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The Effect of Blooket-Assisted Deep Learning Approach on Elementary School Students' Critical Thinking Skills

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Abstract

Critical thinking skills are an important 21st century competency that needs to be integrated into the elementary school curriculum, but the reality on the ground shows the dominance of conventional approaches that limit students' high-level cognitive development. This research seeks to examine how the use of a Deep Learning method, supported by Blooket gamification tools, influences students' abilities in critical thinking regarding the subject of transformations in the states of matter. Using a quantitative method with a quasi-experimental design of the nonequivalent control group design type, this study involved 54 fourth-grade students of Keboananom Elementary School as subjects. Data was collected through a critical thinking ability test instrument in the form of descriptive questions that measure indicators of analysis, evaluation, and decision-making which were given through a pretest and posttest. The data analysis technique was carried out using parametric statistics using an independent sample t-test to compare the scores obtained between the experimental group and the control group. The results of the study showed a significant difference with a significance value of 0.000 ($p < 0.05$), where the class that implemented Deep Learning showed a higher increase in critical thinking skills. In conclusion, the integration of Blooket-assisted Deep Learning approach is effective in strengthening students' reflective cognitive processes. This research provides practical contributions for educators in implementing innovative learning technologies to create active and challenging learning environments in elementary schools.

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Introduction

Education is a conscious, planned, and deliberate effort to enable students to actively develop their potential, both physical and non-physical, namely developing their thinking (mental-intellectual), social, emotional, moral, spiritual, economic (life skills), physical, and cultural potential. The transformation of education in the digital era demands a repositioning of the role of students from mere consumers of information to analytical and evaluative thinkers. Critical thinking skills, as one of the fundamental competencies of the 21st century, are a prerequisite for elementary school students to navigate the complexity of information and solve problems logically. However, empirical facts show that there is stagnation in the quality of students' reasoning in Indonesia. Referring to PISA 2022 data, Indonesian students' scientific literacy achievements are still below the global average, indicating that the curriculum tends to emphasize factual mastery rather than developing higher-order thinking processes (OECD, 2022).

Similar obstacles were identified at Keboananom Elementary School, especially in the area of scientific education concerning the subject of transformations in the states of matter. The characteristics of phenomenological material are often only conveyed through one-way information transfer, so that students have difficulty making abstractions and inferences. The low mastery of this concept is clearly visible when students have difficulty explaining the logical reasons behind simple everyday phenomena, such as why dew forms on a cold morning or why wet clothes can dry even though they are not heated directly. This inability indicates that students are not yet able to connect environmental variables with the concept of changes in the state of matter in an integrated manner. Low student involvement in the inquiry process results in their ability to evaluate arguments or make evidence-based decisions not being honed. Without innovative strategic intervention, the learning process will only touch on the surface cognitive aspects (surface learning) which are temporary and meaningless. Therefore, a methodological breakthrough is needed that is able to touch the depth of students' understanding through fun and interactive methods. The Deep Learning approach offers a new perspective by emphasizing that meaningful learning requires active engagement and deep metacognitive reflection. Deep Learning is a learning approach that emphasizes meaningful, mindful learning experiences and focuses on in-depth understanding, allowing learners to not just retain information but also to deeply understand knowledge meaningfully in the era of digital transformation (Kasi et al., 2025).

Various previous studies have attempted to solve this problem through various digital media. Research by (Sahraini et al., 2024) shows that the use of gamification platforms in general can increase learning motivation. However, the majority of this literature focuses more on low-level cognitive learning outcomes and has not specifically explored the synergy between certain pedagogical approaches and competitive features in gamification media (Andrean & Nurjanah, 2025). On the other side, a study on Deep Learning by (Wijaya et al., 2025) emphasized that meaningful learning requires active involvement and metacognitive reflection, but its implementation in Indonesian elementary schools is often hampered by the limited availability of adaptive supporting media.

Recent studies have highlighted the growing role of technology-enhanced learning in supporting the development of critical thinking skills among elementary school students.

Studies show that using game-like learning environments can help students stay more involved, take part more in lessons, and achieve better results because these environments offer more fun and relevant learning experiences (Safitri et al., 2025). In addition, the use of digital game-based platforms such as Blooket has been shown to enhance students' critical thinking skills and academic achievement (Hidayati & Pratiwi, 2024). Moreover, studies on new ways of learning show that building critical thinking skills needs activities that get students involved in exploring, solving problems, and thinking about what they learn, instead of just listening or memorizing information (Santi et al., 2024). Even though some studies have looked at gamification or active learning on their own, there isn't much research showing how combining deep learning with Blooket can effectively improve critical thinking in elementary students. Therefore, this study seeks to contribute to the existing literature by examining the effectiveness of integrating these two approaches in elementary science learning.

Although numerous studies have been published on gamification media and active learning strategies, there remains a gap in the literature regarding the specific synergy between the Deep Learning approach combined with Blooket in improving critical thinking indicators in elementary school students. especially in Keboananom Elementary School. This needs to be researched because this elementary school has not yet introduced gamification in the learning process. Meanwhile, most previous research tends to position gamification solely as an evaluation or motivational tool without integrating it into a deep learning framework. The novelty of this research lies in the instructional design that systematically combines deep learning stages with Blooket's interactive features to train six components of critical thinking simultaneously at the elementary education level

Based on this gap, this study aims to examine the effect of the Deep Learning approach using Blooket media on the critical thinking skills of fourth-grade elementary school students. The significance of this research is that it strengthens the novelty and scientific contribution by providing new empirical evidence regarding the effectiveness of technology-based deep learning in elementary schools and offers a prototype learning strategy for education practitioners in creating a transformative learning ecosystem. Through this approach, it is hoped that the educational process will no longer be merely a transfer of knowledge, but rather a substantial process of empowering reason.

Methods

This study employs a quantitative method utilizing a quasi-experimental research design. The design used is a non-equivalent control group design, namely a design involving two groups (experimental and control) which are not selected randomly, but are still given different treatments to compare the results. The selection of this design was based on field conditions at Keboananom Elementary School which did not allow researchers to carry out individual subject randomization (random assignment) because it could disrupt the class structure that had been formed (Anantasia, 2025).

In this design, The investigator utilized two pre-existing class groups identified as the experimental group and the control group. Both groups were given a pre-test to measure initial abilities, then given different treatments, and ended with a post-test to measure

students' final critical thinking abilities (Maesaroh & Miladia, 2025). The research design is described in Table 1 below:

Tabel 1. Research Design

Experimental Group	$\mathbf{O_1}$	X	$\mathbf{O_2}$
Control Group	$\mathbf{O_3}$		$\mathbf{O_4}$

Information :

0_1 : *Pre-test* of critical thinking skills in the experimental class (learning using the Deep Learning approach assisted by Blooket media)

X : Learning treatment using the Deep Learning approach assisted by Blooket media

0_2 : *Post-test* of critical thinking skills in the experimental class (learning using the Deep Learning approach assisted by Blooket media)

0_3 : *Pre-test* of critical thinking skills in the control class (Learning using the Direct Instruction model)

0_4 : *Post-test* of Critical thinking skills in the control class (Learning using the Direct Instruction model)

In this study, one class was used as an experimental group that received learning using the Deep Learning approach assisted by Blooket, while another class was used as a control group that received learning without applying this approach. The results from the two groups were then compared to determine the effect of the treatment on students' critical thinking abilities.

The population in this study includes all fourth grade students at the school in the odd semester of the 2025/2026 academic year. This location was chosen by considering the gap between the available digital infrastructure facilities and the low variety of innovative learning methods applied, especially in the science subjects. The population in this study includes all fourth grade students at the school in the odd semester of the 2025/2026 school year.

The method of sampling utilized was purposive sampling. The selection of this technique is based on the research objectives which require a sample group with certain criteria, namely having equality in basic academic abilities but showing similar obstacles in critical thinking skills on phenomenological material. In addition, sampling aims to maintain the existing learning ecosystem without re-randomizing individuals in order to maintain the external validity of the research. Based on this technique, two classes were determined as research subjects with the following details:

Experimental Group (Class IV-A): Consisting of 28 students (15 boys and 13 girls). This group was given treatment in the form of a Deep Learning approach integrated with Blooket gamification media. Control Group (Grade IV-B): Consisting of 26 students (12 boys and 14 girls). This group follows learning with a conventional model or Direct Instruction according to the methods usually applied in the school.

The total number of respondents was 54 students. Before the research began, an initial ability equivalence test was conducted using pre-test scores. This is done to ensure that the differences in results obtained at the end of the study are truly the result of the treatment given, not due to significant differences in initial abilities (Paudia et al., 2025). The characteristics of respondents in these two classes tend to be heterogeneous, both in

terms of socio-economic background and learning style, which represents the general profile of elementary school students in buffer urban areas.

The tool utilized in this research was an assessment of critical thinking skills structured with descriptive inquiries (essay format). The selection of descriptive questions aims to explore students' reasoning flow in depth, so that researchers can identify how students construct arguments, make inferences, and make decisions based on evidence of natural phenomena in the material on changes in the state of objects (Yuliani & Mufit, 2025). The material tested was developed based on the Learning Outcomes (CP) of the Independent Curriculum in the fourth grade Science subject, which focused on the phenomena of changes in the state of matter (melting, freezing, evaporation, condensation, and sublimation). Each question item is compiled by integrating critical thinking ability indicators according to (Affandy & Aminah, n.d.). Specifically, this instrument captures students' abilities in analyzing information, evaluating arguments, drawing conclusions, explaining reasons, identifying assumptions, and making decisions based on evidence.

Tabel 2. Critical Thinking Skills Instrument Grid

Number	Critical Thinking Indicators (Ennis Theory)	Indicator Description	Examples of Materials/Aspects Measured	Question Form	Question Number
1	Analyzing information	Explaining the causes and effects of the phenomenon of changes in the form of objects	Analyzing the reasons why ice cubes melt faster in sunlight than indoors	Description	1
2	Evaluating arguments	Assess the truth of statements related to the phenomenon of changes in state	Evaluate the statement that dew appears because the air becomes hot (demonstrates understanding that dew forms because the air cools).	Description	6
3	Concluding	Draw conclusions from the phenomenon of changes in form	Conclude that melted wax when burned changes from solid to liquid due to the influence of heat.	Description	2
4	Explaining reasons	explain the process of change of state with logical reasons	Explains why water in the freezer turns to ice after a few hours.	Description	3

Number	Critical Thinking Indicators (Ennis Theory)	Indicator Description	Examples of Materials/Aspects Measured	Question Form	Question Number
5	Identifying assumptions	Finding conditions that influence changes in form	Identifying that the freezer temperature is not cold enough, causing the water not to freeze completely.	Description	4
6	Making decisions based on evidence	Determining actions based on observations of phenomena	Determine the reason why clothes dry faster in hot places than in the shade.	Description	5

To assess students' critical thinking skills, the analysis of this research data began by calculating pretest and posttest scores. Before testing the hypothesis, prerequisite testing is carried out. This includes testing for normality and homogeneity with a significance level of 5%. The purpose of normality testing is to determine whether the data distribution for each variable is normal or not. Next, homogeneity testing is carried out to determine whether there is similarity in variance between classes. If the data meets the assumption of normality and shows homogeneous variance, the independent sample t-test is used to perform the prerequisite test.

The data collection process was carried out in stages over the research period to ensure internal validity: Pre-Experiment Stage: The researcher gave an initial test (pre-test) to both groups. The results of this test were then tested for homogeneity to ensure there were no significant differences in the subjects' initial abilities. Implementation Stage (Treatment): The experimental class received an intervention in the form of a Deep Learning approach. The learning syntax includes: (a) Mindful Learning through providing video stimulation of phenomena; (b) Meaningful Learning through group exploration; and (c) Joyful Learning through cognitive challenges on the Blooket platform. On the other hand, the control class still uses the Direct Instruction (conventional) model which is centered on the teacher. Post-Experimental Stage: After the treatment was completed (3 meetings), the researcher gave a final test (post-test) with an instrument that had an identical level of difficulty to the initial test.

The data analysis technique in this study was carried out quantitatively by combining descriptive and inferential statistical approaches. Data analysis focused on testing the significant influence of the Deep Learning approach assisted by Blooket media on the critical thinking skills of fourth grade elementary school students on the material of changes in the state of objects. All statistical data processing procedures in this study were carried out with the help of IBM SPSS software version 25.0.

Before testing the hypothesis, Statistical preliminary examinations are initially conducted to verify that the data satisfies the criteria for parametric analysis. The normality test was conducted using the Shapiro–Wilk technique considering the number of research samples was less than 50 units. If the significance value is greater than 0.05 then the data is considered normally distributed. Next, the homogeneity of variance test

was carried out using Levene's Test to ensure that the experimental group and the control group had equal variance as an absolute requirement for the mean difference test.

After the data is proven to be normally distributed and homogeneous, the analysis step is continued by testing the hypothesis using the Independent Sample T-Test. This test aims to compare the posttest score between the experimental class that implemented the Blooket-assisted Deep Learning approach and the control class that used the Direct Instruction model.

The use of the independent sample t-test is in line with the quasi-experimental design which does not involve random selection of subjects. The decision-making criteria in this hypothesis test are based on the significance value (2-tailed). If the test results show a value of $p < 0,05$, then the null hypothesis (H_0) is rejected, which confirms the real influence of the treatment variable on the transformation of students' critical thinking abilities.

Result

Before conducting a hypothesis test, a parametric test is first carried out, it is necessary to conduct a normality and homogeneity test for the data using the posttest results (Sari et al., 2024). The prerequisite tests are important because they determine whether the Independent Samples T-Test can be appropriately applied in this study. Through these tests, the validity and reliability of the statistical analysis become more scientifically acceptable.

This test is conducted to identify whether the research data follow a normal distribution or not. Data that are normally distributed become an essential assumption in applying parametric statistical analysis because they support more valid and reliable statistical results (Su & Wang, 2022). In this research, the Shapiro–Wilk test was applied since the total number of samples was fewer than 50 students.

Table 3. Normality Test Result Data

	Shapiro-Wilk			
	Pretest Control Class	Posttest Control Class	Pretest Experimental Class	Postest Experimental Class
Statistic	.946	.910	.952	.967
Sig	.155	.198	.260	.536

Source: Researcher, 2026

Based on the results of the normality test presented in table 3 above, it can be seen that the pretest and posttest data on students' critical thinking abilities, both in the control class and the experimental class, are normally distributed. This finding indicates that the distribution of students' critical thinking scores does not experience significant deviation and fulfills the assumptions required in parametric statistical analysis. The normal distribution of the data also shows that the research data are suitable to be analyzed further using the Independent Samples T-Test procedure.

This is indicated by the significance value of the control class pretest of 0.155 > 0.05, the control class posttest of 0.198 > 0.05, the experimental class pretest of 0.260 > 0.05, and the experimental class posttest of 0.536 > 0.05. Because all significance values are greater than 0.05, it can be concluded that the data obtained in this study are normally distributed (Indriyanti et al., 2025). These results confirm that the students' critical thinking data in both groups meet the normality requirements, thereby strengthening the validity and reliability of the statistical testing conducted in this research.

The assessment for data consistency was performed to evaluate if the variability of the critical thinking skills data among students in both the experimental and control groups was uniform or not. The homogeneity test is one of the prerequisites that must be met before conducting a hypothesis test using the Independent Samples T-Test. In this research, the Levene test was utilized to perform the homogeneity assessment through the SPSS software.

Table 4. Homogeneity Test Result Data

	Lavene Statistic	df 1	df 2	Sig
Based on Mean	1.569	3	104	.201
Based on Median	1.477	3	104	.225
Based on Median and with adjusted df	1.477	3	93.425	.226
Based on trimmed mean	1.550	3	104	.206

Source: Researcher, 2026

Based on the results of the homogeneity test presented in table 4.3 above, it can be seen that the posttest data on students' critical thinking skills in the experimental class and the control class obtained a significance value of 0.201. This result indicates that the distribution of variance between the two groups is relatively similar and does not show substantial differences. The homogeneity of the data demonstrates that both classes have comparable characteristics before conducting further statistical analysis.

The significance value is greater than 0.05 (0.201 > 0.05), so it can be concluded that the data has homogeneous variance. Thus, this research data fulfills one of the requirements for conducting a hypothesis test using the Independent Samples T-Test. The fulfillment of the homogeneity assumption strengthens the accuracy of the hypothesis testing process and ensures that the statistical analysis can be carried out appropriately.

After testing for normality and homogeneity of the data, the research results showed that the data had homogeneous variance and was normally distributed. These findings indicate that the research data fulfilled the assumptions required for parametric statistical analysis. Therefore, the next stage is to conduct statistical hypothesis testing to determine whether or not there is an influence of the Blooket-assisted Deep Learning approach on the critical thinking abilities of elementary school students (Novita & Hasmy, 2024).

Hypothesis testing was conducted on the average posttest scores on the posttest between the experimental group and the control group to identify any variations in the critical thinking skills of students following the treatment. The hypothesis test in this study used

the Independent Samples T-Test with the help of the SPSS program. The use of this statistical test was considered appropriate because it is designed to compare the mean differences between two independent groups in quasi-experimental research.

Table 5. Hypothesis Test Result Data

	F	Sig.	t	Df	Sig.(2-tailed)
Posttest of Critical Thinking Ability (Equal variances assumed)	2.465	0.122	5.526	52	0.000

Source: Researcher, 2026

Discussion

Based on the findings of the hypothesis test, which are shown in Table 5, the significance value of Sig. (2-tailed) was 0.000. This figure falls below 0.05 (0.000 < 0.05), which allows us to determine that a notable disparity exists between the posttest results of students' critical thinking abilities in both the experimental group and the control group. These results indicate that the implementation of the Blooket-assisted Deep Learning approach contributed significantly to improving students' critical thinking skills compared to the conventional learning model used in the control class (Zafirah et al., 2025). This finding is in line with previous studies showing that interactive digital learning environments can significantly improve students' critical thinking skills and learning outcomes (Hanum, 2025).

Thus, H_0 is rejected and H1 is accepted, This indicates a notable impact of the deep learning method supported by the blocket on the critical thinking skills of students in elementary education. The increase in student learning achievement is not only influenced by the learning model but also by the role of the teacher. A teacher plays an important role in student education, Teachers are required to be creative in creating new things that can attract students' attention so that students can learn more actively (Novita & Hasmy, 2024). In addition to transferring knowledge, teachers also serve as facilitators and learning motivators who are responsible for creating interactive learning environments that encourage students' cognitive and social growth (Pongpalilu et al., 2025). The creation of an active learning environment is essential because students' critical thinking skills tend to develop more effectively when they are actively involved in the learning process (Aditya et al., 2023).

These results match the idea of constructivist learning, which says that people build knowledge by actively engaging with their surroundings while learning. This perspective is supported by constructivist learning theory, which emphasizes that active engagement in learning contributes to the development of critical thinking, creativity, and problem-solving skills (Almulla, 2023). Students who take part in looking for answers, asking questions, and working through problems usually show stronger critical thinking skills compared to students who just listen to information without getting involved (Darmawati & Mustadi, 2023). By using Blooket along with a deep learning method, students were motivated to take part in learning, talk about science ideas, and check different answers.

These learning experiences gave students chances to improve their thinking skills and make decisions based on solid evidence.

The results of this study also support previous research. Darmawati and Mustadi (2023) found that student-centered learning activities significantly improved elementary school students' critical thinking skills. Similarly, (Saputra et al., 2025) found that the use of interactive digital learning media had a positive and significant effect on students' critical thinking abilities. The findings of the present study reinforce these results by demonstrating that the integration of Blooket-assisted Deep Learning creates an interactive learning environment that encourages students to analyze information, evaluate alternatives, and make evidence-based decisions. Therefore, the combination of the Deep Learning approach and Blooket can be considered an effective instructional strategy for improving critical thinking skills among elementary school students. This finding is supported by who reported that the integration of digital learning media can improve students' critical thinking skills by increasing engagement, participation, and interaction during the learning process (Febriyanti et al., 2024).

Conclusion

The integration of the Deep Learning approach through the Blooket gamification platform has proven a significant transformation in the critical thinking patterns of elementary school students, who have shifted from being passive recipients of information to active processors of scientific phenomena. These findings provide a theoretical contribution to the digital education literature by confirming that gamification does not only function as an external motivational stimulant, but can act as a cognitive instrument that mediates the understanding of abstract science material. The success of this synergy demonstrates that combining the meaningful aspects of Deep Learning with the interactive features of digital media can minimize students' cognitive barriers through visualization and healthy competition, while creating a psychologically safe learning ecosystem.

The implications of this research emphasize the importance of positioning technology not merely as a game tool, but as an integral part of a constructivist pedagogical framework to hone reasoning skills in analyzing and evaluating information. Although this study shows a significance value of Sig. (2-tailed) of 0.000 which is smaller than the significance level of 0.05, this study has limitations in the relatively short duration of the intervention, so the stability of the influence of this approach on critical thinking skills in the long term still requires further verification. Based on these findings, educators are advised to start adopting learning that is oriented towards the depth of the process with the support of digital infrastructure and regular training from the school to maintain the relevance of science and natural science learning. For future researchers, there are wide open development opportunities to explore other psychological variables such as self-efficacy and intrinsic motivation in a wider range of materials, as well as considering longitudinal studies to ensure the consistency of the impact of this approach on students' cognitive development in the future.

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