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Kahoot-based Challenge Based Learning Model: A Strategy to Improve Students' Critical Thinking Skills in Science Subjects for Grade IV Elementary Schools

Model Challenge Based Learning berbasis Kahoot: Strategi Meningkatkan Kemampuan Berpikir Kritis Siswa pada Mata Pelajaran IPA Kelas IV Sekolah Dasar

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Abstract

This research aims to assess the degree to which the paradigm of challenge-based learning in conjunction with interactive media, such as Kahoot, influences students' critical thinking skills. Students in the fourth grade at Kradenan State Elementary School who utilize Kahoot interactive media to develop their critical thinking abilities make up the study's population. This research used a quasi-experimental technique using non-equivalent control groups and a quantitative approach. A study sample consisted of two classes, namely class IV of Kradenan State Elementary School, which served as an experimental class with n = 17. As an experimental class, Kradenan State Elementary School had 17 students using the Challenge Learning approach with the use of Kahoot interactive media. In comparison, the control group also had 17 students using Cooperative Learning. A description question that incorporates elements of critical thinking via validity and reliability testing serves as the research tool, via the findings of validity and reliability tests. The findings of the investigation demonstrated that the two classes' critical thinking abilities differed significantly in a good way. Using Kahoot interactive media, the challenge model-based learning model is used. It has a significant impact on pupils' critical thinking abilities. Students' critical thinking abilities. The N-Gain test analysis findings, which revealed 69% (from 56-75%), demonstrate this. The study's findings demonstrate how well the Challenge Learning approach, combined with Kahoot media, enhances foundational education by fostering teamwork, learning dynamics, and students' capacity for critical thinking.

Keywords: *Challenge-based learning, critical thinking, Kahoot.*

Abstrak

Penelitian ini bertujuan untuk menilai sejauh mana paradigma pembelajaran berbasis tantangan yang dipadukan dengan media interaktif, seperti Kahoot, memengaruhi keterampilan berpikir kritis siswa. Siswa kelas empat SD Negeri Kradenan yang memanfaatkan media interaktif Kahoot untuk mengembangkan kemampuan berpikir kritis mereka menjadi populasi penelitian. Penelitian ini menggunakan teknik kuasi eksperimen dengan menggunakan kelompok kontrol non-Ekuivalen dan pendekatan kuantitatif. Sampel penelitian terdiri dari dua kelas, yaitu kelas IV SD Negeri Kradenan yang dijadikan kelas eksperimen dengan n = 17. Sebagai kelas eksperimen, SD Negeri Kradenan memiliki 17 siswa yang menggunakan pendekatan Pembelajaran Berbasis Tantangan dengan penggunaan media interaktif Kahoot, sedangkan kelompok kontrol juga memiliki 17 siswa yang menggunakan Pembelajaran Kooperatif. Soal uraian yang menggabungkan unsur-unsur berpikir kritis melalui uji validitas dan reliabilitas berfungsi sebagai alat penelitian melalui temuan uji validitas dan reliabilitas. Temuan penelitian menunjukkan bahwa kemampuan berpikir kritis kedua kelas berbeda secara signifikan dalam cara yang baik. Dengan menggunakan media interaktif Kahoot, model pembelajaran berbasis tantangan digunakan. dianggap memiliki dampak signifikan pada kemampuan berpikir kritis siswa. Kemampuan berpikir kritis siswa. Temuan analisis uji N-Gain, yang mengungkapkan 69% (dari 56-75%), menunjukkan hal ini. Temuan studi menunjukkan seberapa baik pendekatan Pembelajaran Berbasis Tantangan, dikombinasikan dengan media Kahoot, meningkatkan pendidikan dasar dengan memupuk kerja sama tim, dinamika pembelajaran, dan kapasitas siswa untuk berpikir kritis.

Kata Kunci: *Challenge-based learning*, berpikir kritis, Kahoot.

1. Introduction

Knowledge continues to evolve. This progress also supports the birth of various new technologies that mark the modern era. Currently, technology has entered the digital stage. Almost all industrial sectors in Indonesia, including the education sector, have begun to utilize technology to boost production (Manongga, 2021). Conventional learning methods often make lessons feel monotonous due to the lack of attractiveness in the learning atmosphere, so students tend to have difficulty staying focused during the learning process (Khomsah & Imron, 2020). Digital era learning requires the role of the teacher as a trigger for student creativity. Teachers must use various methods to guide students in utilizing information from communication tools such as mobile phones (Pratiwi et al., 2022). The utilization of technology, such as learning innovations, supports student achievement and makes it easier for teachers to deliver material and conduct evaluations more effectively. Thus, learning innovation is one form of technology that can improve the quality of the education process and its relevance to 21st-century skills needs.

However, in primary schools, challenges such as the lack of collaboration between students and learning methods that are still individualistic and memorization-based show that learning innovations have not been fully implemented optimally. In fact, 21st-century learning emphasizes the importance of developing life skills, innovation, and utilization of technology in accordance with the essential skills framework (Muhali, 2019). Teachers use innovative learning as a planning strategy to help students understand the material (Pristiwanti, 2022). Innovative learning in schools uses a variety of approaches that emphasize the delivery of material to students. These approaches include scientific approaches, contextual learning, cooperative, expository, inquiry, problem-based learning, thinking skills development, and affective learning. These approaches aim to give students a better chance of understanding the subject matter (Azzahra & Sya, 2023). In a situation like this, the learning approach used in schools must be able to meet this need by using various techniques that emphasize the effective and efficient delivery of material, one of which uses appropriate learning methods and media.

In an effort to fulfill these needs, learning media becomes an important component in supporting the teaching and learning process. Technological advances over the past few decades have changed the way we teach and learn. Digital media, such as electronic devices and the internet, have become increasingly popular and are now competing with traditional media, such as books and blackboards (Rahmadhani et al., 2023). Their use is intended to assist teachers in presenting educational content in a way that makes it easier for students to understand. In addition, the use of this media aims to improve the educational process so that student participation increases (Fadilah et al., 2023). One of the available media is Kahoot. Kahoot is an online tool that supports online learning by allowing educators to design interesting and dynamic tests (Ilmiyah & Sumbawati, 2021). Kahoot is an online learning platform that offers educational games and quizzes. Pretests, posttests, practice questions, and enrichment are just some of the learning activities that can be done with this media (Bunyamin et al., 2020). This Kahoot media is in line with the challenge-based learning (CBL) model, which allows students to use creativity, collaboration, and critical thinking to overcome real challenges.

Critical thinking skills must be applied in various environments, including schools. Critical thinking will encourage children's brains to continue to wonder and find answers to questions that are embedded in the mind. Students use critical thinking skills as a cognitive process to collect and analyze data to formulate solutions to problems, distinguish and analyze problems thoroughly and specifically Fitriya et al. (2022), in line with research from (Sarwanto et al., 2021) from Measuring critical thinking skills involves interpreting, analyzing, concluding, and explaining. Students do

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not have this ability naturally, so they need to be trained through learning activities in the classroom. Critical thinking skills are very important for students in everyday life but are sometimes neglected during the education process.

In science learning, critical thinking skills become very relevant because students are invited to observe, analyze, and conclude natural phenomena based on facts and data. This process not only helps students understand scientific concepts more deeply but also trains them to solve problems, make logical decisions, and apply knowledge in everyday life. Science education is expected to help students understand themselves and the surrounding environment, as well as explore the prospects for future progress by applying it in everyday life (Lubis et al., 2023). The methodical process of studying nature is related to science education. Learning science involves a process of discovery as well as an understanding of facts, ideas, or principles. It is expected that science education that prioritizes research and action will help students have a better awareness of the environment (Diana et al., 2022).

The Challenge-Based Learning model with Kahoot media offers an interesting blend of challenge-based learning and interactive gamification technology. In CBL, students are invited to solve challenges that are relevant to everyday life. At the same time, Kahoot presents a fun and competitive learning atmosphere so as to optimally increase students' active participation. Various studies have shown the effectiveness of learning approaches such as process skill-based media (Yuanita & Yuniarita, 2018), scientific approaches (Wicaksono, 2020), and Problem-Based Learning (Nugraha, 2018) in improving critical thinking and mastery of science concepts. However, limitations such as lack of interactive media integration and contextual relevance are still a challenge. By using Kahoot media and challenge-based Learning methodology, this study aims to assess the success of science learning in grade IV elementary schools. By conducting this learning method, teachers will have the opportunity to evaluate students' critical thinking skills in general research, understanding, and knowledge of science learning, as well as their ability to apply their knowledge and abilities in learning.

2. Literature Review

2.1. Challenge Based Learning

One cutting-edge educational approach is called challenge-based learning. Key elements of this paradigm include problem-based learning, project-based learning, and contextualized learning (CTL), all of which are focused on solving real-world problems (Rahmatillah & Ardiansyah, 2023). Students can be encouraged to create, investigate, and evaluate challenges using the Challenge Based Learning learning approach. Applying what students have learned in the classroom to real-world scenarios can help them become more adept at problem-solving (Fairazatunnisa et al., 2021). In challenge-based Learning (CBL), students work together with the teacher to solve real problems and deepen their knowledge. In contrast to projects whose outcomes are already known, CBL encourages the creation of new knowledge (Ruiz-Cantisani et al., 2024). Through the integration of contextual, project-based, and problem-based learning, challenge-based learning enables students to find relevant solutions to real-world problems.

The Challenge-Based Learning approach starts with the central concept, essential questions, challenges, guiding questions, guiding activities, guiding resources, solutions, evaluation, and publishing (Mukarromah et al., 2020). In the Engage phase, which is one of the stages in the Challenge-Based Learning paradigm, the instructor poses an Essential Question to the class derived from the Main Idea for an actual difficulty and asks them to investigate it further. During

the investigation phase, students plan and take part in procedures that serve as the basis for solutions and fulfill curriculum requirements. Evidence-based solutions are created and implemented for real audiences, and the results are assessed during the Act phase (Viona et al., 2023). From the experts' opinions, the model is then organized more simply into three main phases: Engage, Investigate, and Act.

2.2. Kahoot

Kahoot combines social media, games, personal digital platforms, school infrastructure, and student response systems into one platform. The aim is to enhance learning and classroom dynamics while increasing student enthusiasm, engagement and focus (Wang & Tahir, 2020). Another type of media used in schools to improve learning outcomes is the Kahoot app. In addition, this application is an interactive media that can increase students' interest in learning based on the innovative materials offered (Khomsah & Imron, 2020). Several obstacles still exist, such as the number of students who do not know Kahoot and how to use it. In addition, not all students who do not fully understand how to use the platform (Prihatini et al., 2024). Kahoot has disadvantages, such as requiring fast internet access, and some schools prohibit the use of devices such as smartphones or laptops, limiting its use (Bunyamin et al., 2020). To overcome Kahoot's shortcomings, students need initial guidance from teachers and additional sessions if needed. Involving parents in practicing at home is also beneficial. For connection issues, teachers can provide a backup network and improve infrastructure and devices.

2.3. Critical Thinking

Everyone can assess, train, and improve critical thinking skills (Rahmaini & Chandra, 2024). Critical thinking is a high-level thinking skill that students need to learn in order to be ready for the future and the current era of information and globalization (Jamaluddin et al., 2020). Critical thinking skills allow students to analyze multiple points of view on scientific and technical challenges in everyday life and assess them to generate solutions or solve problems. Students who use critical thinking are also better able to approach problems methodically, generate creative solutions, and face various challenges (Aini et al., 2022). Therefore, teaching strategies for basic skills that can be learned and developed should change depending on the educational environment and the stage of growth of students. Providing essential explanations (basic clarity), developing basic skills (essential support), concluding (inference), providing additional explanations (advanced clarity), and organizing strategies and tactics are indicators of critical thinking ability, according to (Putri et al., 2020; Amalia, 2021; Utomo & Hardini, 2023).

Meanwhile, Nur in (Putri et al., 2022) translates the six signs of critical thinking ability identified by Facione into the following six types of skills: 1. The ability to understand and communicate the meaning of various circumstances, facts, events, decisions, regulations, beliefs, and practices is known as interpretation. 2. The Act of determining logical relationships between claims, questions, ideas, descriptions, information, or other representations that seek to explain meaning is known as analysis. 3. The process of determining the validity or reliability of statements or other representations that offer clues or traces is called evaluation. 4. Recognizing and identifying the components necessary to reach a logical conclusion, formulating assumptions or hypotheses, taking into account related facts, and assessing the significance of data, reports, principles, evidence, judgments, or other ideas is the process of inference. 5. Explanation is the process of conveying the results of thinking by providing reasons supported by evidence, concepts, methods, criteria, and context and building logical and convincing arguments. 6. Self-regulation is

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the ability to realize and manage personal thinking processes, including understanding the elements involved, evaluating results, and applying analysis and evaluation skills to one-self.

2.4. Science Learning in Primary School

Active learning techniques are used to teach natural science, focusing on meeting learning objectives for students. The purpose of this instruction is to create an environment that facilitates student learning. Ensuring that students can learn successfully is the primary goal of any learning activity (Fahrezi et al., 2020). Science content is incorporated into the Indonesian curriculum in grades I, II, and III. Science is taught as a stand-alone topic in grades IV, V, and VI as part of integrated theme learning. The emphasis of science education is on procedures and outcomes (Sari & Atmojo, 2021). One of the resources included in 21st-century education is natural science. Human life and real situations, including the environment, plants, animals, and various natural things, are covered in this subject (Nurhayati et al., 2023). Students' active processes are supported by science education, which emphasizes understanding and using ideas in real-world situations.

3. Methods

This study used a quantitative approach with a quasi-experimental design, specifically a non-equivalent control group, which involved a comparison between an experimental group and a control group to test the effect of the learning model on students' critical thinking skills. The research was conducted at Kradenan Elementary School with fourth-grade students as subjects, using two classes of 17 students each. The sample selection was done by purposive sampling based on similar characteristics between classes. The research instrument was a test in the form of essay questions to measure students' critical thinking skills, which had been tested for validity and reliability with the participation of fifth-grade students in the same school. The research was conducted in three stages, namely preparation, implementation, and evaluation. The preparation stage included the preparation and validation of instruments and the division of groups. In the implementation stage, the experimental group was taught using the Challenge-Based Learning model equipped with Kahoot media, while the control group was taught using the Cooperative learning model. Both groups underwent pretests before learning and posttests after learning to measure the improvement of their critical thinking skills.

The data collected were analyzed through several steps, such as the normality test using Shapiro-Wilk to ensure normal data distribution, the homogeneity test using the F test to determine data uniformity, and hypothesis testing to evaluate the effect of treatment. The N-Gain test was used to measure the increase in learning outcomes between the pretest and posttest, the independent t-test to compare the average learning outcomes between experimental and control groups, and the paired t-test to compare the average pretest and posttest results in each group. All analyses were conducted using SPSS version 26 software with a significance level of 0.05. This study also fulfills the ethical aspects of research, where student participation is carried out voluntarily with permission from the school and parents, and the confidentiality of student data is maintained in accordance with the provisions of research ethics.

4. Result and Discussion

4.1. Research Result

Before implementing the research instrument, a validity test was conducted to ensure that each item used was able to measure students' critical thinking skills appropriately and in accordance with the research objectives. The following is the data obtained from the validity test results:

Table.1. Critical Thinking Instrument Validation Test

No. Item	Calculated r-value	Table r-value α = 5%	Remarks
1	0,647	0,444	Valid
2	0,569		Valid
3	0,518		Valid
4	0,231		Invalid
5	0,473		Valid
6	0,236		Tidal valid
7	0,523		Valid
8	0,573		Valid
9	0,547		Valid
10	0,612		Valid

The results of the validity testing showed that ten of the twelve essay questions were deemed genuine, with significance values of > 0.444, according to the findings of the device test, while two were deemed invalid. As a result, only valid questions will be included in the study; those that are not will be eliminated. After the validity test, a reliability test was conducted on the instrument. The reliability test was conducted to determine the consistency of the measurement results produced by the research instrument. The results of this test ensure that the instrument used has an adequate level of reliability. The following data on the reliability test results are obtained, as shown in Table 2 below.

Table.1. Reliability Test of Critical Thinking Instrument

Learning Outcomes Instrument	
Cronbach's Alpha	**N Item**
0.710	8

Based on the R-value table, the instrument used to measure critical thinking skills shows an R-value of 0.444. This value confirms that the instrument qualifies as a valid instrument in accordance with the applicable statistical criteria. In addition, the reliability test results of the test instrument, summarized in Table 2, showed that the Cronbach's Alpha value obtained was 0.710. Based on the general interpretation of Cronbach's Alpha value, this result is included in the reliable category, which means that the instrument has a good level of internal consistency in measuring students' critical thinking skills. Thus, this instrument is suitable for use in research to obtain accurate and consistent measurement results.

As part of the preparation for analysis, homogeneity, and normality tests were conducted before the data were analyzed using the t-test. The normality test aims to ensure that the pretest and posttest data from the experimental and control groups are normally distributed so that parametric statistical tests can be used. Data is considered normal if the significance value is more significant than 0.05 and homogeneous if the significance value in the homogeneity test is more

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significant than 0.05. Table 3 presents the normality test results for the data collected from the control class using the cooperative model and the experimental class using the CBL-Kahoot model.

Table.2. Normality Test

Test Name	Group	Significance Value	*α*
Pretest	CBL-Kahoot Model	0,910	0,05
	Cooperative	0,940	
Posttest	CBL-Kahoot Model	0,503	0,05
	Cooperative	0,737	

Based on Table 3, the pretest significance values for the CBL experimental group and the posttest significance values for the cooperative control group are 0.910 and 0.940, respectively, while the posttest significance values for both groups are 0.503 and 0.737. Since all these values are more significant than 0.05, it can be concluded that the data has a normal distribution.

The homogeneity test was conducted to determine whether the data from the two groups had uniform variance, which is an important requirement in carrying out further statistical analysis. The following data are the results of the homogeneity test obtained:

Table.3. Homogeneity Test

Data 1	Data 2	Significance Value	*α*
CBL-Kahoot Pretest	Cooperative Pretest	0,902	0,05
CBL-Kahoot Posttest	Cooperative Posttest	0,944	0,05
CBL-Kahoot Pretest	Cooperative Posttest	0,095	0,05

The calculations presented in Table 4 show significance values greater than 0.05. Since the significance value is more excellent, the independent t-test can be applied to data that has a normal and homogeneous distribution, as reflected in Table 4.

The independent pretest t-test was conducted to determine whether there was a significant difference between the experimental and control groups before treatment to ensure that the two groups had equal initial conditions. The following data are the results of the independent pretest t-test:

Table.4. Pretest independent T-test

Sig. (2-tailed)	Significance Level (α)	t-value	Status
0,948	0,05	0,066	H_0 accepted

As seen in Table 5, the 2-tailed significance value is 0.948, which is greater than the 0.05 threshold. This results in the failure to reject the null hypothesis (H_0) and the rejection of the alternative hypothesis (H_1). Thus, there is no significant difference in the critical thinking ability of fourth-grade elementary school students before and after the application of the Challenge-Based Learning Model with Kahoot media when compared to the application of the Cooperative Learning Model. Furthermore, the posttest data were analyzed using an independent t-test.

The independent posttest t-test is used to evaluate the difference in learning outcomes between the experimental and control groups after treatment, which aims to determine the effect of the learning model used. The following is the data obtained from the posttest independent t-test results.

Table.6. Posttest independent T-test

Sig. (2-tailed)	Significance Level (α)	t-value	Status
0,000	0,05	5.531	H_0 rejected

Based on the data shown in Table 6, the two-sided significance level is 0.00, which is lower than the conventional threshold of 0.05. This leads to the rejection of the null hypothesis (H_0) and acceptance of the alternative hypothesis (H_1). Thus, the use of the Challenge-Based Learning Model with Kahoot media, compared to the Cooperative Learning Model, significantly influenced learners' learning outcomes, especially related to force material in fourth-grade elementary school students.

Furthermore, the dependent t-test was conducted to analyze the difference in the average pretest and posttest scores in each group, which aims to evaluate the improvement of student learning outcomes due to the treatment given. The following is the data of the dependent t-test results of the pretest and posttest obtained.

Table.7. Pretest and Posttest Dependent T-test

Sig. (2-tailed)	Significance Level (α)	t-value	Status
0,000	0,05	14,588	H_0 rejected

The results shown in Table 7 of the dependent t-test indicate a significance value (2-tailed) of 0.00, which is less than the threshold limit of 0.05. Thus, the alternative hypothesis (H_1) is accepted, and the null hypothesis (H_0) is rejected. These results indicate that the application of the Challenge-Based Learning Model combined with Kahoot media significantly improves the critical thinking skills of fourth-grade elementary school students. The N-Gain formula was used to measure the improvement of students' critical thinking skills before and after the application of this learning strategy. The N-Gain calculation obtained is shown below.

Table.5. N-Gain Test (Posttest for CBL-Kahoot and Cooperative)

Number of Students	Mean Score of Pretest (Experimental)	Average Posttest Score (Control)	Highest Score	N-Gain	Category
17	87,18	74,12	100	0,5	Medium

Table.9. N-Gain Table (Pretest and Posttest for CBL-Kahoot)

Number of Students	Pretest (Experimental) Average Score	Posttest (Experimental) Average Score	Highest Score	N-Gain	Category
17	59,18	87,18	100	0,69	Medium

In Table 8, the calculated N-Gain score shows the value of posttest data for CBL-Kahoot and Cooperative groups is 0.5, which puts it in the medium category. In contrast to the Cooperative Learning Model, the Challenge-Based Learning Model showed superior results. In addition, Table 9 displays the N-Gain value of the CBL-Kahoot pretest and posttest experimental data, which is 0.69, which falls within the moderate range. This indicates that the applied learning paradigm successfully improved students' critical thinking skills by 69% (within the range of 56%-75%).

4.2. Discussion

The main goal of science teaching in primary schools is to help children better understand scientific ideas and how they are applied in everyday life while developing a positive outlook in overcoming obstacles in the surrounding environment (Nur'ariyani et al., 2023). This requires educators to design innovative pedagogical strategies and methods, such as Challenge Based

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Learning (CBL), which is an innovative teaching method that invites learners to face and overcome real-world challenges while applying the knowledge they have learned during the learning process (Portuguez Castro & Gómez Zermeño, 2020). This approach offers diverse opportunities for communication, allowing learners to design their learning paths with the support of pedagogical expertise from teachers (Caiman & Jakobson, 2024). During learning, teachers provide facilities in the form of game-based Kahoot quiz media that are popular in educational technology, especially among the millennial generation (Widyaningrum, 2019).

Before the Challenge-Based Learning Model with Kahoot was implemented, statistical analysis using SPSS version 26 showed no significant improvement in students' critical thinking skills when compared to the Cooperative Learning Model. However, after the use of Kahoot media in conjunction with the Challenge-Based Learning Model, there was a noticeable increase in students' critical thinking skills. The substantial improvement in critical thinking skills was shown by the significance value (2-tailed) of 0.000 < 0.05. The N Gain test was then used to evaluate how well the model was implemented. Unlike the Cooperative Learning Model, which had an average posttest score of 74, the Challenge-Based Learning Model with Kahoot showed a 69% (57%-75%) increase in students' critical thinking ability with an average posttest score of 87. In summary, the Challenge-Based Learning Model with Kahoot significantly improved student learning outcomes compared to the Cooperative Learning Model.

Students went through the following steps each time the Challenge-Based Learning model with Kahoot media was used in the experimental class. The initial step includes activities such as watching videos (shown in Figure 1) and making video observations containing problems in daily activities related to the material. The initial session focused on the problem of the effect of force and friction, the next session on magnetic force and its benefits in everyday life, and the last session discussed the Peg's force.

Figure.1. Early Learning Activities

The next stage of classroom learning includes a variety of steps, from providing essential questions to spark learners' curiosity, challenges that encourage them to think critically, guiding activities to deepen understanding to developing solutions (shown in Figure 2), assessment of learning outcomes, and publication. Problems should be addressed, and solutions should be derived from fundamental everyday experiences (Sardi et al., 2022). Interactive tools such as Kahoot are used in mentoring activities to make learning more fun and efficient for students (Figure 3).

Figure.2. Finding a Solution

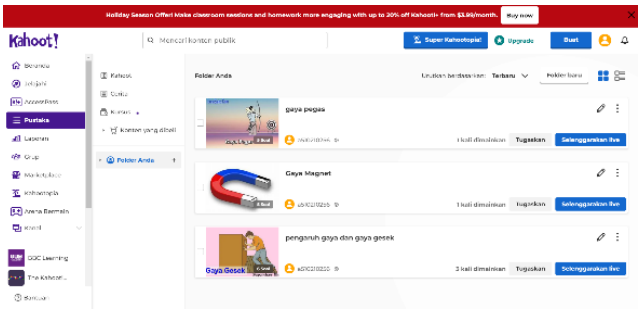

Figure.3. Kahoot Media Display

Three specific treatment sessions were given to students to measure how well their critical thinking skills developed. Students' critical thinking skills improved, according to the initial test results taken before the treatment and the final test results after the use of the Challenge-Based Learning Model with the help of Kahoot media. Research by (Fairazatunnisa et al., 2021) provides support for this. Students can be encouraged to create, investigate, and evaluate challenges using the Challenge-Based Learning learning approach. Students' problem-solving skills can be enhanced when they apply the information they have gained in the classroom to real-world situations. Teachers can help ensure the successful implementation of the Challenge-Based Learning Model by tailoring learning materials to the needs of each student.

It has been proven that the use of Kahoot media, along with the Challenge-Based Learning paradigm, can help elementary school students hone their critical thinking skills. Kahoot encourages students to be more active and engaged in the learning process, while challenge-based learning provides a framework that allows students to overcome the challenges they face. This combination not only improves students' critical thinking skills but also adds excitement and fun to the learning process. However, one of the limitations of implementing this model is the need for more time. In addition, limited internet access and uneven learning devices may affect the effectiveness of implementing this strategy. Future studies might examine different strategies and instructional designs that best foster students' critical thinking skills to improve the use of this paradigm. However, the Kahoot media-supported Challenge-Based Learning Model holds much promise for improving the quality of instruction at the elementary school level. Teachers can create a more collaborative and engaging learning environment for students by using technology in this Challenge-Based Learning paradigm. In a dynamic and cooperative learning environment, students can easily understand the content, improve their memory, and hone their critical thinking skills using Kahoot features such as interactive quizzes.

5. Conclusion

In science classes, particularly those involving forces, the critical thinking skills of fourth-grade elementary school students have been successfully enhanced by the use of the Challenge Based Learning (CBL) paradigm, which is based on Kahoot. This approach encourages students to take an active role in their education by identifying problems and finding their solutions. In addition, a dynamic learning environment is generated through the use of Kahoot media. Students' critical thinking skills improved dramatically in a study that combined Kahoot media with Challenge-based Learning techniques. This was shown by the average posttest score of CBL-Kahoot, which was higher than the Cooperative learning approach. However, the need for careful planning when creating modules and effective time management in this strategy are some of the challenges faced. The use of a Challenge-based Learning paradigm, based on Kahoot media, to

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improve students' critical thinking skills can be further investigated. Learning that utilizes Kahoot media and the Challenge-based Learning model has the potential to be innovative, effective, and relevant in addressing educational issues in the digital era.

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