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Optimizing Problem-Solving Competencies Through Inquiry-Based Learning and Gamified Formative Assessment in Primary Mathematics

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Abstract

Nusukan Primary School primarily utilises conventional teaching methods, with limited incorporation of technology. The objective of this study was to evaluate the efficacy of the Kahoot-supported Inquiry-Based Learning model in enhancing the problem-solving skills of primary school students. Employing a quantitative approach with a quasi-experimental design, the research was conducted with two third-year classes at Nusukan Primary School. The experimental group received instruction through the Inquiry-Based Learning model integrated with Kahoot media, while the control group was taught using conventional methods supplemented by PowerPoint presentations. Data were collected via pre- and post-intervention problem-solving assessments to measure the comparative effectiveness of the instructional approaches. The findings of this study indicate that the experimental group, which received instruction through the Kahoot-supported Inquiry-Based Learning model, demonstrated significantly superior problem-solving abilities compared to the control group. The experimental group achieved an N-Gain score of 78%, classified as 'effective,' whereas the control group recorded a score of 38%, deemed 'less effective.' Furthermore, the integration of Kahoot media enhanced the efficacy of the Inquiry-Based Learning approach, particularly during the second phase (organising students) and the concluding phase. This enhancement contributed substantially to the improvement of problem-solving skills among primary school students.

INTRODUCTION

Background of the Study

Owing to the rapid evolution of science and technology across generations, educators in the 21st century must cultivate interactive learning environments (Alkhater et al., 2025; Arsalan & Fauzi, 2024; Bhardwaj et al., 2025). Such environments encourage students to pose questions and

independently seek answers (Bayraktar et al., 2025; Bicer et al., 2025; Raztiani & Permana, 2019). Interactive learning aligns with constructivist principles and facilitates effective communication among learners (Manda et al., (2025); Kamarulzaman et al., 2025; Novitasari et al., 2020). This approach can be enhanced through the integration of technologies such as audio, video, multimedia, and internet-based tools (Godsk & Møller, 2025; Maahs et al., 2025; Utami & Dewi, 2020). The adoption of this method also increases students' engagement with the learning material (Gulo & Harefa, 2022; Hwang et al., 2025). Inquiry-based learning represents an innovative pedagogical strategy that prioritises students' active participation as the primary means of constructing knowledge (Bhardwaj et al., 2025; Widyastuti, 2018), fosters critical, scientific, and systematic thinking among students (García-Carmona, 2025; Nababan & Sihombing, 2023; Rahmawati & Hardini, 2020), and it equips learners with the tools necessary to independently grasp key concepts (Djakariah & Akbar, 2025; Fahmi et al., 2021; Nurjanah, 2019). Kahoot and other interactive media robustly support this pedagogical model through their engaging, game-based quiz formats (Kherazi & Bourray, 2025; Artika et al., 2024; Masyrufin, 2022; Lana et al., 2025; Ovsiienko et al., 2024), visually appealing interfaces(Alfansyur, A., & Mariyani, M. (2019).; Hasibuan et al., 2025; Larrosa et al., 2025), and their ability to significantly enhance students' motivation to learn (Jarrah et al., 2025; Mieg, 2019; Misnah, 2019; Nisbah et al., 2025).

The ability to solve problems is a critical component of mathematics education, as it enhances students' confidence and decision-making capabilities (Amam, 2017; La'ia & Harefa, 2021). Problem-solving enables students to overcome obstacles that hinder their achievement of learning objectives (Nurmeidina et al., 2025; Sriwahyuni & Maryati, 2022), particularly in the context of mathematics (Mulyati, 2016; Rahmatiya & Miatun, 2020). The integration of the Inquiry Learning model with Kahoot media demonstrates considerable potential for improving problem-solving skills among primary school pupils, especially in mathematics. Accordingly, this study aims to investigate the impact of combining these approaches on the problem-solving abilities of third-grade students.

Problem of the Study

Observations and interviews conducted at Nusukan Primary School indicate that the teaching and learning process remains predominantly teacher-centred, with limited integration of digital technology-based media. The prevailing instructional approach focuses on delivering concepts through direct instruction and rote problem-solving exercises. This approach restricts opportunities for pupils to engage in diverse learning experiences and actively participate in their education (Pan et al., 2024). Several factors contribute to the limited adoption of educational technology, including inadequate facilities, insufficient infrastructure, and teachers' lack of proficiency in effectively utilising digital media. Furthermore, educators have not received adequate training or resources to facilitate student learning in technology-enhanced environments (Hartman et al., 2019; Robandi et al., 2025; Ardiansyah, 2025), Consequently, this has resulted in low pupil engagement, evidenced by observable signs of boredom and fatigue during lessons.

Preliminary observations of pupils' learning in mathematics, particularly in whole number operations, reveal significant difficulties with multiplication and division concepts. Pre-study data indicate that only 33% of pupils achieved the Minimum Mastery Criteria, with the remaining 67% failing to meet this standard. Educators have employed alternative strategies, such as mental mathematics exercises, but conventional methods have failed to create an engaging and interactive learning environment. The lack of technology integration represents a significant barrier to enhancing pupils' problem-solving skills, particularly in the context of the digital era, which demands innovative pedagogical approaches.

Research's State of the Art

The Inquiry-based Learning model constitutes a sophisticated pedagogical approach that cultivates pupils' capacity for critical and systematic problem-solving (Efendi & Wardani, 2021; Nurwahid & Shodikin, 2021; Revina, 2023). By fostering independent exploration and self-directed learning, this model empowers pupils to construct their own knowledge with confidence and autonomy (Efendi & Wardani, 2021; Revina, 2023). The inquiry process unfolds through a series of structured stages: identifying the problem, formulating hypotheses, collecting and analysing data, testing hypotheses, and drawing informed conclusions (Nawawi et al., 2024; Revina, 2023). Moreover, it engages pupils in dynamic cognitive processes, such as problem identification, information synthesis, decision-making, and deriving conclusions (Apriliane & Delhita, 2025; Kartika & Rakhmawati, 2022; Nur et al., 2025). Empirical evidence underscores that Inquiry-based Learning markedly enhances pupils' conceptual understanding, fosters greater engagement with the learning process, and enables them to realise their full intellectual potential (Hanifah & Purbosari, 2022; Widyastuti, 2018). Nevertheless, the approach presents certain challenges, including its time-intensive nature, difficulties in classroom management, and reduced efficacy for pupils who lack sufficient cognitive readiness (Gunardi, 2020; Wahyuningsih et al., 2024).

Kahoot, an innovative technology-enhanced learning platform, leverages gamification to deliver a dynamic and engaging educational experience for pupils (Andari, 2020; Artika et al., 2024; Raghdah et al., 2024; Dewimarn et al., 2022). It supports a diverse array of pedagogical activities, including formative assessments, pre- and post-tests, and supplementary lesson reinforcement, all presented in an interactive and stimulating format. The platform's intuitive design, coupled with real-time feedback mechanisms, enables educators to monitor pupil progress with precision and immediacy (Faznur et al., 2020; Niama et al., 2023; Rosita, 2022). Moreover, Kahoot promotes collaborative learning, enhances digital literacy, and encourages active pupil engagement (Artika et al., 2024; Capaldi, 2015; Dewimarn et al., 2022). However, its implementation is hindered by significant challenges, such as limited internet connectivity, inadequate access to devices, and educators' insufficient proficiency in digital technologies (Ginting et al., 2021; Rafiepour & Faramarzpour, 2023; Yanti et al., 2022). To fully realise Kahoot's potential as a transformative educational tool, targeted improvements in digital infrastructure and robust professional development for educators are imperative (Fithria et al., 2023; Prasetyaningsih, 2021).

Problem-solving skills constitute a cornerstone of mathematics education, equipping pupils with the capacity to address academic and real-world challenges through critical, logical, and systematic thinking (Davita & Pujiastuti, 2020; Sagita et al., 2023; Zulkarnain, 2015). These skills are instrumental in fostering higher-order thinking, reasoning, and creativity (Samo, 2017). Key indicators of effective problem-solving include problem comprehension, strategy formulation, execution, and evaluation, which collectively reflect structured and logical thought processes essential for efficient problem resolution (Ochogboju & Díez-Palomar, 2025; Purba & Warmi, 2022; Yuliani et al., 2019). Consequently, the strategic integration of the Inquiry-based Learning model with Kahoot's interactive platform offers a promising pedagogical approach to cultivating pupils' problem-solving competencies, thereby addressing the demands of contemporary education.

Gap Study and Objective

Empirical research highlights the efficacy of innovative pedagogical approaches, such as guided inquiry, problem-based learning, and contextual strategies, in significantly enhancing pupils' problem-

solving competencies. Sholikhah et al. (2014) demonstrated that guided inquiry substantially improves pupils' logical reasoning skills when addressing geometry problems involving prisms. Similarly, Arifuddin et al. (2018) observed comparable benefits in teaching fractions to fourth-grade pupils. Ranti and Dwi Kurino (2023) corroborated these findings, establishing the superiority of inquiry-based methods over conventional didactic approaches. Furthermore, Yulianti and Septian Airlanda (2022) evidenced that integrating inquiry-based learning with real-world contextual applications further augments pupils' proficiency in solving mathematical problems.

Research consistently demonstrates that Kahoot enhances pupils' learning, particularly in mastering mathematical concepts. Marwa et al. (2023) found that integrating Kahoot into problem-based learning significantly improves pupils' understanding of mathematics. Wahyuni and Sholichah (2022) supported these findings, highlighting Kahoot's effectiveness in promoting problem-based learning environments. Similarly, Febriyanti et al. (2023) and Suwae, (2024) showed that using Kahoot in inquiry-based learning strengthens pupils' critical thinking and learning outcomes. Yamin (2023) further confirmed that combining inquiry-based approaches with Kahoot markedly enhances pupils' ability to solve mathematical problems.

However, research on optimally integrating inquiry-based learning with digital platforms like Kahoot remains limited. Narpila and Sihotang (2022), observed that pupils using calculators in an inquiry-based framework outperformed those in traditional settings. Astuti and Ulia (2025), demonstrated that Kahoot, when used in problem-based learning, supports fourth-grade pupils in solving problems more effectively. Despite these insights, studies on effectively combining guided inquiry with interactive platforms like Kahoot are scarce. This study investigates whether integrating Kahoot's interactive features with guided inquiry learning can improve the mathematical problem-solving skills of primary school pupils. It specifically examines how this combined approach enhances pupils' proficiency in tackling mathematical challenges.

METHOD

Type and Design

This study adopted a quantitative approach employing a quasi-experimental design with a non-equivalent control group. The quasi-experimental design was selected to evaluate differences in outcomes between the experimental and control groups. The intervention involved integrating Kahoot, a digital platform, to support Inquiry-based Learning. To assess pupils' problem-solving abilities, pre- and post-tests comprising problem-solving questions were administered.

Data and Data Sources

The sample consisted of 30 third-grade pupils from Nusukan Primary School, divided equally into two classes of 15 pupils each. The control group received instruction through conventional methods supplemented by visual aids, whereas the experimental group engaged in Inquiry-based Learning facilitated by Kahoot.

Data Collection Technique

Data were collected through written pre- and post-intervention tests designed to evaluate pupils' problem-solving skills. The test instruments included both multiple-choice and essay questions, which were rigorously validated and tested for reliability. Validity testing was conducted with third-grade pupils at Nusukan Primary School. Statistical analysis using SPSS revealed that 23 items met the validity threshold (significance value > 0.3961), while two invalid items were excluded. The reliability of the

instrument was confirmed by a Cronbach's Alpha coefficient of 0.728, exceeding the r-table threshold of 0.3961.

Data Analysis

During the data analysis phase, several prerequisite tests, including normality and homogeneity assessments, were conducted. The Kolmogorov-Smirnov test was employed to evaluate data normality, while the F-test was used to assess homogeneity of variance across samples. The effectiveness of integrating Kahoot interactive media with the Inquiry Learning model was evaluated through hypothesis testing to determine its impact on enhancing mathematical problem-solving skills in third-year primary school pupils. Additionally, specific aspects of problem-solving abilities were examined through further hypothesis testing to establish the significance of differences between the experimental and control groups. The effectiveness of the instructional model was assessed using N-Gain analysis and t-tests, with a significance level of 0.05. All statistical analyses were performed using SPSS version 25 software.

Independent Samples t-test

The independent samples t-test was employed to assess mean differences between two independent data sets. This test assumes normality and homogeneity of variance, although these assumptions can be relaxed under certain conditions, such as large sample sizes or robust test variations. The data collected in this study met the necessary assumptions for conducting an independent samples t-test, as confirmed by preliminary normality (Kolmogorov-Smirnov test) and homogeneity (F-test) assessments. Consequently, this statistical method was appropriately applied to evaluate hypotheses using pretest and posttest data from experimental and control groups.

Independent t-test: Pre-intervention Analysis

H0= There is no significant difference in the mathematical problem-solving abilities of third-year primary school pupils before implementing the Inquiry Learning model augmented with Kahoot interactive media, compared to those receiving traditional instruction with visual aids or PowerPoint presentations for teaching whole number operations ($\mu 1 = \mu 2$).

H1= There is a significant difference in the mathematical problem-solving abilities of third-year primary school pupils before implementing the Inquiry Learning model augmented with Kahoot interactive media, compared to those receiving traditional instruction with visual aids or PowerPoint presentations for teaching whole number operations ($\mu i \neq \mu j$).

Independent t-Test: Post-Intervention Analysis

H0 = There is no significant difference in the mathematical problem-solving skills of third-year primary school pupils who learned whole number operations through the Inquiry Learning model augmented with Kahoot interactive media, compared to those taught using traditional methods with visual aids or PowerPoint presentations ($\mu 1 = \mu 2$).

H1 = There is a significant difference in the mathematical problem-solving skills of third-year primary school pupils after learning whole number operations through the Inquiry Learning model augmented with Kahoot interactive media, compared to those taught using traditional methods with visual aids or PowerPoint presentations ($\mu i \neq \mu j$).

Dependent T-Test

A dependent t-test is employed to determine the mean difference between two related data sets. This analysis uses pre-test and post-test data from the experimental group to test the proposed hypotheses.

H0 = There is no significant difference in the mathematical problem-solving skills of third-year primary school pupils before and after the implementation of the Inquiry Learning model augmented with Kahoot interactive media for teaching whole number operations (μ1=μ2).

H1 = There is a significant difference in the mathematical problem-solving skills of third-year primary school pupils before and after the implementation of the Inquiry Learning model augmented with Kahoot interactive media for teaching whole number operations ($\mu 1 \neq \mu 2$).

N-gain Evaluation

The N-gain score is calculated using Hake's formula (See Table 1). (Febrinita, 2022)

$$N\text{-}gain\ (g) = \frac{Skor\ Posttest - Skor\ Pretest}{Skor\ Maksimum - Skor\ Pretest}$$

Table 1. Interpretation Categories for N-Gain Effectiveness

Percentage	Interpretation
< 40	Ineffective
40 – 56	Slightly Effective
56 – 75	Moderately Effective
>76	Effective

RESULTS

The Kahoot-based Inquiry Learning model was implemented through a structured sequence of pedagogical phases. Initially, an orientation phase engaged pupils in responding to interactive questions on the Kahoot platform to spark curiosity and introduce core concepts. This was followed by collaborative learning sessions, where pupils worked in groups to discuss and address problems, fostering a deeper understanding of the material's key concepts. Subsequently, students completed guided problem-solving tasks on learner worksheets, with teacher support to scaffold their learning. A concluding Kahoot assessment evaluated the extent of students' conceptual understanding at the session's end. Finally, independent homework tasks were assigned to prepare pupils for forthcoming topics, enhancing their engagement with the material, digital literacy, and self-directed learning skills.

Table 2. Normality Test Results

Test Name	Group	Significance Value	Status
Pre-Test	Experimental	0,387	Normal
	Control	0,342	
Post-Test	Experimental	0,985	Normal
	Control	0,407	

Table 2 present the normality test results indicate that the pre-test significance values for the experimental and control groups were 0.387 and 0.342, respectively. For the post-test, the significance values were 0.985 and 0.407, respectively. All significance values exceed 0.05, confirming that the data conform to a normal distribution.

Table 3. Homogeneity of Variance Test Results

Data 1	Data 2	Significance Value	Status
Experimental Group Pre-Test	Control Group Pre-Test	0,469	Homogeneous
Experimental Group Post-Test	Control Group Post-Test	0,971	Homogeneous
Experimental Group Pre-Test	Experimental Group Post-Test	0,114	Homogeneous
Experimental Group Post-Test	Control Group Post-Test	0,270	Homogeneous

Table 3 presents the results of the homogeneity of variance test, indicating that all significance values exceed 0.05. This confirms that the data exhibit homogeneous variances, satisfying the assumptions for conducting an independent samples t-test, as both normality and homogeneity of variance conditions are fulfilled.

Table 4. Independent t-test Results for Pre-test (Control vs. Experimental Groups)

Sig. (2-tailed)	α	t-value	Status
0,193	0,05	1,333	Accept $_{H0}$

Table 4 indicates that the results support the null hypothesis (H_o) and lead to the rejection of the alternative hypothesis (H_1). The significance value obtained (Sig. [2-tailed] = 0.193) exceeds 0.05 ($p > 0.05$), confirming no statistically significant difference in the mathematical problem-solving skills of third-year primary school students using the Kahoot-based Inquiry Learning model compared to those using conventional teaching methods with PowerPoint or visual media for whole number operations. Consequently, the analysis proceeded to examine the post-test data using an independent samples t-test.

Table 5. Independent Samples t-test Results for Post-test (Control vs. Experimental Groups)

Sig. (2-tailed)	α	t-value	Status
0,000	0,05	12,664	Reject $_{H0}$

The two-tailed significance value reported in Table 5 is 0.000, which is below the conventional 0.05 significance level. Consequently, the null hypothesis (H_o) is rejected in favour of the alternative hypothesis (H_1). This finding indicates that the Kahoot-assisted Inquiry Learning model had a statistically significant impact on enhancing the mathematical problem-solving skills of third-year primary school students compared to conventional teaching methods using visual media, such as images or PowerPoint presentations. These results specifically pertain to the teaching of whole number operations in third-year primary school settings.

Table 6. Paired Samples t-test Results for Pre-test and Post-test (Experimental Group)

Sig. (2-tailed)	α	t-value	Status
0,000	0,05	58,329	Reject $_{H0}$

Table 6 presents the results of the paired samples t-test. The two-tailed significance value of 0.000 is below the conventional alpha level of 0.05. Consequently, the null hypothesis (H_o) is rejected in favour of the alternative hypothesis (H_1). These findings indicate that the Kahoot-supported Inquiry Learning model significantly enhanced the mathematical problem-solving skills of Year 3 primary school students when teaching whole number operations. The normalised gain scores (N-Gain) were calculated using Hake's standard formula to quantify the improvement in students' problem-solving abilities following the intervention. The subsequent section will present the results of the N-Gain analysis.

Table 7. N-Gain Score Analysis (Control Group: Pre-test and Post-test Comparison)

Sample Size (n)	Mean Pre-test Score	Mean Post-test Score	Maximum Attainable Score	N-Gain (%)	Effectiveness Classification
15	60	75	80	0,38	Ineffective

Table 8. N-Gain Score Analysis (Experimental Group: Pre-test and Post-test Comparison)

Sample Size (n)	Mean Pre-test Score	Mean Post-test Score	Maximum Attainable Score	N-Gain (%)	Effectiveness Classification
15	59	91	97	0,78	Effective

Table 7 and Table 8 present the calculated N-Gain scores. The post-test N-Gain scores for both the experimental and control groups were 0.38 (see Table 9), indicating a moderate level of improvement. The Kahoot-based Inquiry Learning model yielded superior outcomes compared to conventional teaching methods using PowerPoint and other visual media. The experimental group's N-Gain score of 0.78 from pre-test to post-test (as reported in Table 10) falls within the effective range. This demonstrates that the Inquiry Learning model significantly enhanced students' mathematical problem-solving abilities, achieving a 78% improvement rate, which exceeds the 76% threshold for effectiveness.

DISCUSSIONS

Mathematics education constitutes a complex cognitive endeavour that necessitates a progressive, experiential approach to foster problem-solving, conceptual understanding, and solution formulation skills (Sari et al., 2023). From the early years, mathematics is frequently perceived as a challenging subject due to the need for students to master foundational concepts and skills that distinguish it from other disciplines (Utomo et al., 2020). This pedagogical challenge compels educators to develop innovative teaching strategies, particularly through the adoption of the Inquiry-Based Learning model. Grounded in constructivist educational theory, this approach encourages students to actively engage in investigative and discovery-oriented learning processes (Ochogboju & Díez-Palomar, 2025). The instructional framework begins with educators presenting carefully designed problem scenarios that induce cognitive dissonance, thereby motivating students to formulate solutions (Zamista & Kaniawati, 2015). This preliminary inquiry phase supports educators in effectively scaffolding students' conceptual development prior to formal instruction (Nurjanah, 2019).

Analysis conducted using SPSS version 25 revealed significant differences in the mathematical problem-solving abilities of students employing the Kahoot-supported Inquiry Learning model compared to those taught using conventional methods with PowerPoint or other visual media. Following the implementation of the Inquiry Learning model, students' problem-solving outcomes demonstrated statistically significant improvement, as evidenced by a two-tailed significance value of 0.000 ($p < 0.05$). This finding underscores the substantial impact of the Kahoot-integrated Inquiry Learning model. A subsequent N-Gain analysis was conducted to evaluate the model's effectiveness. The results indicated that the Kahoot-supported Inquiry Learning model enhanced students' problem-solving abilities by 78%, surpassing the 76% benchmark for effectiveness. The experimental group achieved an average post-test score of 91. In contrast, students taught using conventional PowerPoint and visual media methods attained an average post-test score of 77. The study clearly demonstrates that the Kahoot-supported Inquiry Learning model yields superior learning outcomes compared to conventional PowerPoint and visual media methods. During the experimental sessions, students engaged in a structured learning process that encompassed the following steps.

The initial phase of the lesson plan involved students observing physical objects and numerical displays within the classroom environment. Educators then posed targeted questions to stimulate interest in whole number concepts. This orientation phase transitioned into focused engagement with Student Worksheets (Figure 1), which systematically addressed foundational skills, including recognition of whole numbers, sequencing numbers, arranging digits, and solving real-world word

problems involving whole number operations. Subsequent phases incorporated collaborative group work, during which students established learning objectives, discussed problem-solving strategies, shared their findings, and drew conclusions based on their acquired knowledge, with Figure 2 illustrating their active presentation of group solutions to reinforce understanding of whole number operations.

Figure 1. Collaborative Completion of Worksheet Tasks in Groups

Figure 2. Presentation of Worksheet Outcomes

The third phase integrated Kahoot-based activities (Figure 3) to facilitate summative assessments and provide immediate feedback following classroom instruction. The digital platform was strategically implemented at various points during the lesson (Figure 4), with Figure 5 and Figure 6 exemplifying the assessment items employed. This phase concluded with an orientation to the content of the subsequent lesson, ensuring continuity in the learning process. Concurrently, the control group followed a comparable structural framework but relied on direct instruction, resulting in measurably lower levels of student participation and engagement.

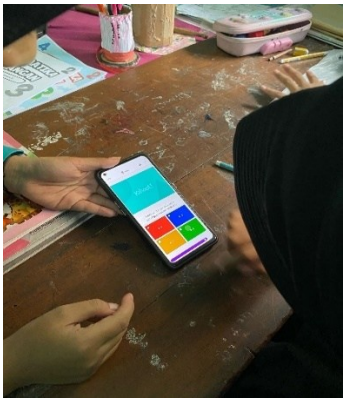

Figure 3. Implementation of the Kahoot Interactive Platform

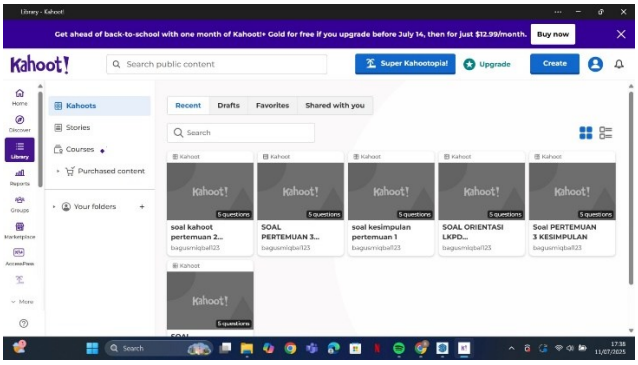

Figure 4. Kahoot Activities

Students participated in a targeted instructional intervention across three sessions to evaluate improvements in their mathematical problem-solving skills. A comparison of pre-test results, administered prior to the intervention, and post-test results, conducted following the implementation of the Kahoot-assisted Inquiry Learning model, revealed significant enhancements in students' problem-solving abilities. These findings align with research by Nadhifah and Afriansyah (2016), which demonstrated the efficacy of the Inquiry Learning model in fostering problem-solving skills. Further

support is provided by Aristianti et al. (2018), whose study confirmed that the model enhances both problem-solving and scientific communication skills. Yandhari et al. (2019) offer additional empirical evidence, highlighting the model's effectiveness in developing problem-solving skills among fourth-year primary school students.

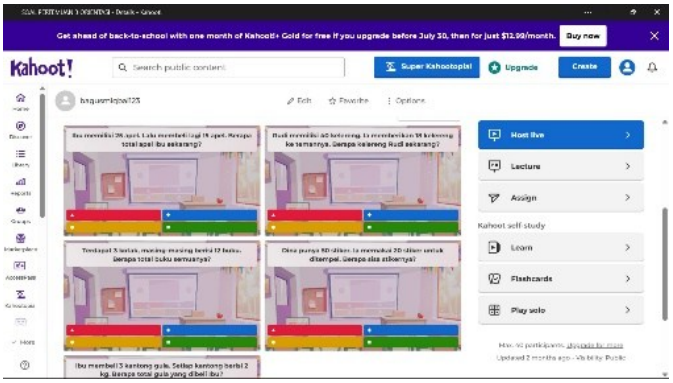

Figure 5. Example of a Kahoot assessment item

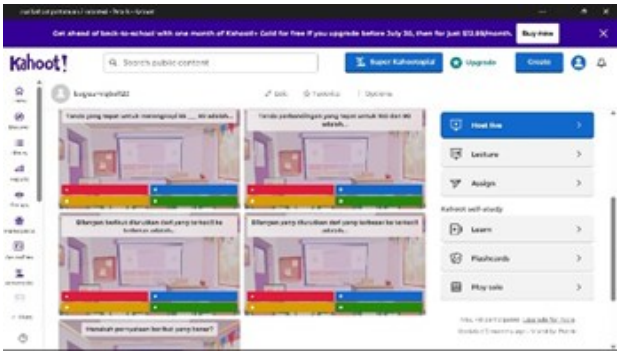

Figure 6. Supplementary Kahoot evaluation example

When optimising the Kahoot platform for the Inquiry Learning model, two key pedagogical phases warrant particular attention: pupil organisation (the second phase) and lesson closure (the final phase before reflection). Kahoot effectively prepares pupils for the worksheet phase by delivering interactive quizzes with questions designed to foster critical thinking and align with the curriculum content. The platform's real-time response functionality enables educators to gauge pupils' initial understanding of concepts, facilitating the development of more precise and effective problem statements. In the closure phase, Kahoot supports pupil reflection through summative quizzes that assess overall conceptual understanding at the lesson's conclusion. The integration of Kahoot in both phases is particularly effective, as its gamification features enhance engagement, promote intrinsic motivation, and cultivate a dynamic learning environment that mitigates fatigue (Alfansyur & Mariyani, 2019). This approach is especially valuable in primary school settings, where pupils benefit from a blend of visual, auditory, and interactive stimuli to maintain focus and active participation in the learning process.

The implementation of the Inquiry Learning model presents several significant challenges that educators must address to ensure effective pedagogical practice. Adapting lesson plans and resources to accommodate the diverse needs of pupils significantly increases the complexity of instructional planning (Sofiani, 2011). Inadequate technological infrastructure, such as limited access to digital devices and unreliable internet connectivity, poses substantial barriers to integrating digital learning tools (Arisanti et al., 2024). Moreover, educators must design engaging and contextually relevant

lesson plans that connect with pupils' lived experiences to foster meaningful and enjoyable learning (Muslimim, 2024).

A comprehensive and contextually responsive strategy is essential to address these challenges, encompassing complex instructional materials, limited technological resources, gaps in teacher expertise, and insufficient environmental support. Research indicates that adaptive learning platforms, such as Kahoot, enable educators to tailor lessons and formative assessments to individual pupil needs, enhancing differentiation (Artika et al., 2024). Community partnerships can foster a supportive educational ecosystem by engaging school committees and parents to secure essential technological resources and improve network infrastructure (Sinaga, 2018). Gamified learning tools like Kahoot create dynamic, interactive learning environments that enhance pupil motivation, promote active engagement, and deepen conceptual understanding through innovative, quiz-based pedagogical approaches (Artika et al., 2024).

CONCLUSION

This study demonstrates that integrating the Inquiry Learning model with Kahoot interactive media significantly enhances the mathematical problem-solving skills of third-year primary school pupils. Post-test results and N-Gain scores from the experimental group confirm the effectiveness of this pedagogical approach. The use of Kahoot as an interactive tool enriched the inquiry-based learning process, fostering greater pupil engagement in scientific inquiry and making learning more dynamic and effective. Kahoot's gamification features promoted collaborative learning and increased pupil motivation. However, the study has limitations, including a lack of participant diversity, a relatively short implementation period, and incomplete data for some pupils. To yield more robust findings, future research should involve a more diverse sample and an extended duration. The findings underscore the pivotal role of technology in education. Prior research on the Inquiry-based Learning model and interactive platforms such as Kahoot has predominantly examined these elements in isolation or without full integration. This study demonstrates that the synergistic application of the Inquiry-based Learning model with the Kahoot platform yields a statistically significant positive impact on enhancing the mathematical problem-solving abilities of third-grade primary school pupils. The study proposes two principal recommendations. Firstly, primary school administrators should prioritise the enhancement of supporting infrastructure, including reliable internet connectivity and access to digital devices, to facilitate technology-enhanced learning. Secondly, educators should increasingly integrate interactive media into their teaching practices to heighten pupil engagement and deepen comprehension of the subject matter.

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