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The Effect of the Challenge Based Learning Model on Critical Thinking Skills and Learning Outcomes

Shohib Furqon Farizi
Faculty of Teacher Training and Education, University of Jember, Indonesia, *shohibfurqon@gmail.com*

Nurul Umamah
Corresponding author, Faculty of Teacher Training and Education, University of Jember, Indonesia, *nurul70@unej.ac.id*

Bambang Soepeno
Faculty of Teacher Training and Education, University of Jember, Indonesia, *bsoepeno2013@gmail.com*

This study aims to examine the effect of the Challenge based learning model on Critical thinking skills and learning outcomes in History learning. This research type is a quasi-experimental design with a Pretest-Posttest Non-Equivalent Control Group. The population were students of class X IPA 1, X IPA 2, X IPA 3, X IPA 4 and X IPA 5 at SMA Unggulan Haf-Sa Zainul Hasan BPPT Genggong. Determination of the research sample using simple random sampling to determine the control and experimental classes. Based on the results of homogeneity test of the five classes, the control class and the experimental class were determined, namely Class X MIPA 4 and Class X MIPA 3. In the experimental class, treatment was given using the Challenge based learning model and Control Class using problem-based learning. The research data used product assessment instruments and learning outcomes tests. The data analysis technique used ANCOVA. The results of ANCOVA analysis concluded that the Challenge Based Learning model had a significant effect on Critical thinking skills and student learning outcomes in History learning with a value (sig 0.00 <0.05) because Challenge Based Learning emphasized thinking skills to create new knowledge from learning experiences and Challenges Based learning which can instruct students' thinking skills. This study recommends the implementation of Challenge Based learning model as an alternative innovation in the history learning process.

Keywords: challenge based learning, critical thinking, effect, history learning, learning outcomes

INTRODUCTION

The paradigm of learning history in the 21st century makes fundamental changes as transformation era. Transformation occurs in learning objectives, learning processes, and the role of educators. Learning objectives and processes focus on efforts to optimize student competencies (Umamah, et al., 2021). The learning objectives shifted from being able to only understand factual and conceptual knowledge to grow critical thinking skills in students (Cummings, 2019; Umamah, et al., 2020). The role of educators shifts from Teacher Centered Learning to Student-Centred Learning (Farizi et al., 2021). Students are facilitated to play a role in the surrounding environment, become problem solvers and be ready to face the challenges of the times. Thus, critical thinking skills become the primary skills needed by students in dealing with a more complex real world. The urgency of critical thinking skills in history learning is a means for students to make historical interpretations, be critical in choosing

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historical sources and connect history with the present (Kamarga, 2018) as well as a material consideration to live life in the future more wisely. This transformation is a challenge that educators must help students for preparing life in the future.

Problems arise when the findings of previous research indicate the low critical thinking skills of students (Saputri et al., 2019; Silviariza et al., 2021; Umamah, et al., 2021). This is due to educators' low ability to facilitate students to think critically. History educators do not use Innovative learning models (Suratno et al., 2020; Umamah, Sumardi, et al., 2021) so their learning outcomes are below the minimum completeness criteria (Gusnissa et al., 2021; Safitri et al., 2019). Efforts to improve the quality of history learning have been carried out, research results by Umamah et al., (2020) show that (1) 21,43% of Educators encourage students to connect real problems with historical material (2) 21,43% of Educators use technology in history learning; (3) 21.43% of educators use the student-centred learning history learning model. However, many educators still have not made innovations in learning; students are still learning with low cognitive domains, and educators have not been able to train students to think independently (Safitri et al., 2019).Research result by Farizi et al., (2021) show that In the aspect of learning outcomes, 75% of students only reached the cognitive realm of C1 which are remembering and mentioning the material in history learning. Mujianti et al., (2021) show that students' low critical thinking skills: 48.8% in the Low category, 35.16% in the Enough category, and 11.19% in the very high category 4.78%. This happens because the history learning process only focuses on memorizing and does not develop the intellectual abilities of students (Andriani et al., 2021). Research result by Keleşzade et al., (2018) show that Students do not have skills such as research, analysis, and synthesis as well as historical thinking skills. The research results above show problems in learning history that requires problem-solving. Educators still have not innovated in designing learning, thus reducing the motivation and performance of students in learning history. Learning has not been designed according to the needs and characteristics of students. Innovative educators have creativity and innovation in teaching styles and can design and develop learning models according to the needs of students (Umamah, et al., 2021). Therefore, it is necessary to innovate the learning process in dealing with learning problems and the needs of students in the 21st century.

The innovation of the learning process can be appropriately applied if educators know the characteristics of students. Middle school students born in the 1990s to 2000s are called Z Generation (Lathabhavan & Padhy, 2022). The Z Generation grew up with more access to information than previous generations, so this Generation can find and access a broader range of learning materials and integrate virtual and offline experiences. The characteristics of the Z Generation are creativity, flexibility, independence and the next Generation of technology and digitization (Iftode, 2020; Puji & Umamah, 2018). They prefer non-traditional learning methods, using a logic-based approach and experiential learning (Bartman, 2021). The learning process is learning by doing experience-based learning that is creative and independent using technology. Another characteristic is that they require critical thinking skills to solve problems rather than memorizing information (Roslinda et al., 2019). The tendency toward critical thinking skills to solve problems makes them prefer logic-based learning, and it is easier to understand the application of concrete concepts rather than just memorizing material. Innovative educators will equip students with critical thinking skills, problem-solving, and facilitation of high learning outcomes (Umamah et al., 2021; Umamah, 2015). Therefore, educators are expected to innovate creatively in the learning process by using learning models that can train critical thinking skills.

The learning model commonly used in the history learning process is Problem Based Learning. Problem Based Learning is a model recommended in the 2013 curriculum (Isrokijah, 2020). The benefits of Problem Based Learning are active participation, analyzing various historical topics, developing events in learning and training students' critical thinking skills (Maxwell, 2020; Seibert,

2020). The Problem Based Learning process familiarizes students with conducting in-depth investigations and stringing relationships between materials to find solutions. In the Problem Based Learning model, students learn collaboratively in identifying problems to get appropriate solutions. When students collaborate and discuss solutions to problems faced, they can improve their decision-making skills to practice critical thinking skills. Liu (2022) show that the application of Problem Based Learning has a positive effect on students' critical thinking skills. Darhim et al., (2020) show that Problem Based Learning is more effective in improving critical thinking skills than traditional teaching. show that problem-based learning has more influence on learning outcomes than traditional learning. Problem-based learning models have drawbacks; students cannot develop conceptual abilities and have difficulty solving challenging problems and assignments (Belland & Axelrod, 2019; Shishigu et al., 2018). Based on the theoretical study of the use and benefits of problem-based learning in the learning process above, considering the shortcomings in the history learning process, educators are expected to innovate in designing learning models that better facilitate students in responding to the challenges of the times.

The learning model following the characteristics of students in the 21st century is Challenge Based Learning. It is a new learning model with problem-based, material-based and contextual learning (Johnson & Adams, 2011; Johnson et al., 2009). This model is active learning involving students in real situations, relevant and connecting with the student's environment. the teacher's way to train students in improving Critical thinking skills is to make a real-world relationship with the material being discussed. This can make students more interested so they can analyze and think critically in the learning process. The benefit of the Challenge Based Learning Model is that it emphasizes thinking skills that are useful for creating new knowledge from learning experiences (López-Fernández et al., 2020). The Challenge Based Learning model follows the characteristics of Z Generation, the generation where it is easy to acquire new knowledge and the generation that likes the learning process by doing learning by doing experience-based learning. The advantage of the Challenge Based Learning model compared to other models is that there is a higher increase in cognitive outcomes in the learning process (Gonzalez-Hernandez et al., 2020). The learning process Challenge based learning encourages collaboration to identify big ideas, ask appropriate questions, and identify, investigate, and solve challenges. This CBL learning process can train students in investigating information in learning. So that this learning process can train students in making the best decisions. In this CBL process students are also active in connecting with other material, matching main ideas, and evaluating ideas validly and logically so as to train critical thinking skills. The research results by Yang et al. (2018) show that Challenge Based Learning improves students' skills, involvement and thinking abilities. Mukarromah et al., (2020) show that Challenge Based Learning can improve critical thinking skills, so the Challenge Based Learning model has the potential to improve critical thinking skills.

Many studies have been conducted on the application of Challenge based learning in the learning process but Challenge based learning has not really become the subject of research. Based on theoretical studies of the effectiveness of Challenge based learning, research comparing the effectiveness of Challenge based learning and Problem based learning in improving Critical thinking skills and learning outcomes has not been reviewed in historical research and learning. So this research is important in studying the effect of Challenge Based Learning on Critical thinking skills and learning outcomes.

Research Questions

Based on this background, researchers are interested in conducting a study on

1) Whether a significant effect of the application of Challenge Based Learning on critical thinking skills in history learning ?

2) Whether a significant effect of the application of Challenge Based Learning on learning outcomes in history learning?

Research Hypothesis

Based on the formulation of the problems in this study, the hypotheses in this study are as follows:

(H0) There is no significant effect of the application of Challenge Based Learning on Critical thinking skills and student learning outcomes in history subjects.

(Ha) there is a significant effect of the application of Challenge Based Learning on Critical thinking skills and student learning outcomes in history subjects.

METHOD

Research Type and Design

The design of this study was quasi-experimental, with a Pretest-Posttest Non-Equivalent Control Group. This research was conducted in two classes: the Control Class applying problem-based learning and the Experiment class applying the Challenge-based learning model. The following is the research design of the Pretest-Posttest Non-Equivalent Control Group below:

Table 1
Design for pretest-posttest non-equivalent control group

GROUP	*Pretest*	Treatment	Post-Test
Eksperimen	O1	X1	O2
Control	O3	X2	O4

(Resource : Creswell & Creswell, 2018)
Description :

O1 = Pretest Critical thinking skill and Learning Outcomes in the Experiment class
O3 = Pretest Critical thinking skill and Learning Outcomes in the Control class
O2 = Post-test Critical thinking skill and Learning Outcomes in the Experimental class
O4 = Post-test Critical thinking skill and Learning Outcomes in the Control class
X1 = Challenge-Based Learning model
X2 = Problem-Based Learning model

Research Subject

The population in this study were students of class X IPA 1, X IPA 2, X IPA 3, X IPA 4 and X IPA 5 at SMA Unggulan Haf-Sa Zainul Hasan BPPT - Genggong. A homogeneity test is conducted to determine that two or more groups of sample data taken from the population have the same variance. Determination of the research sample using simple random sampling to determine the control and experimental classes. The use of simple random sampling has advantages such as being free from misclassification and requiring minimal population knowledge, everyone has the same opportunity to represent the population, the method is the cheapest, and the accuracy is easy to assess (Dubey & Kothari, 2022). The following are the results of the homogeneity of variance test based on the daily test of Class X IPA:

Table 2
Test results of homogeneity of daily deuteronomy class X IPA

Variable	Levene Statistic	Sig.	Description
Daily Test of X IPA	0.608	0,723	Homogeneous

Based on the table above, the value (sig 0.723>0.05) means it is homogeneous. Based on the homogeneity test calculation results for the five classes, class X MIPA 4 was chosen as the Control class and Class X MIPA 3 as the experimental class.

Research Instrument

Assessment of Critical Thinking Skill

Critical thinking skill assessment uses product assessment in the form of paper. The reason for choosing a product assessment is that the product can reflect students' critical thinking skills through material and conceptual knowledge, application of skills, and the ability to communicate understanding (Johnsen & VanTassel-Baska, 2022). The validity of the instrument in this study was obtained by expert judgment by providing assessment and critical thinking skills. This research instrument has been validated by educational experts. Assessment to determine students' critical thinking skills is carried out twice to determine the value of students' initial abilities and after being given treatment to measure students' critical thinking abilities. Based on the results of validity, all items of critical thinking skills obtain a correlation coefficient greater than 0.6 so that all items are considered valid and the reliability results are 0.930 with a very high category.

Assessment of Learning Outcomes

Assessment of learning outcomes uses 30 multiple choice questions. The advantage of multiple choice is that the assessment is more valid and objective by covering learning material in a short time, but the shortcomings of essay assessment are subjective and have a long training time (Allanson & Notar, 2019; Brown & Abdulnabi, 2017). The instrument is said to be valid if it has valid validity. In this study, researchers tested the validity of the items using the Product Moment correlation formula with the help of SPSS 22 for Windows software to perform a correlation analysis between the items and the total score. In this study, the reliability test of the instrument used Spearmant Brown with the Split Half technique with the help of SPSS 22 software for windows. The assessment to find out the value of student learning outcomes is carried out twice to determine the value of student's initial abilities and the value after being given treatment to measure student learning outcomes. In the learning outcomes instrument, the validity test produces 30 valid questions and the reliability results with a value of 0.957 are in the very high category. Based on the results of validity, all items obtain a correlation coefficient greater than 0.6 so all items are considered valid. The following learning outcomes instruments were adapted from Anderson's revised Bloom's Taxonomy in this study:

Table 3
Learning outcomes ınstrument

Cognitive Process Category	Sub indicator	Question Number	Topics	Cognitive level
Analyze	Differentiating	1-10	analyze the system of government during the Islamic empire in Indonesia	C4
	Organizing	11-20	analyze the culture during the Islamic kingdoms in Indonesia	C4
	Attributing	21-30	Analyzing the development of society during the Islamic empire in Indonesia	C4

Note: The Cognitive Level Questions (C1-C6) refer to Anderson's revised Bloom's taxonomy

Adaptation : Anderson et al., 2001

Data Analysis

The research data analysis uses ANCOVA to test the primary data, which is the significance of the effect of the independent variable on the dependent variable. Hypothesis testing was carried out at a significance level of 5% or = 0.05 using SPSS 22 software for windows.

FINDINGS

The Prerequisite Test Analysis ANCOVA

This study used ANCOVA, and the research data must meet the prerequisite tests, including tests for normality, homogeneity, and regression and a linear relationship between covariates and the dependent variable.

The significance value of the normality test is determined based on the Shapiro-Wilk test. The results of the normality test on the variable critical thinking skills with Experiment class values (Pretest = 0.042 and Posttest = 0.175) and Control class values (Pretest = 0.018 and Posttest = 0.023). The results of the normality test for the learning outcomes variable with Experiment class values (Pretest = 0.69 and Posttest = 0.76) and Control class values (Pretest = 0.200 and Posttest = 0.200). This Normality Test shows that the pretest and posttest data show the value of critical thinking and learning outcomes are normally distributed with a value (sig > 0.05). After the data is normally distributed, the next step is to test the homogeneity.

The Data homogeneity shows the pretest (0.796) and post-test (0.620) data on critical thinking skills and the pretest (0.453) and post-test (0.787) learning outcomes show data for all homogeneous variances with a value (sig > 0.05) After the data is declared homogeneous, the next step is to test the homogeneity of the Regression. The assumption of the homogeneity test of Regression has the criteria fulfilled if there is no relationship between the covariate and the independent variable on the condition that the sig covariate*independent variable value is more than 0.05 (Sign > 0.05) (Johnson, 2016). Following are the results of the Homogeneity test of Regression:

Table 4
Homogeneity test of regression

Variable	Analysis	Sign Value	Description
Critical thinking	Learning Pretest*model Value	0.096	Fulfilled
Learning Outcome	Learning Pretest*model Value	0.182	Fulfilled

The table above shows critical thinking data and learning outcomes with homogeneity data from regression fulfilled with a value (Sign > 0.05). The conclusion is that there is no relationship between Covariate (Pretest) and Independent Variable (Learning Model). After the homogeneity test of the regression is fulfilled, the final prerequisite test is the linear relationship between the covariate and the dependent variable. The following are the results of the linear relationship test between the covariate and the dependent variable:

Table 5
The test of linear relationship between covariates

Variable	Analysis	Sign Value	Description
Critical thinking	*Pretest Score*	0.000	Fulfilled
Learning Outcome	*Pretest Score*	0.001	Fulfilled

The table above shows the sign value < 0.05 with the conclusion that the linearity assumption of the regression is fulfilled. The results of linearity assumption from the regression indicate a linear relationship between the covariate and the dependent variable so that the assumption of linearity has been fulfilled by including the Pretest variable as a covariate. After conducting the ANCOVA prerequisite test, therefore the hypothesis analysis test conducts with ANCOVA.

Effect Challenge Based Learning on critical thinking skills

The ANCOVA analysis result of critical thinking skills in the Tests of Between-Subjects Effects table below:

Table 6
Tests of between-subjects effects

Tests of Between-Subjects Effects						
Dependent Variable: Post test						
Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	5589.112[a]	2	2794.556	67.266	.000	0.702
Intercept	3483.721	1	3483.721	83.854	.000	0.595
Pretest	3498.545	1	3498.545	84.211	.000	0.596
Learning Model	2543.244	1	2543.244	61.217	.000	0.518
Error	2368.064	57	41.545			
Total	285850.694	60				
Corrected Total	7957.176	59				

a. R Squared = .702 (Adjusted R Squared = .692)

Based on the table above, the Corrected model column produces a value of 0.000 with a significance result below 0.05, so the conclusion is that the simultaneous pretest and learning model simultaneously affect students' critical thinking skills. In the learning, the model column produces a value of 0.00 (sig. <0.05), then Ho is rejected, and Ha is accepted, so the conclusion is that there is a very significant influence on the implementation of Challenge Based Learning on students' critical thinking skills in history learning with large categories (Effect size = 0.518).

Effect Challenge Based Learning on learning outcomes

The following are the results of the ANCOVA analysis of learning outcomes in the Tests of Between-Subjects Effects table:

Table 7
Tests of between-subjects effects

Tests of Between-Subjects Effects

Dependent Variable: Post test

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3226.082[a]	2	1613.041	46.255	.000	0.619
Intercept	13087.632	1	13087.632	375.299	.000	0.868
Pretest	430.016	1	430.016	12.331	.001	0.178
Model Pembelajaran	2595.419	1	2595.419	74.426	.000	0.566
Error	1987.734	57	34.873			
Total	348557.394	60				
Corrected Total	5213.816	59				

a. R Squared = .619 (Adjusted R Squared = .605)

Based on the table above, the Corrected model column produces a value of 0.000 with a significance result below 0.05, concluding that the pretest stimulus and learning model simultaneously affect student learning outcomes. In the learning, the model column produces a value of 0.00 (sig. <0.05), then Ho is rejected, and Ha is accepted with the conclusion that there is a very significant influence on the implementation of Challenge Based Learning on student learning outcomes in history learning with large categories (Effect size = 0.566). These criteria can be seen based on the Effect Size Criteria table.

DISCUSSION

Effect Challenge Based Learning on Critical Thinking Skill

Based on the table 6, the Corrected model column produces a value of 0.000 with a significance result below 0.05, so the conclusion is that the simultaneous pretest and learning model simultaneously affect students' critical thinking skills. In the learning, the model column produces a value of 0.00 (sig. <0.05), then Ho is rejected, and Ha is accepted, so the conclusion is that there is a very significant influence on the implementation of Challenge Based Learning on students' critical thinking skills in history learning with large categories (Effect size = 0.518). The results of this study are consistent with research by Mukarromah et al., (2020) and Nawawi, (2017) show that there is a positive effect of Challenge-based Learning on Critical thinking skills. The Challenge based learning model in the learning process encourages collaboration to identify big ideas, ask the right questions and identify, investigate, and solve Challenges. Challenge-based learning has collaborative characteristics, uses innovative technology and solves problems directly according to 21st-century challenges (Membrillo-Hernández et al., 2019; Nichols et al., 2016). Challenge Based Learning Challenge Based Learning (CBL) is a learning process designed to improve the learning and engagement of students with authentic learning experiences to encourage students to take advantage of technology. The application of technology-integrated Challenge based learning aims at research, analyzing, organizing, collaborating, networking, communicating, publishing and reflecting (Nichols et al., 2016). The use of technology facilitates active learning and trains students to solve authentic problems (Farizi et al., 2021). The technology-integrated learning environment supports innovative and interactive learning because learning resources can be obtained easily according to the needs of the learning process (Rufaidah et al., 2021). Technology-integrated learning resources have proven helpful, based on research by Ma'rifatullah et al., (2021) show that E-Modules increase students' knowledge with high categories. The technology-integrated learning process shows that it can improve the learning

experience for students. Technology implementation creates a learning environment suitable for Z generation students, including collaborating, sharing knowledge/information, providing feedback among students, logic-based approaches and experience-based learning. So the Challenge based learning model is learning to integrate technology to improve critical thinking skills.

The learning process Challenge-based learning has several syntaxes that train students' cognitive processes, including Big Ideas, Essential Questioning, Challenge, Guiding Questions, Guiding Activities and Resources, Analysis, Solution concepts, Implementation, and Evaluation. In Big idea syntax, students identify big ideas as global problems in Electronic Student Worksheet. At this stage, students practice brainstorming to identify big ideas. The Brainstorming process inspires students, broadens their horizons, and learns to make decisions. Brainstorming activities can improve students' thinking and decision-making skills (Tsai et al., 2020). The brainstorming process helps to develop higher cognitive abilities such as reflective thinking and problem solving to create quality ideas. After choosing a big idea, students carry out Essential Questioning; in this step, students contextualize the big idea by making relevant questions to solve problems. By design, significant idea activities provide a variety of essential question innovations that reflect personal interests and group needs so that students identify one Essential Question that has been agreed upon. The purpose of Essential Questioning is to involve students in reflection, problem-solving, and decision-making to strengthen scientific thinking and reasoning (Rashtchi & Khoshnevisan, 2020). In the Essential Questioning process, students are directly involved in providing new patterns between ideas to train students' higher-order thinking. The role of educators in Essential Questioning helps students develop thinking processes in the context of real learning. After students determine the Essential Questioning, the question is turned into an act of studying a topic and developing a solution in the form of a Challenge, namely making a Paper. Students analyze, evaluate, and create about the subject matter to find solutions to problems to encourage critical thinking skills. (Saputra et al., 2019). The next step is the guiding question; students generate a series of questions that guide the search for solutions to challenges. Guiding questions provide direction for students to think when students review each other's assignments which helps to improve the quality of peer interaction (Zhan, 2021). At the Guiding question stage, there is an interaction between students and educators as facilitators to produce relevant questions to create a Challenge. Guiding questions are designed to explore topics in greater depth and encourage students to gain understanding by thinking deeply about the topic. In the guiding question step, students categorize and prioritize questions to create an organized learning experience The next step is guiding activities and resources. Students look for various information to answer the guiding questions developed by students. During guiding activities and resources, students seek and read relevant learning resources such as books, the internet, etc., with technology. Reading activities are related to critical activities because they require critical, analytical, and expressive abilities and self-discovery (Mahanal et al., 2019). It is supported by Imansari et al., (2019) who show that digital books increase students' high cognitive abilities. When reading various learning resources, students can determine information in solving problems so that students have new knowledge. The process and results of the new knowledge of these students can train and improve critical thinking skills (Ongesa, 2020). The next step is Analysis; After all the Guiding Questions have been answered and the results of the guiding activities and resources are recorded, students analyze the collected data. Process Students analyze, synthesize, retrieve the information needed based on the information, evaluate the data, and synthesize conclusions using the information to create a Solution Concept (Rashidov, 2020). Solution Concept involves a plan to present the results of the challenge. So that students have a solid foundation to answer a given challenge.

In the Challenge Based Learning model, the syntax that trains critical thinking is Solution Concept, Implementation. In this step, Learners begin to develop the concept of a Solution, but an exploration of the Challenge will result in several Solutions. Each group or individual needs to identify one

Solution to design and implement. The process of building solutions is a cognitive process that has implications for developing students' literacy in higher-order thinking (Mahanal et al., 2019). In this syntax, students conduct discussions and presentations so that students understand and analyze the material in depth. During the discussion and presentation process, students can convey their perspectives and ask various questions to practice critical thinking skills (Davut Gul & Akcay, 2020). In the discussion process, arguments and suggestions from peers can provide solutions to cognitive conflicts, which strengthen the development of critical thinking (Filius et al., 2018; Zhan, 2021). The discussion process with arguments and suggestions from peers can bring solutions to cognitive conflicts to strengthen the development of critical thinking (Trang & Anh, 2022). So that it can be concluded that applying the Challenge-based learning model affects critical thinking skills.

Effect Challenge Based Learning on learning outcomes

Based on the table 7, the Corrected model column produces a value of 0.000 with a significance result below 0.05, concluding that the pretest stimulus and learning model simultaneously affect student learning outcomes. In the learning, the model column produces a value of 0.00 (sig. <0.05), then Ho is rejected, and Ha is accepted with the conclusion that there is a very significant influence on the implementation of Challenge Based Learning on student learning outcomes in history learning with large categories (Effect size = 0.566). This can be seen from the value of learning outcomes which show changes in the student's pretest and post-test scores. This finding is consistent with the study by Legaki et al. (2020) dan Portuguez Castro & Gómez Zermeño (2020) show that the Challenge Based Learning model positively affects student learning outcomes. The Challenge based learning model facilitates the collaboration of students to explore new ideas and assists the development of behavioural and cognitive strategies. Collaborative learning facilitates reflection, provides a variety of understanding and stimulates critical skills and higher-order thinking (Saqr et al., 2018). Gonzalez-Hernandez et al. (2020) state that the Challenge Based Learning model was superior in increasing cognitive outcomes higher than other models. During the learning process, students work together to complete complex tasks, conduct investigations and create communication skills for students. When students work together, they can increase knowledge, social interaction, and learning achievement (Gyasi et al., 2021). In the Challenge based learning model, students are required to be active in the learning process in the classroom and use technology to solve the problems given. The learning process using technology helps solve real problems and enhance learning with innovative solutions (Lin et al., 2020). Hartikainen et al. (2019) also state that active learning can improve students' competence. Increasing students' cognitive abilities and competencies can improve student learning outcomes.

In the learning process, students analyze, design, develop, and implement the best solutions to overcome challenges with the guidance of educators. In the learning process with the results of this product, students develop different solution scenarios and have accurate results (Gutiérrez-Martínez et al., 2021). When students learn scientific concepts and the application of technology by connecting with everyday life or real-world contexts (Utomo et al., 2020). The learning process Life-based learning by connecting to the real world can improve students' abilities (Umamah, Subchan, et al., 2021). The application of knowledge by connecting everyday life to learning can be stored in students' long-term memory so that the challenge-based learning model can improve student learning outcomes. The results of the study by López-Fernández et al. (2020) dan Yang et al., (2018) state that Challenge Based Learning improves skills, engagement and thinking ability. The process of solving problems so that students can strengthen their cognitive structure. Theoretically, the Challenge Based learning model is active learning that can achieve learning objectives and improve students' cognitive abilities (Wong & Liem, 2022). Based on the results of this study, the Challenge-based learning model affects critical thinking skills and learning outcomes more than the Problem-based learning model. Problem-based learning models have drawbacks. Namely, students have difficulty solving problems and tasks

given and are unable to increase students' conceptual knowledge (Belland & Axelrod, 2019; Shishigu et al., 2018). So that the challenge-based learning model has advantages over the problem-based learning model in improving cognitive, critical thinking skills, communication skills, working together, and problem solving activities.

LIMITATIONS

This study experienced several research limitations, including (1) The number of samples was relatively small (2) The research was limited to measuring critical thinking skills and learning outcomes (3) Data collection was limited to students of class of X IPA Science at di SMA Unggulan Haf-Sa Zainul Hasan BPPT Genggong (4) The researchers did not analyze students' perspectives in applying the Challenge-based learning model.

CONCLUSION

The conclusions of this study are 1) Based on the results of data analysis it produces a value of 0.00 (sig. <0.05) then Ho is rejected, and Ha is accepted with the conclusion that there is a very significant influence on the implementation of Challenge Based Learning on students' critical thinking skills in learning history of the Problem based learning model. 2) Based on the data analysis results produce a value of 0.00 (sig. <0.05), Ho is rejected, and Ha is accepted with the conclusion that there is a very significant effect of the application of Challenge Based Learning on student learning outcomes in history learning than the Problem based learning model Educators are advised in learning history to apply the Challenge based learning model so that students can be motivated, active, interactive, have broad insights, and make good and correct use of information technology. The following research recommendations are a Challenge Based learning model with self-efficacy, Student Engagement, Creative thinking skills and communication skills, as well as 21st-century skills that are useful in the future with a larger sample.

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