The Effectiveness of Critical Thinking Ability on the Basis of Quizizz Application Viewed from Problem Based Learning Model in History Learning of Senior High School

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Abstract. Problem based learning is a learning method that characterized by real problem that must be solved which triggers the learners to think critically to find a new knowledge. In accordance with this point, this study is aimed to identify the difference of critical thinking among the students through the application of quizizz in the experimental class with problem based learning model and students with interactive learning model. This study is also aimed to investigate the effect of problem based learning on the improvement of student critical thinking ability. The utilization of quizizz application to scrutinize the critical thinking ability of the students is to adapt the 4.0 education development where the students must be common with the use of technology for learning process. The method was quasi experiment with nonequivalent controlled group design. Based on the T Test to investigate the critical thinking of the students, it is known that $t_{count} = 0.85$ with $\alpha = 0.05$. Thus, it can be concluded that the use of the problem based learning model is more effective in increasing students' critical thinking skills when compared to the interactive learning model. The N-gain test revealed that $t_{count} = 4.90$ with $\alpha = 0.05$, it can be concluded that there was an improvement on the student critical thinking in the application of Quizizz.

1. Introduction
History learning has an important role in developing students' critical thinking skills. Critical thinking skills are needed to find out the problems that caused an event, so that it becomes an event that has value for the present and the future. Based on the basic competencies of the 2013 curriculum, students are required to be able to show a logical, critical, analytic, consistent and thorough attitude, responsible, responsive, and not easily give up in solving problems. The ability to think critically is one of the competencies that must be achieved during the history learning.

According to the National Education Association in I Wayan, the abilities that students must have in meeting the demands of the 21st century are critical thinking, creativity, communication, and collaboration [13]. The ability to think critically is one of the various skills that students must possess in facing the challenges of the 21st century. Critical thinking skills not only emphasize problem-solving skills, but also students' ability to evaluate problem solving. When there are problems and problem solving, students are able to evaluate the truth of the problem.

Fisher states that critical thinking refers to skilled and active interpretation and evaluation of observation and communication, information and argumentation [3]. This is in accordance with one of the objectives of the history subject, namely that students have the ability to think critically and analytically in utilizing knowledge of the past to understand present and future life [1]. The ability to think critically in history learning is a very important goal because the purpose of learning history is...
closely related to students' critical thinking skills. Therefore, to achieve this goal, the teacher must use a variety of learning methods that can support the improvement of students' critical thinking skills.

According to Santrock there are only a few schools that actually teach their students to develop critical thinking skills [8]. Usually schools spend learning time by giving a single correct answer in an imitative way rather than encouraging students to be able to develop their thinking, so that learning activities in the classroom do not encourage students to expand their thinking by creating new ideas according to students' abilities.

High school is a period where students begin the teenage phase. According to Hurlock adolescence is a period of change, namely changes in emotions, changes in body, interests and influences (becoming adolescents who are mature and independent), changes in adopted values, and the desire for freedom [4]. For that it is very important to develop critical thinking skills at high school age. Developing critical thinking skills will help to see one's potential, good and bad so that they are able to solve various problems faced, including seeing the extent of their abilities. Therefore, it is necessary to see the improvement of students' critical thinking skills. Hitherto, the research on critical thinking skills has been evaluated conventionally, so in this study the evaluation of students' critical thinking skills was carried out using the quizizz application. The use of the quizizz application is in line with the era, where the education era 4.0 emphasizes the use of digital technology. According to Nancyradjah (2018), quizizz is a web tool for creating interactive quiz games used in classroom learning. Quizizz is a multiple choice quiz that can be accessed via a web browser and used for formative assessment, to find out students' understanding of the learning material that has been studied. By using quizizz, students will be more motivated in evaluating learning. Thus, it will be seen an increase in students' critical thinking skills. In addition to emphasizing students' critical thinking skills based on quizizz applications, it is also necessary to select an appropriate learning model. The choice of learning model is intended to improve students' critical thinking skills significantly.

Based on observations made in high schools in Banten, it was found that many teachers only use conventional learning methods, including the lecture method. Whereas based on the existing lesson plans, the teacher should use the Discovery Learning model in accordance with the 2013 curriculum guide. However, in learning the teacher only explains the material, students write while listening to the teacher explains the material so that students feel bored. This causes learning to occur in one direction, because the teacher only explains while students are busy writing without having the opportunity to ask questions. The opportunity to ask questions is at the beginning and at the end of the lesson which causes students to rarely ask questions.

Warming up during the learning process also occurs because students are less interested and enthusiastic about history lessons. Students consider history lessons to be memorization lessons regarding the names of figures, years and places of incidents. Whereas history lessons are lessons about the cause and effect of the reasons an event can occur. So that students' thinking skills are needed in criticizing an event that can happen, not only conveying the name of the character, year and place of the incident.

To overcome this problem, it is necessary to introduce a new learning model that is in accordance with one of the objectives of learning history, namely to encourage students to think critically-analytically in utilizing knowledge of the past to understand present and future life. One of them is the Problem Based Learning (PBL) model which emphasizes students' thinking abilities. According to Duch in Aris Shoimin PBL is a learning model characterized by real problems as a context for students to learn critical thinking and problem-solving skills and gain knowledge [9]. By using this learning model, students are expected to be able to develop critical thinking skills to solve the problems that have been given by the teacher. Therefore, the teacher does not only deliver material based on teaching materials directly, but the teacher requires students to solve the problems given by the teacher.

Based on the results of research conducted by Nashar on the effect of learning models and critical thinking skills on historical learning outcomes of high school students, it is proven that there is an effect of learning models and critical thinking skills on student learning outcomes [7]. However, in this study using the Group Investigation model, so it is necessary to do research using a learning model that is in accordance with the improvement of students' critical thinking abilities, for this reason, the PBL learning model is chosen.
2. Methods
This study used a quasi experiment method using a pretest and posttest nonequivalent control group design. In this design the experimental group and the control group were not chosen randomly [10]. The population of this study were 4 classes of XI-IPS (Social Science) students. Sampling used non-probability sampling method with purposive sampling type. According to Sugiyono purposive sampling is a technique of determining samples with certain considerations [10]. Sampling was obtained from the results of the consideration of history subject teachers based on activity in class during learning which is almost the same. The sample was class XI-IPS 1 as the experimental class using the Problem Based Learning model and class XI-IPS 2 as the control class using interactive learning models. The results of the students' critical thinking ability tests were obtained from the pretest and posttest scores using the quizizz application through the two-mean difference test and the N-gain test. The instruments used in the study consisted of 10 instruments that were in accordance with the indicators of students' critical thinking abilities, with details of 5 indicators of critical thinking skills including providing simple explanations, building basic skills, concluding, providing further explanations and arranging strategies and tactics. The difference between the posttest and pretest scores between the experimental class and the control class was then analyzed using the two-party t test.

3. Results and Discussion

3.1. Learning in Experiment Class
The experimental class is a class that uses the PBL model, according to Duch in Shoimin which is characterized by a real problem in each context for students to learn critical thinking and problem-solving skills and gain knowledge [9].

At the first meeting in the experimental class at the initial stage students were given learning objectives and motivation to be actively involved in learning and always have high enthusiasm in learning so that they could find out students' readiness to start learning. After that the students were given pretest questions using the quizizz application to find out the students' initial abilities. After implementing the pretest, the teacher began to apply the Problem Based Learning model in the experimental class. The application of the Problem Based Learning model was begun with the teacher introducing the concept of the Problem Based Learning model. After that the teacher divided the students into small groups consisting of 4-5 people heterogeneously and distributes Student Worksheets (LKS) containing material to each group. In addition, the teacher also explained the group discussion mechanism and the tasks that must be completed during the learning process.

Furthermore, the third phase presented a problem. In this phase the teacher instructs students to discuss and look for the material that has been given and make questions from the material given regarding the current state of Indonesia. Each group was required to make questions from the material given regarding the condition of Indonesia at the present time with at least two questions. In addition, each group was required to find additional sources other than books and the internet, from teachers in the form of interviews with history teachers. Furthermore, the fourth phase was to discuss and find information related to the problems given by the teacher to the group. In this phase, students seeked information through books, the internet and interviews with history teachers and discuss existing problems. For reasons of short break time apart from that other history teachers were busy teaching in another class when learning in the experimental class took place so that students lacked additional information, for this reason the teacher tolerated which resulted in the students getting less than optimal resources. Even though by tolerating this, students got less relevant information because students only got from books and the internet and there was no additional and input from teacher that was more relevant.
Furthermore, in the fifth phase, students presented and shared information in front of the class. In this phase, the teacher invites each group to come forward to explain the problems that they have and find solutions. In addition, the problems that were obtained were questions that had been thrown first to the other groups and then the solutions according to them were presented after the other groups provide solutions. In this phase the students seemed quite active and enthusiastic in learning. This was because of the different ways of presenting the learning that was usually conveyed by the teacher. In this phase, students ask each other good questions from the group that was the presenter first asking about problems related to the current state of Indonesia then the other groups answer and argue with each other.

Additionally, the sixth phase was analyzing and evaluating the problem-solving process. In this phase the teacher provided additional explanations about the issues discussed. In addition, students were invited to ask questions about problems and unclear material. The teacher also evaluated the contribution of each group as well as the shortcomings of each group, namely not interviewing history teachers at school. Finally, the teacher provided conclusions regarding the material and problems given by the teacher. During the learning activities, from the beginning to the end, most students follow each learning step well. During group work each student participates in completing the assignment given by the teacher. The only disadvantage in this activity was the lack of optimizing other information sources besides books and the internet, namely interviews with history teachers. Whereas one of the advantages of the PBL model is that students are accustomed to using sources of knowledge, both libraries, internet, interviews and observations.

At the fourth meeting the teacher reviewed a little of the previous material. After that the teacher ordered to collect books so that there was no cheating. Then the posttest was carried out. Posttest was using the quizizz application to determine students' critical thinking skills after being given treatment, namely learning with the PBL model.

3.2. Learning in Controlled Class

The control class is a class that gets learning with an interactive learning model. The material given was the same as the material in the experimental class. As in the experimental class, learning was carried out in 4 meetings.

At the first meeting the learning began with a joint prayer led by the class leader and said greetings. Then the teacher asked for the presence of students, motivated and asked students' readiness to take part in learning. The teacher gave a pretest by using the quizizz application first. After doing the pretest the teacher began to apply the interactive learning model. The interactive learning model consists of 7 stages. In the first stage was the preparation stage, namely the teacher prepares learning such as sources and media that will be used during learning besides that at this stage the teacher also divided students into 4 groups totaling 8-9 people. The second stage was the initial knowledge stage, namely the teacher dug up students' initial knowledge of the material to be delivered by the teacher.

The third stage was the activity stage, which was to present activities to provoke student curiosity. Furthermore, students are encouraged to ask questions related to the topic in question. The fourth stage was the student question stage. At this stage, each student was given a question in groups, then student representatives of each group read the questions made by the group then the teacher wrote the questions read by the students on the blackboard. After the group questions were gathered, the teacher invited students to select what had been written on the board. The teacher must direct students to choose questions related to topics whose answers can be investigated through investigation and investigative activities.

The fifth stage was the investigation stage. At this stage there were interactions between students and teachers, students and students, students with the media and students with learning resources. At this stage students were given the opportunity to find concepts through collecting, organizing and analyzing data in an activity that had been designed by the teacher. Meanwhile, the teacher helped the students to find answers to the questions they asked. Then in groups of students conduct investigations through observation and examination. The sixth stage was the final knowledge stage. At this stage the students read the results they got. The teacher directed the students to conduct class discussions. The students’ answers were collected and compared with the students' prior knowledge before carrying out the previously written investigations. In this case students were asked to compare what they know with what they previously knew. The last stage was reflection, which was
thinking about what had just happened and had just been learned. The point was to think again about what had been learned, then put it forward into a new knowledge structure. At this time students were given time to digest, weigh, compare, appreciate, and have discussions with themselves. At this stage students were stimulated to express opinions about what had been obtained after the learning process. Students were also given the opportunity to ask follow-up questions if something was not understood after conducting an investigation and the teacher provided reinforcement and rectified things that are still wrong. At the fourth meeting the teachers reviewed the learning that had been delivered which was continued by doing a posttest using the quizizz application.

3.3. The Differences of Students’ Critical Thinking Ability
The indicators of students’ critical thinking abilities used were critical thinking indicators according to Ennis which consisted of five indicators, namely providing simple explanations, building basic skills, providing further explanations, concluding and finally setting strategies and techniques [11]. These indicators were analyzed based on the average percentage value of students’ critical thinking skills obtained from the experimental class after using the PBL model and the control class after using the interactive learning model. The percentage of students’ critical thinking skills can be seen in the diagram below.

![Diagram 1. The percentage of students' critical thinking ability posttest scores using the quizizz application](image)

Based on the diagram above, it can be concluded that the critical thinking ability of the experimental class using the PBL model was better than the critical thinking ability of the control class using the interactive learning model. This can be seen from the large number of experimental class instruments with better results than the number of control class. The control class only had 1 instrument that had a better percentage of the instrument value than the instrument value of the experimental class, and that is only 1% different from the experimental class. Meanwhile, the experimental class had 9 instruments that had a better percentage of the instrument value than the instrument value of the control class. The disparity in the percentage value of the experimental class was quite different from the control class. Based on the data, it can be concluded that there were differences in the critical thinking skills of the experimental class using the PBL model and the control class using the interactive learning model.

In addition to the achievement of the mean percentage value of the posttest scores above, then the two-party mean test (t test) was carried out on the control class and the experimental class with a significant level of \( \alpha = 0.05 \). The results of posttest calculations using the t test showed the acquisition of a data value of 0.85, it can be concluded that students’ critical thinking skills in history learning in the experimental class and the control class had a significant difference between those using the PBL model and the interactive learning model in history learning. This difference refers to the students’ critical thinking skills in the experimental class that were better than the control class. This is supported by the research results of Diah Ayu Ningrum and Sri Mulyani Endang Susilowati (2015) which stated that students' critical thinking skills have increased after using the PBL model in learning that has been implemented.

3.4. The Effect of the PBL Model on the Improvement of Students’ Critical Thinking Ability
Based on the results of research in the field, there was an increase in students’ critical thinking skills in the experimental class which showed that the learning process using the PBL model was higher than the students' thinking ability using the interactive learning model. This could be seen from the results of the average N-gain in the experimental class of 0.74 with the high category, while the average N-gain result in the experimental class is 0.47 in the moderate category. In addition, students in the experimental class who used the PBL model were more active in learning compared to students in the control class who used the interactive learning model. This was in line with Finkle and Top that PBL was a curriculum development and teaching system that develops simultaneously problem-solving strategies and the basics of knowledge and skills by placing students in an active role as problem solvers in everyday life [9].

The difference in students’ critical thinking abilities occurred because of differences in the way of delivering material, namely in the experimental class using the PBL model while in the control class using an interactive learning model that did not require students to search for complete information. According to Abdul Majid in the interactive learning process students were only trained to organize rational thoughts and arguments [6]. Meanwhile, according to Aris Shoinim the process of learning activities in the PBL model students were required to solve problems with the help of various sources both from the library, internet, interviews and observations [9].

This causes the problem-solving process in the experimental class to be better than the problem-solving process in the control class because in the experimental class that uses the PBL model students were required to solve problems by seeking information from various sources. Whereas in the control class that used the interactive learning model students were only required to organize thoughts and arguments so that students were only able to make questions based on the material given but were only required to solve problems by conveying the arguments the students have.

In the process of learning history, students are accustomed to use the PBL model, which will create a more active and effective learning. In addition, by getting used to using the PBL model students will be accustomed to independent learning and be able to improve their ability to solve problems given by the teacher. Teachers must be able to apply the advantages of the PBL model, namely students were encouraged to have the ability to solve problems in real situations and students had the ability to build their own knowledge through learning activities.

Another advantage of using the PBL model is that learning focuses on problems so that unrelated material did not need to be studied by students. In addition, teachers must focus on students in finding additional sources of information, namely students must conduct interviews to obtain relevant information apart from textbooks and the internet. This was consistent with one of the advantages of the PBL model, namely students were accustomed to using sources of knowledge, both from the library, the internet, interviews and observations. The success of implementing the PBL model would be better with teachers requiring students to do all searches for sources both from the library, internet interviews and observations.

The obstacle in this research is that the time for history subjects was less strategic. This can be seen from the many cut hours of subjects. The research was carried out in class XI-IPS 1 as an experimental class which has history lesson hours at 4 and 5 hours, while class XI-IPS 2 as a control class has history class hours on the 1st and 2nd hour. IPS 2 during the first lesson was cut off by about 15 - 20 minutes to tidy up the field that had been used for morning daily activities, while Indonesian history lesson hours were only 2 × 45 minutes in one week. The lesson hours in class XI-IPS 1 were at the 4th and 5th hours. Between the 4th and 5th hours there was a break for the first 15 minutes. The position of class XI-IPS 1 was quite far, it took ± 5 minutes to reach the canteen. Many students entered class late after break because of the short time and the distance to the canteen which was quite far. This research was constrained by the lack of class time because it was cut by morning habit and break time. This constraint caused the posttest result scores between the experimental class and the control class was not too much different. There were several indicators of students 'critical thinking abilities that scored better on control class than students' critical thinking abilities in the experimental class. This constraint caused the scores of the experimental class to not much differ from those of the control class.

The weakness in this study was that the teacher was too tolerant on students to get additional sources of information. Whereas when the distribution of material, the teacher had obliged students to add sources of information from the history teacher interviews, for some reason the teacher tolerated...
this which caused students to only get information from textbooks and the internet. One of the advantages of the PBL model was that students were accustomed to using good sources of knowledge in libraries, internet, interviews and observations. The absence of an interview process with history teachers in seeking information, students did not get relevant information, because high school students were still unable to filter information appropriately according to the desired information needs.

The critical thinking ability test data from the results of the pretest and posttest using the quizizz application were then processed using the N-gain test which was then reprocessed using the t test to determine the effect of the PBL model on increasing students' critical thinking skills. The average N-gain result of students' critical thinking ability in the experimental class was 0.74 which was included in the high category while the control class was 0.47 which was included in the moderate category. It can be seen that the experimental class and the control class had significant different scores. After knowing and comparing the average value of N-gain, it was processed again with the help of the t test. The results of the t-test N-gain score obtained t count> t table, namely 4.9> 1.67, so it can be concluded that there is an effect of the PBL model on students' critical thinking skills. This is supported by the results of research conducted by [2] which state that the application of the PBL model had a positive effect on student learning outcomes and learning motivation.

4. Conclusions
Based on the results of the parametric statistical test from the N-gain score of 4.9> 1.67, it can be concluded that H0 is rejected and Ha is accepted. So it can be concluded that there is an effect of the PBL model on improving students' critical thinking skills.

Based on the results of students' critical thinking skills who used the PBL model had a significant difference with the critical thinking skills of students who used the interactive learning model. This can be seen from the acquisition of a data value of 0.85, it can be concluded that students' critical thinking skills in history learning in the experimental class and the control class had a significant difference between those using the PBL model and the interactive learning model in history learning.

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