

# The Effectiveness of Problem Based Learning Assisted Quizizz Media to Improve Critical Thinking Skills

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Changes that are fast-paced and unlimited, force every individual to improve their competence in order to adapt and be able to face global competition. One of the competencies needed is the ability to think critically, so that schools have an important role in realizing the quality of education to produce graduates who meet demand. However, the results of observations show that students' critical thinking skills are still relatively low. The purpose of this study was to determine the effectiveness of the Problem Based Learning model assisted Quizizz Media to improve students' critical thinking skills. The research method is a quasi-experimental research, with data collection techniques using questionnaires and multiple choice test. The research sample is class XI IPS 3 and XI IPS 4 of SMA N 7 Surakarta. The results of hypothesis testing by using the t-test showed a sig value of 0.023 and an N-gain value for the experimental class of 0.62. The PBL model assisted Quizizz media can effectively improve students' critical thinking skills, while the N-Gain value of 0.62 indicates an increase in students' critical thinking in the medium category.

**Key words:** *Problem Based Learning, Quizizz Media, Critical Thinking*

## Introduction

In the fast-paced and unlimited information era, it requires every individual to be able to face global competition so that education must be able to equip students to have cognitive, creative and innovative intelligence (Erlangga, et al., 2021). In carrying out learning, teachers must be able to adapt to changes, so teachers must prioritize student activity and participation in learning (student centered learning) (Miterianifa., et al., 2019).

The competencies needed in the 21st century are the 4Cs, namely critical, creative, collaboration and communication (Lorencia & Jatmiko, 2021). Teachers must be innovative in

preparing the demand for skills needs in the 21st century, so that schools have a role and responsibility in realizing the quality of education to produce graduates in accordance with the demands of the 21st century (Iskandar, et al., 2021). Critical thinking skills in problem solving are very important, but the facts show that critical thinking skills in Indonesia are still relatively low. According to the Program for International Students, Indonesia's ranking in the Science category is 62 out of 71 countries. The results show that students in Indonesia still have deficiencies in the learning process in the Science category, especially in thinking skills that are lower than other countries ((Lorencia & Jatmiko, 2021; Maulyda, et al., 2020; Nihayah & Rahayu, 2021). The low critical thinking ability of students can be caused by low contextual abilities that require thought processes, reasoning and arguing in solving the questions given.

Students need critical thinking skills to be able to process and apply information in life (Chadziqoh, Abdulkarim & Wiyanarti, 2018). Critical thinking is one of the prerequisites that must be owned by students if they want to succeed in education today. Because critical thinking is effective in solving various problems, both related to the field of study they are studying and the problems they will face in everyday life. Education does not only educate students cognitively, but also from the aspect of innovative skills (Erlangga, et al., 2021). In everyday life, many students have difficulty understanding learning at school. The subject that is often complained about, particularly the specialization in Social Sciences is Economics. Although economics is a part of social science, the concepts can be read through a quantitative approach, so that economics is dubbed as the exact social science. The materials taught in economics are closely related to life, so it was easy to hone students' critical thinking through practical activities and problem solving.

Observations were made at SMA Negeri 7 by distributing questionnaires via google form to 33 students, it was found that students' critical thinking in the very high category was 3 students (9%), the high category was 7 students (21%), while 9 students (27), and the low category as many as 14 students (42%). This shows that students' critical thinking skills are dominated by the low category. Teachers in the learning process too still use the lecture method and assign assignments so that there are still many students who have not been involved in learning. The main characteristic of lecture learning is that the teacher explains the material and then gives training to the students. The questions given by the teacher have not shown questions in the form of problem solving, only in the form of short answers. This is a factor in the low critical thinking of students. In learning, students did not play an active role but only performed tasks individually. Students could not think and innovate because they were not given the opportunity to learn. As a result, students became less concerned about the problems that exist in the surrounding environment. It is very important for students to be able to find solutions to real life problems, so it was important to equip students to be able to formulate, analyze and solve problems (Iskandar, et al., 2021).

Alternative solutions in learning to improve students' critical thinking skills can be done by using the Problem Based Learning model asissted Media Quizziz. The PBL model is a learning model that guides students in finding solutions to problems independently and motivates students to think critically. The problems given are problems that are in accordance with real life, thus making learning meaningful because it places learning into a context that is in accordance with (Mabley, et al., 2019; Zuryanty., et al., 2019).

In the PBL model when students are faced with problems, students will try to investigate problems and find solutions during problem solving and critical thinking training (Lorencia & Jatmiko, 2021). According to Haryani, et al., (2019); Juandi (2020) PBL requires students to play an active role in learning, with the problems given, students are challenged to explore curiosity, and develop critical thinking skills in solving problems. PBL stimulates students' higher thinking skills so that students become accustomed to critical thinking (Brata & Mahatmaharti, 2019).

The PBL model fits perfectly with Quizizz media. Quizizz is an educational game application that is narrative and flexible in nature that can be used as a means of delivering material as well as an interesting and fun learning evaluation medium (Ulhusna, Dewimarni & Rismaini, 2021). The use of technology with the Quizizz application, besides being fun, challenging, and interactive, will contribute to increasing student competence and fostering students' critical thinking. The results of the study by (Setiyani, Fitriyani & Sagita, 2020) show that the quizizz media is proven to be effective in improving problem-solving skills. Quizizz is packaged in learning as part of presenting subjects, themes, topics of discussion. Yanti, Suarnajaya & Pratiwi (2021) stated that quizizz media can effectively improve student learning activities.

The results of a study conducted by Lim & Yunus (2021) from 2017-2021 regarding quizizz showed that Quizizz was positively accepted among educators, because of its effectiveness, ease of use and can motivate students to be actively involved in learning. The content in quizizz can be designed by educators in an effort to review lessons, evaluate students' understanding and skills in absorbing lessons presented in the form of fun exercises or evaluations and can be done outside and inside the classroom as long as the facilities and infrastructure supporting learning can accommodate it (Aini, 2019). Thus, this study aims to determine the effectiveness of the PBL model asissted media quizizz in improving students' critical thinking skills in economics subjects.

## **Literature Review**

### **Critical Thinking**

Fajari, Sarwanto & Chumdari (2020) state that critical thinking is analyzing and evaluating thinking to improve it in other words, thinking independently, being disciplined, self-

monitoring, and self-correcting. Learning that can improve students' critical thinking skills is to provide meaningful concepts with active teaching methods, and involve students' skills to make rational decisions in complex situations. Darmaji., et al., (2020) says that critical thinking is an important competency that must be owned to solve problems that individuals need to live successfully and responsibly for society to face current and future challenges. So, students will develop independently in the thinking process. (Harahap, Ristanto & Komala, 2020) said students who tend to think critically will think before they act and are not easy to believe in something before they prove it.

Yunita & Aufa, (2020) said that someone who has critical thinking skills is someone who has the ability to explain or state the results of thoughts based on evidence, methodology and context. Furthermore, Riyadi, Alimah, & Saptono (2020) said that students who have critical thinking skills are students who are able to: 1) consider whether the source of information is trusted or not; 2) determine the results of the consideration; 3) define terms and consider definitions; 4) determine the action to be taken. Efendi & Prakisyia, (2021) suggests that critical thinking skills mean that students are able to: 1) interpret; 2) analysis; 3) evaluation and 4) conclusion. Lamsihar (2020: 137) also explained that students who have critical thinking skills are able to: 1) evaluate evidence; 2) analyze and evaluate arguments; 3) understand the consequences and their application; 4) express opinions and 5) understand the consequences of the conversation.

### **Problem Based Learning**

Kassymova, et al., (2020) states: Problem Based Learning is a teaching method in which complex real-world problems are given to students to be analyzed as tasks as tasks during their study period. Thorndahl & Stentoft (2020) explained that problem-based learning is a work method that increases the ability to analyze and collaborate, have a critical and independent view. The steps of the Problem Based Learning model (Sugiyanto, 2010) are: 1) giving orientation to the problem to students; 2) organize students to research; 3) assist with independent and group investigations; 4) develop and present the results; 5) analyze and evaluate the problem solving process. The use of problem-based models has the characteristics of starting based on student or teacher problems, so students explore knowledge about what they already know and not to solve problems. The problem-based model makes students learn in small groups who are responsible for solving problems (Hanipah, Florentinus, & Rifai RC, 2018). The advantages of the PBL model are: 1) the existence of teamwork where students exchange ideas with fellow groups in finding something new and developing critical thinking skills; 2) improve students' critical thinking, because students must be able to solve the given problem; 3) develop communication skills in group work; 4) can solve complex problems (Sinaga, 2021; Ting, Cheng & Ting, H, 2021).

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## Quizizz Media

According to Setiyani, et al., (2020) quizizz is a game-based educational application that brings multiplayer activities to the classroom and makes classroom practice interactive and fun. Quizizz is a media application that can be used in organizations to deliver subject matter and provide game-shaped tests. Study materials and tests can be shared by using links. Games are learning media that are integrated with evaluation materials or questions, which will have a positive impact on students, namely entertaining, providing exercises for problem solving and logic (Henry, 2010).

The advantages of quizizz media are 1) it makes it easier for teachers to make questions; 2) when students answer questions or quizzes correctly, how many points are obtained in one question; 3) if a student answers the quiz incorrectly, the correct answer will appear, for self-correction for students; 4) at the end or closing session, previously a review question will be displayed in order to re-examine the answers that have been selected; 5) in doing quizzes, each student gets different quiz questions, because they have been randomly randomized, thus minimizing cheating is presented (Citra, & Rosy, 2020; Salsabila, et al., 2020).

Using quizizz media in learning is very easy, where the teacher first prepares material in the form of questions and alternative answers in this Quizizz online application. After you are ready with the content, please enter the application on the web, namely [www.Quizizz.com](http://www.Quizizz.com) (Aini, 2019). Junior (2020) states that the use of quizizz media can be in the form of mobile devices in the classroom, without the need for a data projector or computer, this is because quizzes can be accessed via mobile phones or tablets; has a game-based design and repeats gamified mechanics such as music, rankings, scoreboards, avatars; inserting pictures or videos related to questions and using formulas and symbols; analyze the performance of each student or the whole group. Furthermore, Zhao (2019) states that Quizizz is a leaderboard that shows students' direct rankings based on their performance. Students can see their live ranking during the quiz.

## Research methods

This type of study is a quasi-experimental, where the authors cannot fully control the two groups studied because it is impossible to control all the two external variables, so the changes that occur are not fully influenced by the treatment given (Amin, et al., 2020). The research design is a pretest-posttest control group design (Creswell, 2014) as shown in table 1.

Table 1. Research design

Group	Pretest	Treatment	Posttest
Experiment	Q <sub>1</sub>	x	Q <sub>3</sub>
Control	Q <sub>2</sub>		Q <sub>4</sub>

Q<sub>1</sub>: pretest for experiment class; Q<sub>2</sub>: pretest for control class

X: learning with the PBL model asissted the media Quizizz; Q<sub>3</sub>: posttest experiment class, Q<sub>4</sub>: posttest control class

This study was conducted at SMA Negeri 7 Surakarta in class XI IPS 3 and XI IPS 4 for the academic year 2020/2021. Before doing the treatment, the students' initial ability test was conducted to find out that the two classes had the same initial ability (Budiyono, 2016). The results of the sample t-test showed that the two classes were in a balanced state, so it was determined that class XI IPS 3 was the experimental class and class XI IPS 4 was the control class. The data collection technique used is HOTS multiple choice questions. The instrument is used to measure students' critical thinking skills.

To test the effectiveness of the model, the t-test was used to determine the difference in critical thinking between the experimental class and the control class students. The experimental class uses the PBL model asissted quizizz media, while the control class uses the conventional method. If the significance result is <5%, then there is a significant difference between the two classes, so the PBL model asissted Quizizz media can effectively improve students' critical thinking skills. Prior to the t-test, a prerequisite test was conducted to determine that the data were normally distributed and homogeneous. The Shapiro-Wilk test was used to determine the data were normally distributed and Fisher's exact test was used to test for homogeneity. If the results of the Shapiro-Wilk test are >5%, then the data is normally distributed, and the data is said to be homogeneous if the significance results are >5%.

To measure the increase in students' critical thinking scores at the pretest and posttest, the N-Gain test was used (Sundayana, 2014). N-Gain is the difference between the pretest and posttest scores. To determine the quality of improvement in critical thinking skills, the formula for the average N-gain is used. The N-Gain criteria are as follows:

Table 2 N-Gain Criteria

N-gain Score	Interpretation
$0,70 \leq g \leq 100$	High
$0,30 \leq g < 0,70$	Medium
$0,00 < g < 0,30$	Low
$g = 0,00$	No increase
$-1,00 \leq g < 0,00$	There is a decrease

Source: (Sundayana, 2014)

## Results and Discussion

To test the effectiveness of the PBL learning model assisted quizizz media, it must first meet the prerequisite tests, namely the normality test and homogeneity test. The results of the normality test using the Shapiro-Wilk experimental class for the pretest 0.12 and the post-test 0.095. The control class was 0.49 on the pretest and 0.16 on the posttest. It can be concluded that the data are normally distributed at a significance level of 5%. The results of the homogeneity test also showed that the data was homogeneous, where the results of the homogeneity test at the pretest were 0.22 and the posttest was 0.72. The results of the prerequisite test are shown in table 3.

Table 3 Prerequisite Test

Group	Normality		Homogeneity	
	Pretest (sig)	Posttest (sig)	Pretest (sig)	Posttest (sig)
Experiment	0,12	0,095	0,22	0,72
Control	0,49	0,16		

Source: Processed data (2021)

After the prerequisite test has been carried out, then a hypothesis test is carried out to determine the differences in students' critical thinking abilities before and after the experiment. The t-test before treatment was conducted to determine the equality of the two groups. The results of the t-test showed a significance of 0.52 ( $> 5\%$ ) meaning that both groups had the same equality, so treatment could be carried out. After the treatment, the results of the t-test showed a significance of 0.023 ( $< 5\%$ ) meaning that the use of the PBL model with quizizz media could improve students' critical thinking. The results of the t-test pretest and posttest are shown in table 4. From these results, the score for improving students' critical thinking can be measured using the normality gain score. The results of N-Gain can be seen in table 5.

Table 4 Independent Sample t-test

	Group	Mean	t-test	sig
Pretest	Experiment	38,61	0,635	0.52
	Control	36,66		
Posttest	Experiment	77,48	2,336	0.023
	Control	71,36		

Source: Processed data (2021)

Table 5 N-Gain Score

Group	N-gain score	Criteria
Experiment	0,62	Medium
Control	0,52	Medium

Source: Processed data (2021)

The results of the N-gain score showed that the increase in scores in the experimental class was higher (0.62) than in the control class (0.52). This shows that the use of the PBL model with quizz media is effective in improving students' critical thinking. These results are in line with the research of Iskandar, et al., (2021); Kumar & Refaei (2017); Lorencia & Jatmiko (2021); Miterianifa., et al., (2019); Permana, Nyeneng & Distrik (2021); Suhirman, Prayogi, & Asy'ari, (2021) who showed that the PBL model can improve students' critical thinking. This can happen because of the PBL learning model that uses issues as a learning context to develop multidisciplinary, including critical thinking skills.

In the PBL model, learning begins with the existence of a problem regarding the material that must be solved or resolved so that in the learning process, the teacher must activate students' knowledge to find and understand phenomena in small group learning, which allows students to understand the concepts and subject matter, learning experiences that are also helps students develop their understanding of the context in accordance with their learning ways and situations effectively (Yew & Goh, 2016). PBL has a positive influence on critical thinking, because the use of the PBL model focuses on the chosen problem so that students not only learn concepts related to problems but also scientific methods to solve problems. Therefore, students must not only understand the concepts relevant to the problem at the center of attention but also gain experience related to learning skills to apply scientific methods in problem solving and encourage critical thinking patterns (Miterianifa., et al., 2019).

The focus of the PBL model is on the chosen problem, so that students have the opportunity to learn concepts related to the problem itself and the scientific method to develop students' critical thinking skills (Amin, et al., 2020; Arifin, et al., 2020). In applying the PBL model, first the teacher gives real problems about economic material to students which were distributed on the quizz application media. Students were asked to be able to find solutions to the problems they face. So that on this occasion students can develop critical thinking skills in dealing with problems. Aini (2019); Aswan, Lufri & Sumarmin (2018); Chadziqoh, et al., (2018); Pebriana, & Disman (2017) stated that PBL provides opportunities for students to develop critical thinking skills by connecting information from knowledge with real-life problems. Second, the teacher provides opportunities for students to be active in learning by using their experiences in solving the problems given.

In practice, students played an active role by observing any relevant information, organizing information by combining it with knowledge, so that students' thinking skills develop. The teacher provided the widest opportunity for students to practice solving problems and finding something new (Issufiah, et al., 2018). The concept given to students is also a problem that is often encountered in everyday life, making it easier for students to apply it in life (Erlangga, et al., 2021).

The role of quizizz media also makes learning fun. Quizizz media helps improve students' understanding and skills in achieving the learning competencies to be achieved (Aini, 2019). The results of this study are also in accordance with the research of Wihartanti, et al., (2019) which proves that there is a significant difference in students' critical thinking skills between classes that use smartphone-based Quizizz applications compared to classes that use conventional models in the learning process. Citra & Rosy (2020) research also shows that quizizz media is proven to improve students' cognitive abilities. The quizizz media is used by the teacher as an evaluation medium to provide varied learning so that students can learn more interestingly. In using quizizz media, the questions presented have a time limit, students are taught to think accurately and quickly in solving them so that students are required to have high-level thinking skills which in turn can improve students' critical thinking. Quizizz's potential is very large in the field of education, if teachers can design learning well, it can attract students' attention in learning, motivate students to be actively involved in learning so that students can develop their skills. Quizizz media is a fast, safe and smart tool that is easy to use in facilitating the creation of questions that require critical thinking skills in the field of education (Junior, 2020).

## **Conclusion**

Based on the results of statistical testing t-test critical thinking skills showed sig 0.023 <0.05, meaning that the PBL model asissted Quizizz media can effectively improve students' critical thinking skills. The results of the N-gain calculation of 0.62 means that the increase in critical thinking of experimental class students is in the medium category. The increase in students' critical thinking skills is due to the fact that in learning while applying the PBL model asissted the media quizizz students are trained to think critically by giving a problem. Thus, students are required to connect each problem with knowledge information which ultimately improves students' critical thinking. The use of quizizz media provides a new and fun atmosphere and students are also required to think quickly and accurately to solve HOTS questions that lead to the growth of students' critical thinking skills.

## **Contributions/Originality**

The application of the Problem Based Learning model asissted quizizz media can effectively improve students' critical thinking skills. Students' critical thinking ability is one of the competencies that are needed in the 21st century. Increasing critical thinking skills can help students to examine and deal with every problem faced in everyday life. Students not only learn conceptually, but can practice it in their lives. In the field of economics, increasing critical thinking is able to shape students' attitudes to be responsible, have knowledge and skills in economics that are beneficial for themselves, society and the country.

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