The effect of problem-based learning during the pandemic on self-confidence and social interaction of high school student

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Abstract: The Coronavirus disease 2019 (COVID-19) pandemic has become an epidemic that has major impacts throughout the world, one of which is the change in the Indonesian education system from face-to-face learning to online learning. This study aims to determine the effect of online-based problem-based learning on the self-confidence and social interaction of students in class X MIPA at SMA Negeri 6 Tasikmalaya, West Java-Indonesia. This study uses the true experimental method. The population of this study is all classes X MIPA of SMA Negeri 6 Tasikmalaya for the 2020/2021 academic year. The samples of this study are class X MIPA 4 and class X MIPA 5, with as many as 36 students from each class. The instruments used are a self-confidence questionnaire and a social interaction questionnaire. The data analysis technique used is One-Way ANOVA with the Fcount of self-confidence (7.328) and social interaction (6.115). The results of data analysis and hypothesis testing concluded that there was an effect of problem-based learning on self-confidence and social interaction with a high category. A study using online-based problem-based learning must be supported by the readiness of students and teachers so that learning becomes effective. In addition, learning media such as Zoom meetings or Google Meet must be used.

Keywords: COVID-19; online learning; problem-based learning; self-confidence; social interaction

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Introduction

The 2019 Coronavirus disease (COVID-19) pandemic has caused several impacts on community activities, one of which is in education. With the development of the times and the state of education, it is necessary to find a way to prevent the learning system from being outdated by changing face-to-face learning into online learning. Online learning causes several obstacles for some communities such as teachers and students (Aguilera-Hermida et al., 2021; Sadikin & Hamidah, 2020). These obstacles include limited devices and limited quota or network access, to the point of causing boredom for students, and teachers are required to be able to use technology and create online learning media (Suprapmanto & Utomo, 2021).

The impact of online learning on students is limited social interaction. Aguilera-Hermida (2020) explains that online learning can reduce students' social interactions with teachers, as well as interactions between students. This problem emerges because learning that is always done at school every day becomes online learning that is done at home (Fitriyani et al., 2019). One form of student social interaction is learning in groups (Bali, 2017). Casino-García et al., (2021) explains that the process of social interaction of students is related to self-confidence.

In social interactions, each student must have self-confidence so that they are more confident in their own abilities (Arianti et al., 2019). Syam & Amri (2017); Celikel & Çoban (2022) states that individuals who have a supportive background and self-concept will gain a high level of trust so they can socialize well. Self-confidence is an important personality aspect that must be applied to a person. Educators must take action to increase students' self-confidence in social interactions by choosing media and learning models that will be used in the learning process.

One learning model that can increase students' self-confidence and social interaction is problem-based learning (Rahman & Fauzia, 2020), where the student learning process is in building relationships and

communication easier (Conradie et al., 2021). During the pandemic, the use of problem-based learning can be carried out online (Susanto, 2020). The problem-based learning model in online learning is different from face-to-face learning as it is carried out using learning application media.

The material used in this study is the concept of an ecosystem because it has concrete characteristics. Students can take advantage of the environment around their homes to learn about ecosystems during online learning. Based on the results of interviews with two students of SMA Negeri (State Senior High School) 6 Tasikmalaya-West Java, Indonesia, student A explained that they lacked confidence in answering the assignments given by the teacher. Student B explained that the process of social interaction had not been synergistic, so there were still some students who did not understand the material. Therefore, it is necessary to conduct a study to determine whether there is an effect of online-based problem-based learning on the self-confidence and social interaction of students on the concept of ecosystem in class X MIPA (Mathematics and Natural Sciences) of SMA Negeri 6 Tasikmalaya. This study aims to determine the effect of online-based problem-based learning on the self-confidence and social interaction of students in class X MIPA at SMA Negeri 6 Tasikmalaya, West Java-Indonesia.

Method

This study is a quantitative study with experimental methods. Probability sampling was conducted using the cluster random sampling technique. The samples produced in this study were class X MIPA 4 as an experimental class and class X MIPA 5 as a control class. The instrument used is in the form of a closed questionnaire. Based on the results of the validity test using product moment correlation, there were 28 statements in the self-confidence questionnaire, and 21 validated statements in the social interaction questionnaire, which were used in the questionnaire. Invalid statements were corrected and then retested. Statements that remained invalid are not used in the questionnaire. In the reliability test using Cronbach Alpha, the self-confidence instrument obtained a value of 0.887 and the social interaction instrument obtained a value of 0.850, both of which were declared reliable. Data processing and analysis techniques used were One-Way ANOVA test with normality test using Kolmogorov-Smirnov test and homogeneity test using Levene's test. This study uses synchronous learning assisted by the use of the WhatsApp application because learning is conducted amid the pandemic so that there are no face-to-face meetings. The problem-based learning syntax used by the author uses the syntax from Arend in 1997, namely providing orientation on problems to students, organizing students to research problems, assisting with independent and group investigations, developing and presenting artifacts and exhibits, as well as analyzing and evaluating the process of overcoming problem.

Results and Discussion

In this study, the normality test was performed using the Kolmogorov-Smirnov test. The data tested include the results of a self-confidence questionnaire and a social interaction questionnaire with the following tested hypotheses: H0: the sample comes from a normally distributed population. Ha: the sample does not come from a normally distributed population.

Basic decision-making with a significance level of 5%. The sample is normally distributed if it has a significance value greater than 0.05 (Sig > 0.05). The results of the normality test of self-confidence can be seen in table 1 while the results of the test on social interaction are presented in table 2.

Table 1. Self-Confidence Normality Test

Class	Statistics	df	Sig
Control class	0.088	33	0.200
Experiment class	0.124	31	0.200

Source: Data Processing Results

Table 2. Social Interaction Normality Test

Class	Statistics	df	Sig
Control class	0.143	33	0.085
Experiment class	0.102	31	0.200

Source: Data Processing Results

The conclusion of the normality test is that self-confidence and social interaction are normally distributed with Sig > i.e. 0.085 > 0.05 and 0.200 > 0.05.

The data of the homogeneity test on self-confidence and social interaction was processed using Levene's Test. Data can be said to be homogeneous if the significance value is more than 0.05 (Sig > 0.05). The results of the homogeneity test of self-confidence are displayed in table 3 while the results of the

homogeneity test of social interaction can be observed in table 4.

Table 3. Self-Confidence Homogeneity Test

Levene Statistics	df1	df2	Sig.
1,785	1	62	0.186

Source: Data Processing Results

Table 4. Social Interaction Homogeneity Test

Levene Statistics	df1	df2	Sig.
0.954	1	62	0.332

Source: Data Processing Results

The results of the homogeneity test of self-confidence and social interaction are both homogeneous because the significance value is more than 0.05.

The following hypotheses were tested using One-Way ANOVA test: (1) H_0: there is no effect of online-based problem-based learning on students' self-confidence and social interaction on the concept of ecosystems in class X MIPA of SMA Negeri 6 Tasikmalaya for the 2020/2021 academic year. (2) H_a: there is an effect of online-based problem-based learning on students ' self-confidence and social interaction on the concept of ecosystem in class X MIPA of SMA Negeri 6 Tasikmalaya for the 2020/2021 academic year. (3) H_0 is accepted if $F_{count} < F_{table}$. The following table presents the results of the hypothesis testing.

Table 5. Summary of Hypothesis Test Results

	F_{count}	F_{table}	Conclusion
Self-confidence	7,328	2.15	H_0 Rejected
Social interactions	6,115	2.15	Reject H_0 Rejected

Source: Data Processing Results

The results of the One-Way ANOVA test show that $F_{count} > F_{table}$, so H_0 is rejected. This means that there is a significant effect of online-based problem-based learning on self-confidence and social interaction in the control class and the experimental class.

The learning process in the experimental class using problem-based learning

The application of the online-based problem-based learning model in the experimental class during the study was carried out in two meetings with a predetermined time from the school. The first, second, and third stages of learning were carried out in the first meeting. The third stage, namely guiding and supervising students in each group, was carried out outside class hours. Meanwhile, the fourth and fifth stages were carried out at the second meeting. During the learning process, problem-based learning was used at the first meeting for 60 minutes.

The results of the study showed that there were several students who could generate opinions or ideas about the problem. Ideas about problems obtained by the students are as follows: (a). What causes the destruction of tigers' habitat in protected forests? (b). Why did the food chain in Sumatra's protected forests break? (c). Who is the mastermind behind this problem? (d). How to prevent tigers from coming to residential areas?

As explained by Leonda et al. (2015) the steps in problem-based learning are designed to help students develop their thinking, problem-solving, intellectual skills, where they can become independent learners with experience gained through real situations or simulations. With problem-based learning, pedagogical growth and performance improvement can describe long-term learning outcomes (Liu & Pásztor, 2022; Su, 2022). Problem-based learning requires students to acquire knowledge in solving existing problems and have independent learning strategies (Mohammadi et al., 2020). In addition, students must have the ability to work together in groups (Riyadi et al., 2021; Dirgatama et al.,2016).

From the results of the study on problem-based learning using WhatsApp, it is observed that students can attend from the beginning to the end of learning. The first, second, and third stages of problem-based learning with the help of the WhatsApp application can be carried out effectively at the first meeting with a learning time of 60 minutes. The third stage is also carried out outside of learning hours to be effective. At the second meeting, the fourth stage was conveying the results of group discussions, while the fifth stage of the evaluation was less effective because the time allotted was only 30 minutes.

Learning process in control class using direct instruction

The learning carried out in the control class used direct instruction. The direct instruction phase in the control class is conducted to convey goals and prepare students. demonstrate knowledge and skills,

guide training, check understanding and provide feedback, as well as provide opportunities for independent practice (Zahriani, 2014). The Direct Instruction (DI) model is given to students who have different cognitive styles to give an overview of the learning process as a whole (Arifin et al., 2020),

At the first meeting, learning was carried out by delivering ecosystem material with a time of 60 minutes. The first phase conveyed the learning objectives by sending them to the WhatsApp group. Then, in the second phase, the researcher presented material on the energy flow part of the ecosystem and explained each slide of the energy flow material. In the third phase, the researcher gave short questions about the energy flow material to guide students in discussing the answers to these questions. In the fourth phase, the researcher asked questions about the material that had been explained to check the students' understanding, and it ended with the conclusion of the energy flow material. The fifth phase was carried out by giving assignments to students in the form of LKPD (student worksheet) to be collected at the next meeting.

Learning activities at the second meeting were conducted for 30 minutes by providing a link to a self-confidence questionnaire and a social interaction questionnaire. Then, students were directed to fill out the questionnaire on the link that had been given. There were 33 students who filled out the self-confidence questionnaire in the control class.

Self-Confidence

Self-confidence is a belief in one's own ability so that an individual does not feel awkward about taking an action, feels free to do something according to one's own wishes, is able to take responsibility for what they do, is polite, courteous when talking to others, and understands their own weaknesses and strengths (Nisa & Wulandari, 2019). Therefore, self-confidence is very important in students' learning activities.

The highest indicator is the 5th indicator namely being responsible for everything that is done, which has an average score of 3.4. According to Getie, (2020); Juwita et al., (2019), there are several ways to foster an attitude of responsibility in students, including by giving assignments, letting students make their own decisions, and giving students confidence. Students in the experimental class were given tasks to solve problems obtained from the results of group discussions.

The fourth indicator is having an assessment of the problem that is in accordance with the actual reality, which constitutes the lowest indicator with an average score of 2.82. According to Malureanu et al., (2021); Arianti et al.,(2019) high self-confidence will make students successful in life and it is needed by students to be able to solve problems calmly without despair and to accept gracefully the results of their efforts. Furthermore, with self-confidence, students become good at school or in social settings.

As for the results of the study that has been carried out in the control class, the highest indicator is the 3rd indicator, namely self-confidence in overcoming problems, which has the third lowest average score of 3.11. Afifah et al.,(2019) explain that students must have good self-confidence so that they can express something easily, can believe in what they have, and effortlessly express opinions to others.

The first indicator, namely being able to act independently in making decisions, has the lowest average score of 2.78. In this indicator, students still need other people in making decisions or plans and they lack self-confidence. In line with the opinion Sa'diyah, (2017) it is explained that independent people show initiative, strive for achievement, show great self-confidence, and relatively rarely seek protection from others.

The comparison of self-confidence in the control class and the experimental class can be seen in Figure 1.
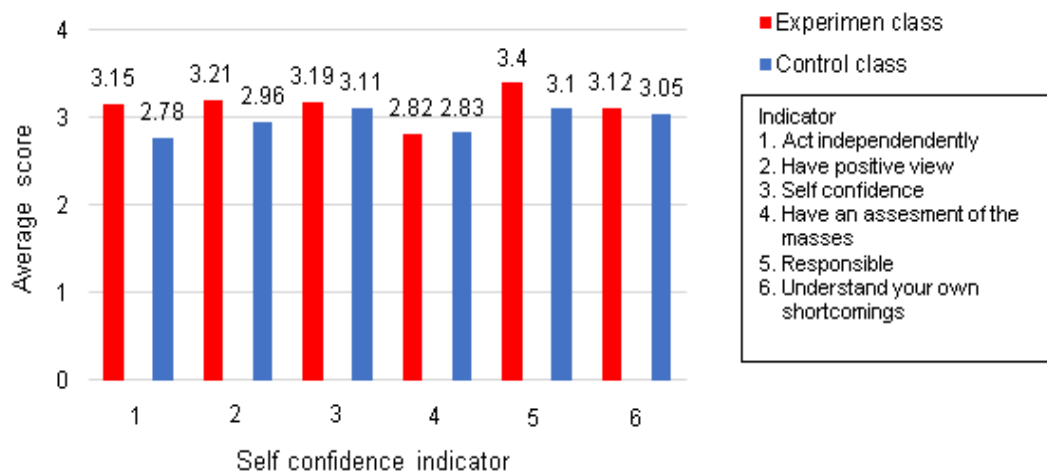

Figure 1. Diagram of the average score of self-confidence

Social interactions

From the results of indicators of social interaction in the control class and experimental class, it can be seen that the 7th indicator, namely adapting to the environment, has the highest average score (3.48). According to Windaniati (2015), the process of self-adjustment or adaptation is a natural and dynamic thing that aims to change individual behavior so that there is a relationship that is more in line with environmental conditions. while the decrease in the level of intellectual communication can be influenced by the availability of self-social information processes and adaptation of student behavior (Şenol & Metin, 2021).

The 4th indicator, namely providing help to others, and the 8th indicator, namely choosing to live in groups, have the lowest average score with a score of 2.42. According to Bashori (2017); and Rezapour et al., (2022) it is explained that the number of individuals who have a sense of help is low because these individuals have differences with other individuals and have negative feelings towards individuals who ask for help.

Meanwhile, from the results of the study of social interaction in the control class, it is discovered that the 9th indicator, namely adapting or tolerating the attitudes of group members, has the highest average score of 3.06. To date, learning activities in class X MIPA are conducted online, but adaptable or tolerant students have a high average score. in line with Hamaidi et al., (2021) and Windaniati (2015), the process of self-adjustment or adaptation is a natural and dynamic thing that aims to change individual behavior so that there is a relationship that is more in line with environmental conditions. For example, students can share their feelings or tell the problems they are feeling to other students by telling stories to get solutions to the problems they face.

The lowest indicator is the 4th indicator, namely providing help to others, which has the lowest average score of 2.35. Rachman and Nashori (2016) argues that the development of helping behavior is influenced by the size of the school because the size of the school is a factor in determining how often students see familiar faces.

The difference in the average score of social interaction in the control class and the experimental class can be seen in Figure 2.
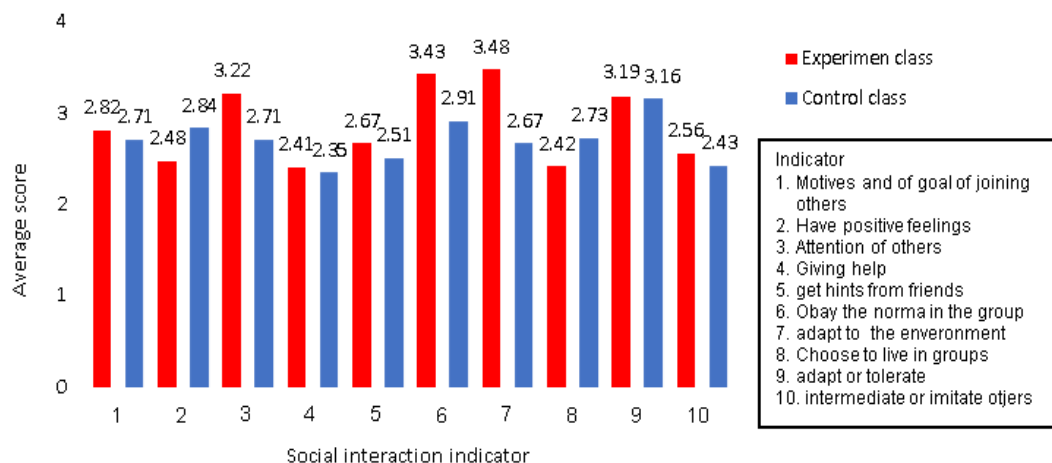

Figure 2. Diagram of the difference in the average score of social interaction

Figure 2. shows the results of the comparison of the average score of social interaction in the experimental class and the control class. Several indicators have similar average scores because one of them is the average self-confidence score which has a difference in the number of students who respond to the social interaction questionnaire.

The effect of online-based problem-based learning on self-confidence and social interaction of students

The following is a diagram of the average difference in self-confidence scores in the control class and the experimental class from Figure 3. Figure 3, it can be seen that there are differences in self-confidence in the control and experimental classes as explained by Hussin et al., (2019) where collaborative learning is very important to use in building students' self-confidence during the learning process. With a good level of self-confidence, students will be able to solve the problems they face during learning. Therefore, the average self-confidence score in the experimental class that uses problem-based learning is higher than in the control class. This is in line with the study conducted by Susanto et al., (2019) which explains

that the application of problem-based learning can increase students' self-confidence. Student confidence is increased by carrying out problem presentation activities. As a result, students become confident in formulating questions through the stages of investigation. Students are optimistic and can be responsible, and through presenting the results, students have confidence in themselves and dare to express their opinions.

Figure 3. Self-Confidence Average Difference Chart

The low self-confidence of students is caused by the many psychological barriers such as feelings of security, fear, anxiety, and feeling separated from society, which have a negative impact on students during learning activities (Nguyen et al., 2019). This is in line with the study conducted by Akbari and Sahibzada (2020), which showed that there was poor participation at Kandahar University in classroom learning. This participation was closely related to self-confidence which resulted in the influence of their vulnerability in the learning process.

For the results of the social interaction study in the experimental class, an average score of 2.87 was included in the high category and in the control class, an average score of 2.69 was included in the high category as well (table 4). The experimental class has a high average score compared to the control class. Yew and Goh (2016) explain that the learning process using problem-based learning is a strategy that supports active learning and group learning because effective learning occurs when students build and collaborate with each other to develop ideas through the process of social interaction. The difference in the results of social interaction can be seen in the Figure 4.
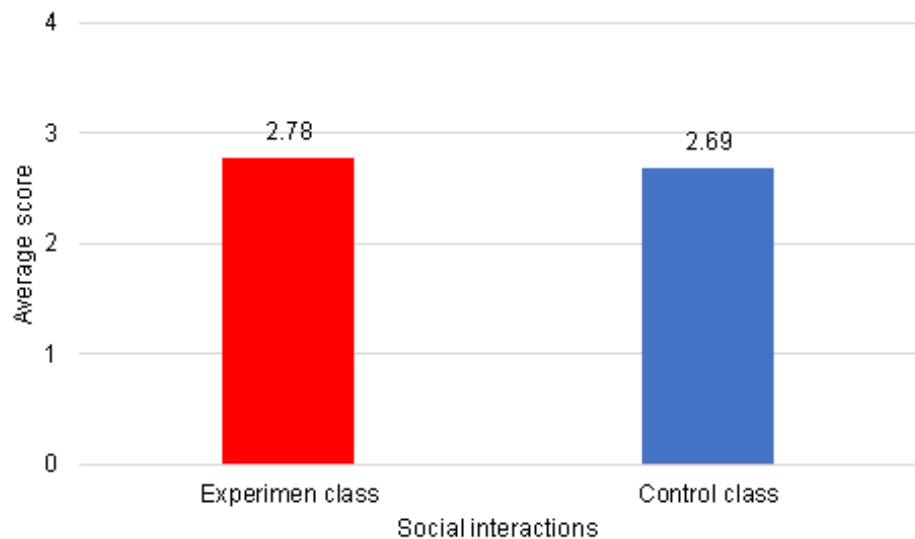

Figure 4. Difference in Social Interaction Average Score

Meanwhile, the effect of problem-based learning on social interaction resulted in higher social interaction in the experimental class compared to the control class. In problem-based learning, there are group work

and discussions that require students to interact with their friends. Social interaction plays an important role in problem-based learning because students conduct group discussions and use problem-based learning to increase their social interaction and achieve higher learning outcomes compared to competitive learning or individualistic learning (Dewi et al., 2013).

Advantages and disadvantages of the WhatsApp application as a tool in the online learning process

Based on the results of the study, it can be observed that there are advantages and disadvantages of using the WhatsApp application as an online learning aid. The advantages of the WhatsApp application include its features that can save documents in the form of PDF, Microsoft Word, Excel, and PowerPoint files, send messages, engage in group chats, share photos, videos, and WhatsApp messages, as well as its role as a social media that can be used for media literacy (Sahidillah & Miftahurrisqi, 2019). Meanwhile, according to Bhagaskara et al., (2021) the advantages of the WhatsApp application are that teachers, students, and parents are familiar with the use of the WhatsApp application, it does not use a lot of internet quota, learning objectives can be achieved by using various methods such as learning videos, messages, voice messages, and also through images. Moreover, WhatsApp media can accommodate three aspects of assessment, namely cognitive, affective, and psychomotor.

As for the shortcomings of the WhatsApp application as an online learning aid, according to Zakirman and Rahayu (2018), WhatsApp cannot send files with a large enough size. Another drawback of the WhatsApp application is the problem of punctuality, where there are some students who are not on time when learning begins.

Conclusion

It can be concluded that this study was used to see the process of social interaction and students' self-confidence during the pandemic when a different learning system was implemented. This study is expected to be a reference for future learning using online-based problem-based learning

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Conflicts of Interest

The author states that there are no problems in the process of writing and publishing this article

Author Contributions

S. L. N.: research, preparation, and improvement; R. F. M and E. N.: preparation, research, and improvement methods; and all authors: read and approved the final manuscript

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