

# The Effectiveness of Online Learning in Improving Students' Problem Solving Skill

*by p3i UM Surabaya*

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# The Effectiveness of Online Learning in Improving Students' Problem Solving Skill

Endah Hendarwati<sup>(✉)</sup> and Naili Sa'ida

Universitas Muhammadiyah Surabaya, Surabaya, Indonesia  
endah.hendarwati@fkip.um-surabaya.ac.id

**Abstract.** This article discusses how to improve problem-solving skills through online learning. Online learning involves actions and knowledge that make it easier for students to enhance their learning quality. The zoom meeting platform is used in the teaching and learning process which uses a variety of discussion techniques, such as students arguing, asking and answering questions, and completing given the assignments. The results of data analysis using t-test Independent Sample Test obtained the value of Sig.Levene's Test for Equality of Variance of  $0.108 > 0.05$ , so the data variant is said to be homogeneous. Meanwhile, the equal variance assumed with a sig (2-tailed) value of  $0.000 < 0.05$  so that  $H_0$  was rejected and  $H_1$  was accepted. This means that the two groups, namely the control class and the experimental class, have a significant difference in the post-test scores of problem-solving abilities so that it can be stated that there is a significant difference between the pretest and posttest scores for the control and experimental classes, so it can be said that the treatment given to the class with the application of the online learning system through an effective zoom meeting platform to enhance problem-solving capabilities.

**Keywords:** online learning · problem solving

## 1 Introduction

The development of science and technology requires the education to produce quality graduates with 21st century learning skills who are able to communicate, collaborate, think critically and solve problems and be creative. One of the skills needed in real life for students is the ability to solve problems. In general, students' ability to solve student problems is still lacking. They tend to form groups and do negative activities, often Skip the class, live lazily, spend most of the time for playing or even hanging out at the mall. Today, students tend to be less able to solve problems well.

Problem-solving skills are important and useful in all fields of study [1]. This skill is an effort to find ways to solve new problems faced [2]. The ability to solve problems is the result of a person's thinking in solving a problem by using insight, experience, and understanding of the problem. Problem-solving needs high-level thinking in accordance with the insights someone has in solving problems [3]. It can be concluded that problem-solving skill is a process of thinking to solve problems using the knowledge, experience, and understanding.

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Based on observations, it was found that students were less able to solve problems well. This could be seen from students' behavior such as making decisions without considering the impact, which meant that they were not able to make decisions appropriately; still following friends' decision, unable to manage the time for tasks submission. These things show that students' problem-solving skills are still low. The students who have the ability to solve problems well they will tend not to do things that can harm themselves, in making decisions they will also tend to consider the impact that will occur.

During the Covid 19 pandemic, to overcome the problems above, online learning could be one of the media used for direct discussions such as zoom, google meet, webex, and many others to give students understanding. Through online learning students are still able to meet face to face with friends and lecturers even though it is virtual, so it still looks like learning when offline. In addition, online learning also requires evaluation to get improvements based on valid data. Thus, the writer wanted to know the effectiveness of online learning in improving students' problem-solving skills.

### **1.1 Problem Solving Skill**

The problem is a situation where the individual wants to do something but does not know the action needed to get what he wants [4]. Problems occur when someone does not know how to achieve the goals they have [5]. The problem is the difference between expectations and the real situation. Thus, to find or solve, it is needed to pay attention to social, cultural, or intellectual values [6]. Problems occur when the situation has a gap between the expected conditions and existing conditions and requires problem solving.

The problem categories are: 1) initial knowledge used in problem solving, 2) the nature of the goal, 3) complexity, 4) how to solve problems, 5) similarity to previous solutions, and (6) alternative solutions to problems. Types of problems are based on differences in four elements, namely complexity, dynamism, and specification of expertise or abstractness [6].

The problem structure is in a well-structured to ill-structured situation [6]. Problems in learning are well structured problems. Structured problems require the application of certain concepts, rules and principles so that they are easier to solve. Problems in life are more ill-structured, so that the solutions are unpredictable or convergent, and are interdisciplinary, that is, they cannot be solved by applying concepts and principles from one domain so that they require different intellectual abilities for each problem.

Problem-solving abilities are determined by a specific domain and context which depend on the nature of the individual's context or knowledge or area of expertise. Individuals in different fields of expertise or contexts will develop different reasoning in problem solving [6]. Experts in the field of biology have different problem solutions from experts in other fields because each field of science has different solutions according to the thoughts and theories in their field of science.

Solving problems means finding ways how to achieve the expected goals in a way according to the problem at hand. Problem solving is a non-automatic strategy used to achieve goals with higher order thinking. A person requires a high-level thinking process in determining how to achieve the expected goals. This thought process is called problem solving [7]. In looking for new information, a person must remember the information that has been obtained, understand the information, evaluate all ideas critically, develop

alternative solutions to problems, and communicate effectively. Problem solving skills are important for students to increase their chances of getting a job placement [8].

Problems as a process to solve existing problems (new situations) by using previous abilities or experience to assess the causative factors. Factors that influence problem solving are classified into two, namely external and internal factors. External factors are factors related to the nature of the problem at hand. Internal factors are related to personal characteristics of problem solvers, such as experience such as prior knowledge, strategies used, and problem abilities [9].

The typology of problems, in the form of puzzles, algorithms, story problems, problem use rules, decision making, problem solving, problem diagnosis solutions, strategic performance, systems analysis, design problems, and dilemmas [6]. The typology of story problems (problem stories) is often used in the research. Learning is inseparable from problems, learners are required to be able to plan strategies in solving very diverse problems. In problem solving learning, it can be done by teaching the material according to the target material and certain learning to certain learners for a certain amount of time. Some specific problems require specific solutions. But there are many problems that have multiple solutions or multiple ways to the same solution. Problem solving is a common mechanism behind all thinking, even memory [10]. Apart from memory, problem solving is necessary for critical thinking, creative thinking, and effective communication. Thus, solving the problem requires higher-order thinking. Problem solving is needed for critical and creative thinking (higher order thinking).

## 1.2 Online Learning

Online learning is learning that utilizes internet networks in the learning process [11]. Online learning is a learning activity effort that teaches students to do face-to-face learning through internet networks using various platforms such as zoom meetings, google classrooms and video calls via what's up application. Besides, online learning is also defined as learning activities organized by schools where the students and teachers are in separate locations so that it requires the necessary media to support the learning process [12].

Currently, online learning can be used as a solution for implementing distance learning when a disaster or condition occurs that makes it impossible to have direct learning [13]. Online learning activities emphasize the interaction and distribution of information that makes it easier for students to improve the quality of their learning. This learning also facilitates the implementation of learning from wherever and whenever it is implemented.

The online learning nowadays is becoming more popular because it is able to provide a more flexible service, providing many advantages in its implementation. Online learning aims to provide quality learning services and is able to reach a broad target [14]. Online learning used in this study is zoom meeting platform. Zoom meeting is an application that provides video conferencing, online meeting, mobile collaboration and chat services. In distance learning, zoom cloud meetings are able to present a face-to-face learning atmosphere via virtual. Learning activities through this application can make students excited and actively involved in the learning process. The zoom application has several features including: 1) one on one meeting, 2) group video conferencing, 3) chat and share screen, and 4) recording [15].

The zoom meeting platform is able to present learning activities such as face-to-face even though it is done virtually. This platform is used as a medium for remote communication through virtual meetings. This application can be used by 1000 participants simultaneously, has clear video and sound quality, various interesting features such as background and filter settings, supports presentation activities, there is feature for microphones and videos, and can be used for group discussions such as small groups with breakout room settings.

The use of a zoom meeting forum for online learning makes it easier to manage learning discussions. During discussions, students will directly engage with their peers. Students are more enthusiastic about sharing their opinion than using Whatsapp or university LMS.

## **2 Methodology**

The method in this study used quantitative with a quasi-experimental design. This study aims to determine the effectiveness of online learning in developing problem-solving skills. The sample in this study were 4th semester students of early childhood education study program, Universitas Muhammadiyah Surabaya on learning strategy course. Random sampling was used to choose homogeneity of the population. The data were collected using questionnaire with closed, semi-closed and open questions. The data analysis technique used the t-test Independent Sample Test.

## **3 Results and Discussion**

Students in higher education need the opportunity to work in groups and apply their problem-solving skills in real-life circumstances, which necessitates the development of problem-solving skills. The ability to define problems, understand problems, formulate problems, analyze problems, organize problem solving, conduct problem solving, and evaluate the results using problem-solving ability test.

To find out the significant increase in problem-solving skill between the pretest and posttest, t-test must be used. With a significance level of 5%, an independent sample test was conducted to determine the efficacy of online learning in enhancing problem-solving skill. Data normality and homogeneity tests were performed prior to the t test. The significance of the results of problem-solving skill in online learning is analyzed as follows.

### **Homogeneity Test**

The t-test of the Independent Sample Test was carried out on two groups of homogeneous students, so that before the t-test of the Independent Sample Test was carried out, a homogeneity test was necessary. The data used to analyze the homogeneity were the pretest and posttest data in two classes with the test criteria of the results of the SPSS program version 20.0 with the criteria;  $H_0$  is accepted if the significance is  $>0.05$  and  $H_1$  is accepted if the significance is  $<0.05$ .

**Table 1.** Test of Homogeneity of Variance

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Examination score	Based on Mean	,403	1	42	,528
	Based on Median	,384	1	42	,538
	Based on Median and with adjusted df	,384	1	41,979	,538
	Based on trimmed mean	,408	1	42	,526

**Table 2.** Normality Test of Problem solving skill score

Tests of Normality						
	Kolmogorov-Smirnov <sup>a</sup>			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Examination score	.094	44	.200*	.981	44	.638

\*This is a lower bound of the true significance. <sup>a</sup>Lilliefors Significance Correction

Based on Table 1, it is known that the homogeneity of Lavene is 0.404 with a significance of 0.529, it can be concluded that Ho is accepted and H1 is rejected, which means that the two groups of students in two classes are a homogeneous group.

### Distribution Normality Test

The significance test was used to know the increase in problem-solving skill, the normality test was carried out to determine the distribution of groups. The data normality test is shown in Table 2.

The normality test chart can be seen in Fig. 1.

The results of the normality test in table 4:33 show that based on the Kolmogorof-Smirnov test and the Shapiro-Wilk test, the significance value (p-value) > 0.05 with the Shapiro-Wilk test value of 0.638 > 0.005 meaning that Ho was accepted. This means that the data is normally distributed so that it can be used for the t-test of the Independent Sample Test.

### Independent Sample Test t-Test

The t-test Independent Sample Test was used to compare before and after treatment given to the two different classes so that the significance level of the treatment given was known [16]. The treatment referred to the implementation of online learning system. Independent Sample Test t-test analysis using control group pretest-posttest design.

The results of the t-Independent Sample Test on the problem-solving skill using SPSS version 20.0 are shown in Table 3.

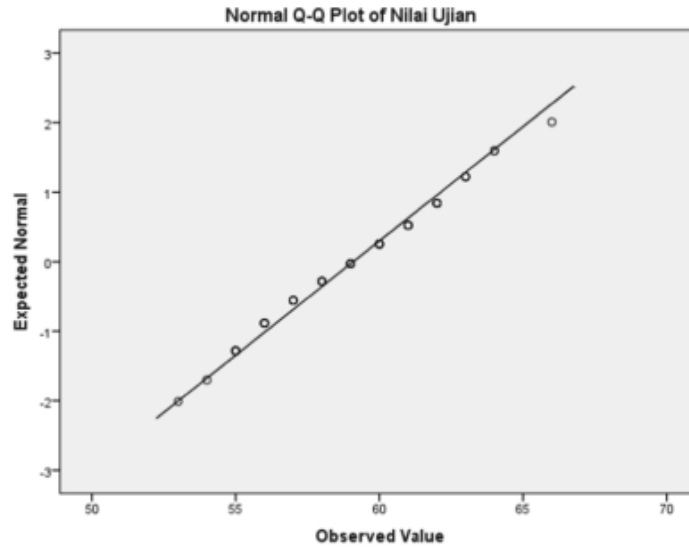


Fig. 1. Result of normality test of problem solving skill

Table 3. t-test Independent Sample Test of Problem Solving score

Group Statistics										
	Class	N	Mean	Std. Deviation	Std. Error Mean					
Examination score	A	23	84.4782	4.52136	.94276					
	B	21	63.7142	3.19598	.69741					
Independent Samples Test										
	Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Examination score	Equal variances assumed	2.698	.107	17.434	42	.000	20.76398	1.19104	18.36037	23.16759
	Equal variances not assumed			17.706	39.617	.000	20.76398	1.17269	18.39316	23.13479

The Sig. Test Levene's for Equality of Variance value was  $0.107 > 0.05$ , indicating that the data variant was homogeneous, based on the results of the t-test Independent Sample Test in Table 3. Meanwhile, similar variance was assumed with a sig (2-tailed) value of  $0.000 < 0.05$ , so that  $H_0$  was rejected and  $H_1$  was accepted. This means that the two student class groups, namely the control and experimental classes, have a significant difference in the post-test scores of problem-solving skill so that it can be stated that there is a significant difference between the post-test and pretest scores after treatment given through online learning system effective to improve problem solving skills.

The ability to solve problems is needed by someone to achieve certain goals and to find solutions. A student has a duty to become an individual who always carries out positive activities such as discussing, studying, expressing arguments during deliberations or presentations, asking questions, bringing up various innovations, developing creativity, critical thinking, and good time management appropriately. When students can do this, they will be able to solve the problems they face well. Based on the results of the study, it shows that the implementation of online learning can improve students' ability to solve problems. This happens because online learning activities through zoom meetings emphasize the interaction and channeling of information that makes it easier for students to improve the quality of their learning. In online learning using zoom meetings, frequent discussions are held which requires students to be actively involved in asking, answering, and arguing on the issues being discussed.

Online learning through zoom meetings has many advantages, especially in the distance learning process, because it can accelerate the learning and teaching process, promoting student excitement for learning, providing opportunities for students to engage directly with friends and lecturers, and allowing students to learn the materials based on their abilities and interests [17]. Seeing as it is more real-time and interactive, and allows students to engage in learning discussions, online learning using the Zoom meeting platform makes it easier for students to absorb learning material provided by lecturers. Therefore, It can also help students gain more information in the real time.

#### 4 Conclusion

Online learning through zoom meeting applications is effective for developing student problem-solving skill. Online learning is able to develop students' problem-solving skill because this platform emphasizes the interaction and distribution of information that makes it easier for students to improve the quality of learning. Online learning also uses a lot of discussion method where students are required to argue, ask and answer in discussing problem solving presented by lecturers.

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