show respect C                   | 12                           | 40.00    | 64.12     | 26       | 86.67      | 83.12     |
| NC                               | 18                           |          | 4         |          |            |           |
| NC                               | 12                           | 40.00    | 66.40     | 25       | 83.33      | 82.50     |

Information: x̅= Average score, ΣN = Number of students, C = Complete, NC = Not Complete [20]

Based on Table 1, the pre-test class B students have not achieved completeness for all indicators of collaboration skills. Each of the five indicators is still below 76%. Collaboration skills as the ability to participate in every activity to build relationships with other people, respect each other’s relationships and teamwork to achieve the same goal play an important role in the industrial revolution era 4.0 and society era 5.0 [7-8]. After the PjBLL lectures on the Online platform, the achievement of the collaboration indicators (1) actively contributes, (2) works productively, (3) shows flexibility and compromise, (4) shows responsibility, and (5) shows an attitude of respect for getting everything done [20].

Table 2. Collaborative skills class C

| Indicators*                      | Description                  | Pre-test | Post-test |
|----------------------------------|------------------------------|----------|-----------|
|                                  |                              | ΣN       | x̅        | ΣN       | x̅         |
| Actively contribute C            | 12                           | 40.00    | 56.40     | 26       | 86.67      | 80.50     |
| Work productively NC             | 18                           |          | 4         |          |            |           |
| Demonstrate flexibility and NC   | 10                           | 33.33    | 68.60     | 27       | 90.00      | 89.60     |
| Compromise, C                    | 20                           |          | 3         |          |            |           |
| Show responsibility NC           | 14                           | 46.70    | 68.50     | 24       | 80.00      | 80.20     |
| Show respect C                   | 16                           |          | 6         |          |            |           |
| NC                               | 12                           | 40.00    | 64.12     | 26       | 86.67      | 83.12     |
| NC                               | 18                           |          | 4         |          |            |           |
| NC                               | 12                           | 40.00    | 66.40     | 25       | 83.33      | 82.50     |
| NC                               | 18                           |          | 5         |          |            |           |
Information: \( \bar{x} \) = Average score, \( \Sigma N \) = Number of students, \( C \) = Complete, \( NC \) = Not Complete [20]

For class C, the results are not much different from class C. Where at the time of the pre-test, all indicators of collaborative skills have not been completed and after studying with PjBLL online platforms, all indicators are completed. This indicates that the treatment given to the two classes has an effect on students’ collaboration skills. These abilities can be trained through lectures by providing challenging problems that exist in real life [2-9].

### Table 3. N-gain score and sensitivity class B and class C

| Indicators* | Class B | Class C |
|-------------|---------|---------|
|             | Gain score | Sensitivity | Gain score | Sensitivity |
|             | Coef. | Descrip. | Coef. | Descrip. | Coef. | Descrip. | Coef. | Descrip. |
| Actively contribute | 0.87 | High | 0.58 | Sensitive | 0.88 | High | 0.66 | Sensitive |
| Work productively | 0.89 | High | 0.68 | Sensitive | 0.88 | High | 0.69 | Sensitive |
| Demonstrate flexibility and compromise, | 0.80 | High | 0.69 | Sensitive | 0.82 | High | 0.68 | Sensitive |
| Show responsibility | 0.88 | High | 0.66 | Sensitive | 0.87 | High | 0.69 | Sensitive |
| Show respect | 0.85 | High | 0.57 | Sensitive | 0.88 | High | 0.68 | Sensitive |

Table 3 underlies the conclusion that there is an influence on the implementation of PjBLL online platform which in its implementation uses google meet combined with whatsapp and google form in class B* and class C*. The N-gain scores of the five indicators of collaborative skills are in the high and sensitive category. It is in accordance with and supports the research that has been done on the same topic as the PjBLL model [8-21].

The use of WhatsApp in learning is very helpful when there are problems in the synchronous mode. Lecturers can check assignments and implementation of learning via WhatsApp and students can also collaborate with fellow students or ask lecturers to overcome urgent difficulties. The use of the online PjBLL platform supports students’ collaborative abilities [11].

#### 3.2. Basic science process skills

The results of the study after implementation PjBLL Online platform for students from the Department of Chemistry who programmed basic physics courses in physics education study programs with aspects: (1) observing; (2) classifying; (3) communicating; (4) inferring; (5) predicting as shown in Table 4 [13,15,16].

### Table 4. Basic science process skills class B*

| No | Pre test | Post test | N-Gain |
|----|----------|-----------|--------|
|    | Score | Completeness Indicator Individual | Score | Completeness Indicator Individual | <g> | Information |
| 1* | 41.63 | D | NC | 71.99 | B | C | 0.54 | Medium |
| 2 | 44.75 | D | NC | 78.83 | B+ | C | 0.67 | Medium |
| 3 | 38.50 | E | NC | 78.93 | B+ | C | 0.68 | Medium |
| 4 | 51.00 | D | NC | 78.53 | B+ | C | 0.59 | Medium |
| 5 | 35.38 | E | NC | 84.78 | A- | C | 0.77 | High |
| 6 | 45.75 | D | NC | 84.88 | A- | C | 0.79 | High |
| 7 | 46.78 | D | NC | 79.33 | B+ | C | 0.58 | Medium |
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Based on Table 4, 30 students of class B for the pre-test achieved classical completeness of 13% in the incomplete category. Getting an A is not there yet. Obtaining B grade of 4 students, obtaining C value of 1 student, obtaining D value of 12 students and the rest obtaining E score. Only 4 students completed the individual indicators.

The results of the post-test showed that classically the completeness reached 97% in the category of complete completion and there was a large increase as the effect of the application of PjBLL Online platform in basic physics lectures. There are no more students who get D and E grades (do not pass). These skills are not hands-on skills using tools but thinking skills process using scientific processes so that the use of the Online platform during the COVID-19 pandemic is suitable to be applied in lectures guided using WhatsApp and google forms [21].

While the results of the basic science process skills in class C, the results are not much different from those obtained in class B, the results basic science process skills from students are presented at Table 5.

| No | Pre test | Post test | N-Gain |
|----|----------|-----------|--------|
|    | Score    | Completeness | Score    | Completeness |        |
|    | value    | Indicator Individual | value    | Indicator Individual |        |
| 8  | 51.12    | D          | 73.78   | B          | C       | 0.46   | Medium |
| 9  | 30.01    | E          | 78.85   | B+         | C       | 0.73   | High   |
| 10 | 35.38    | E          | 82.65   | A-         | C       | 0.76   | High   |
| 11 | 52.00    | D          | 76.40   | B+         | C       | 0.52   | Medium |
| 12 | 34.38    | E          | 85.88   | A-         | C       | 0.76   | High   |
| 13 | 46.63    | D          | 76.30   | B+         | C       | 0.59   | Medium |
| 14 | 67.63    | B-         | 73.48   | B          | C       | 0.38   | Low    |
| 15 | 43.75    | D          | 76.40   | B+         | C       | 0.59   | Medium |
| 16 | 33.25    | E          | 79.63   | B+         | C       | 0.69   | Medium |
| 17 | 65.66    | B-         | 71.66   | B          | C       | 0.17   | Low    |
| 18 | 56.65    | C          | 81.57   | A-         | C       | 0.57   | Medium |
| 19 | 34.48    | E          | 81.75   | A-         | C       | 0.71   | High   |
| 20 | 37.37    | E          | 72.89   | B          | C       | 0.56   | Medium |
| 21 | 34.38    | E          | 81.65   | A-         | C       | 0.71   | High   |
| 22 | 33.35    | E          | 66.73   | B-         | C       | 0.53   | Medium |
| 23 | 66.71    | B-         | 72.21   | B          | C       | 0.28   | Low    |
| 24 | 45.86    | D          | 77.73   | B+         | C       | 0.62   | Medium |
| 25 | 47.68    | D          | 78.11   | B+         | C       | 0.54   | Medium |
| 26 | 66.73    | B-         | 81.24   | A-         | C       | 0.46   | Medium |
| 27 | 36.60    | E          | 69.65   | B-         | C       | 0.53   | Medium |
| 28 | 24.87    | E          | 65.73   | B-         | C       | 0.55   | Medium |
| 29 | 43.64    | D          | 68.85   | B-         | C       | 0.46   | Medium |
| 30 | 33.35    | E          | 56.85   | C          | NC      | 0.37   | Medium |

Completeness Classical Indicator: 13% (not achieved)
Complete Classical indicators: 97% (achieved)

Information: C = Complete, NC = Not Complete

Table 5. Basic science process skills class C

| No | Pre-test | Post-test | N-Gain |
|----|----------|-----------|--------|
|    | Score    | Completeness | Score    | Completeness |        |
|    | Inf.     | Indicator | Inf.     | Indicator |        |
| 1* | 40.63    | D          | 65.63   | B-         | C       | 0.42   | Medium |
| 2  | 40.63    | D          | 78.13   | B+         | C       | 0.63   | Sedang |
| 3  | 26.12    | E          | 79.28   | B+         | C       | 0.76   | High   |
| 4  | 35.57    | E          | 76.26   | B+         | C       | 0.68   | Medium |
Based on Table 5, 30 students of class C for the pre-test achieved classical completeness of 3.3% in the incomplete category. Getting an A is not there yet. Obtaining a B- value of 1 student, obtaining a C value of 1 student, obtaining a D value of 16 students and the rest obtaining an E score. Only 1 student who completed the indicators individually.

The results of the post-test showed that classically the completeness reached 93.3% in the category of complete completion and there was a large increase as the effect of the application of PjBLL Online platform in basic physics lectures. There are still students who get a D as much as 1 person and pass all of them. These basic skills can be taught and trained for students even through online lectures because they are not hands-on skills using tools but process thinking skills using scientific processes so that the use of the online platform during the covid-19 pandemic is suitable to be applied in lectures. guided using the WhastApp and google form [21]. The increase in the N-gain of basic process skills obtained by class B* and class C* students due to the influence of the PjBLL Online platform with five indicators is shown in Table 6.

Based Table 6 shows that implementation PjBLL can increase completeness process skill indicators in two classes namely class B* and class C* which was originally not completed to 86% completed; because all indicators in research have been completed. This shows that there is an effect of using the PjBLL Online platform combined with WhatsApp and google forms. The results of this research are in accordance with and support the research conducted by [13,14]. The N-gain value shows the level improvement each indicator basic science process skills in the medium criteria.
### Table 6. N-Gain Process Skills Class B* and Class C*

| Class | Indicator | Pre-test Score | Completeness | Post-test Score | Completeness | N-Gain |
|-------|-----------|----------------|--------------|-----------------|--------------|--------|
|       | Basic Science Process Skills | | | | | |
|       | Observing | 46.88 | 8 | 25.00 | NC | 78.13 | 28 | 87.50 | C | 0.59 | Med. |
| B*    | Classifying | 40.63 | 5 | 15.63 | NC | 80.47 | 27 | 84.38 | C | 0.67 | Med. |
|       | Communicating | 42.97 | 4 | 12.50 | NC | 74.22 | 25 | 86.13 | C | 0.64 | Med. |
|       | Inferring | 27.34 | 3 | 9.38 | NC | 72.66 | 26 | 86.25 | C | 0.62 | Med. |
|       | Predicting | 30.47 | 4 | 12.50 | NC | 73.44 | 25 | 88.13 | C | 0.62 | Med. |
| C*    | Observing | 44.53 | 2 | 6.25 | NC | 78.91 | 27 | 84.38 | C | 0.62 | Med. |
|       | Classifying | 40.63 | 0 | 0.00 | NC | 80.47 | 28 | 87.50 | C | 0.67 | Med. |
|       | Communicating | 39.06 | 2 | 6.25 | NC | 75.78 | 27 | 84.38 | C | 0.61 | Med. |
|       | Inferring | 25.00 | 3 | 9.38 | NC | 74.22 | 28 | 87.50 | C | 0.67 | Med. |
|       | Predicting | 25.78 | 3 | 9.38 | NC | 74.22 | 27 | 84.38 | C | 0.65 | Med. |

Description: C = Completed, NC = not complete

### 4. Conclusion
The effect of implementing PjBLl online platform using Google Meet combined with WhatsApp and google form on collaboration skills can complete all indicators with gain scores in the high and sensitive category, while on basic science process skills can complete all indicators with gain scores in medium and high criteria.

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