



MANAGEMENT ANALYSIS OF INCREASING INTEREST IN LEARNING MATHEMATICS THROUGH GAMIFICATION INTEGRATED CANVA MEDIA AT NABILAH ISLAMIC SCHOOL

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ABSTRACT

This research is motivated by the low interest in learning mathematics in a class. To overcome this challenge, Classroom Action Research is one of the important strategies to increase learning interest in a sustainable manner. This study aims to analyze the increase in learning interest in mathematics material through integrated gamification Canva learning media at Nabilah Islamic Elementary School, Batam. The research method used is a qualitative method with a Classroom Action Research approach to determine the process of learning activities, guidance processes, classroom management/classroom management, and how the relationship between teachers and students at school. This research was conducted from September to October 2025 involving 54 target students. Data collection in this study is Formulating Research Problems, Conducting Data Collection, Analyzing Data, Developing Theory, Validating Theory, Compiling Research Report. Data analysis through three main stages, namely data reduction, data presentation and drawing conclusions/verification. The results of this study indicate that students' understanding of interest in learning mathematics has increased. The results of the analysis show that research carried out based on the classroom action research approach is able to have a positive impact on increasing student interest in learning. The conclusion of this study is that student interest in learning has increased. Thus, research on increasing interest in learning mathematics through integrated gamification canva learning media at SD Islam Nabilah is effective in improving student learning.

Keywords: *learning media, Canva, interest in learning mathematics, elementary school, PTK*

INTRODUCTION

Mathematics education in elementary schools plays a fundamental role in developing students' logical thinking, analytical thinking, and problem-solving skills. However, mathematics remains a difficult subject and is unpopular among most elementary school students. The 2023 National Assessment revealed that only 40% of Indonesian students achieved minimum competency in mathematics (Ministry of Education, Culture, Research, and Technology, 2023), highlighting the urgency of improving the quality of mathematics learning. In the Riau Islands Province, educational challenges are increasingly complex, given that 94.6% of its territory is water, with more than 2,000 islands spread across 251,810 km². This geographic condition creates a gap in access to learning innovations. Data from the 2025 Dapodik (Education and Training Center) shows that there are 1,067 elementary schools with 242,615 students and 10,612 teachers, requiring leadership and quality learning

innovations. As an international gateway bordering Singapore, Malaysia, and Thailand, the Riau Islands are expected to produce competent and competitive graduates, including in mathematics.

Initial observations at Nabilah Islamic Elementary School in Batam City revealed a concerning situation: of 54 sixth-grade students (three parallel classes), only 20% showed a high interest in mathematics, 40% a moderate interest, and 40% a low interest. Interviews with three mathematics teachers identified contributing factors: conventional and teacher-centered learning methods, limited learning media such as blackboards and textbooks, the perceived abstractness and difficulty of fractions, and a lack of variety and innovation in learning. One teacher stated: "Students feel forced to learn mathematics, not because they want to learn it."

Learning interest is a relatively persistent psychological tendency to pay attention to and remember certain activities, accompanied by feelings of pleasure and satisfaction (Slameto, 2015). A meta-analysis by Kriegbaum et al. (2018) showed that learning interest has a significant positive correlation with academic achievement ($r = 0.30$), indicating that approximately 9% of the variance in academic achievement is explained by students' level of learning interest. In the context of mathematics learning, interest functions as a driving force that encourages students to be actively involved, persist in the face of difficulties, and continue to understand complex mathematical concepts. The digital era and Society 5.0 demand a transformation in learning that aligns with the characteristics of Generation Alpha students who grew up in a technologically rich ecosystem with visual stimuli, interactivity, and instant feedback. Prensky (2001) emphasized that digital natives require a more engaging, interactive, and technology-enhanced learning approach to attract and retain their attention. Research by Lai and Hwang (2016) found that technology integration in learning can improve students' intrinsic motivation, engagement, and learning outcomes, with effect sizes varying from moderate to large.

Gamification, defined as the use of game elements and mechanics in non-game contexts (Deterding et al., 2011), shows great potential in increasing learning interest. Deci and Ryan's (2000) Self-Determination Theory explains that gamification is effective because it fulfills three basic human psychological needs: autonomy, competence, and relatedness. A meta-analysis by Sailer and Homner (2020) involving 38 experimental studies showed that gamification has a moderate positive effect on motivation ($d = 0.49$) and a small effect on cognitive learning outcomes ($d = 0.26$), but a much larger effect on interest and engagement ($d = 0.67$).

Digital design platforms like Canva have opened up new opportunities for teachers to develop engaging learning media without requiring advanced technical skills. Canva offers an intuitive drag-and-drop interface, thousands of ready-to-use templates, high-quality visual elements, and easy collaboration and sharing capabilities. Canva's strengths include a low learning curve, accessibility across multiple devices, and a free tier adequate for educational needs. Lie et al. (2020) found that using Canva in learning increased student creativity and motivation with a significant effect size. However, research specifically integrating Canva with gamification principles for mathematics learning in elementary schools is still very limited, especially in the Indonesian context.

This research gap is the basis for developing Canva-based mathematics learning media integrated with gamification in this study. What distinguishes this approach is: (1) holistic integration between Canva as the main platform (80%) with cohesively designed gamification elements, (2) focus on learning mathematics fraction material for 6th grade elementary school which is a fundamental concept but is often considered difficult, (3) implementation in the context of Islamic elementary schools in the Riau Islands with specific demographic and cultural characteristics, and (4) the use of a Classroom Action Research approach that allows for iteration and improvement based on reflection.

The developed learning media is carefully designed to meet the principles of multimedia learning according to Mayer (2014) and gamification elements based on the Octalysis framework by Chou (2015). Specifically, the media displays a guide avatar "Si Pecah" who invites students on a mathematical adventure, learning is divided into four levels (Equivalent Fractions, Addition of

Fractions, Subtraction of Fractions, Fraction Story Problems) with a clear progression mechanism, as well as a badge, point, and progress tracking system that creates a sense of accomplishment. To enrich the learning experience, Quizizz is used as a supporting tool (20%) for evaluation sessions and competitive challenges integrated with the points system in Canva.

The objective of this PKM is to increase the interest in learning mathematics of 6th grade students at Nabilah Islamic Elementary School through the development and implementation of Canva-based learning media integrated with gamification. Specifically, the objectives include: (1) developing mathematics learning media for fractions that are integrated with gamification elements in a cohesive and systematic manner; (2) testing the feasibility of learning media through validation by media experts, material experts, and learning experts; (3) implementing learning media in mathematics learning in grades 6A, 6B, and 6C using the CAR approach; (4) measuring the effectiveness of learning media on increasing students' interest in learning from the aspects of attention, interest, involvement, enjoyment, and willingness to learn; (5) identifying student and teacher responses to learning media; and (6) producing learning media products, usage guides, and research instruments that can be replicated by other teachers in the Riau Islands Province.

The benefits of this research encompass various stakeholder perspectives. For students, this research provides a more enjoyable, engaging, and meaningful mathematics learning experience, which is expected to increase learning interest, reduce math anxiety, and ultimately improve conceptual understanding. For teachers, this research provides a model and inspiration for developing innovative digital learning media with accessible tools (Canva) and enhance professional development in technology integration. For schools, this research improves the quality of mathematics learning and strengthens their reputation as innovative schools. For the Riau Islands Province Education Office and KGTK, this research produces best practices and models that can be disseminated to other schools. For the academic community, this research provides an empirical contribution to the literature on the integration of Canva and gamification in elementary mathematics learning, a field still limited.

More broadly, this research aligns with the national education policy direction in Merdeka Belajar (Freedom to Learn) and the latest curriculum that emphasizes student-centered learning, the development of 21st-century competencies (critical thinking, creativity, collaboration, communication), technology integration in learning, and engaging and enjoyable learning. The Canva-based learning media integrated with gamification developed is a concrete manifestation of the Merdeka Belajar philosophy, where teachers are empowered to be learning innovators, students become active subjects who learn in ways that suit their learning styles, and technology is used as an enabler to create a better learning experience. More broadly, this research also contributes to efforts to achieve the Sustainable Development Goals (SDGs), particularly SDG 4 on Quality Education, which targets ensure inclusive and equitable quality education and promote lifelong learning opportunities for all.

MATERIAL AND METHODS

The research method used is a qualitative method, namely to produce an in-depth description of how research is carried out to improve student learning outcomes. This research was conducted for two months starting from September 5 to October 10, 2025. The population in this research was all sixth-grade students of Nabilah Islamic Elementary School and the sample of this research was 18 students out of 54 students. Partners involved in this research consisted of the Ministry of Primary and Secondary Education, KGTK of Riau Islands Province, Batam City Education Office. This research was conducted through a systematic managerial approach consisting of five stages: planning, organizing, implementing, controlling and evaluating. This research was conducted from September 5 to October 10, 2025 at Nabilah Islamic Elementary School, Batam City, Riau Islands Province, involving 54 sixth-grade students divided into three parallel classes (6A, 6B, and 6C, each with 18 students). The partners

involved consisted of the Ministry of Primary and Secondary Education, KGTK Riau Islands Province, Riau Islands Province Education Office, and Batam City Education Office. The research implementation used a systematic managerial approach consisting of five stages: planning, organizing, implementing, controlling, and evaluating.

Research Design

This study used the Kemmis & McTaggart Classroom Action Research (CAR) design, which consists of a repetitive cycle with four stages: planning, action, observation, and reflection. CAR was chosen because it aligns with the research objectives of improving the quality of learning practically and directly in the classroom, and involves teachers as researchers who reflect on their teaching practices. The study was designed in two cycles, with each cycle consisting of two meetings (2 x 35 minutes each). The following is a flowchart of the CAR applied:

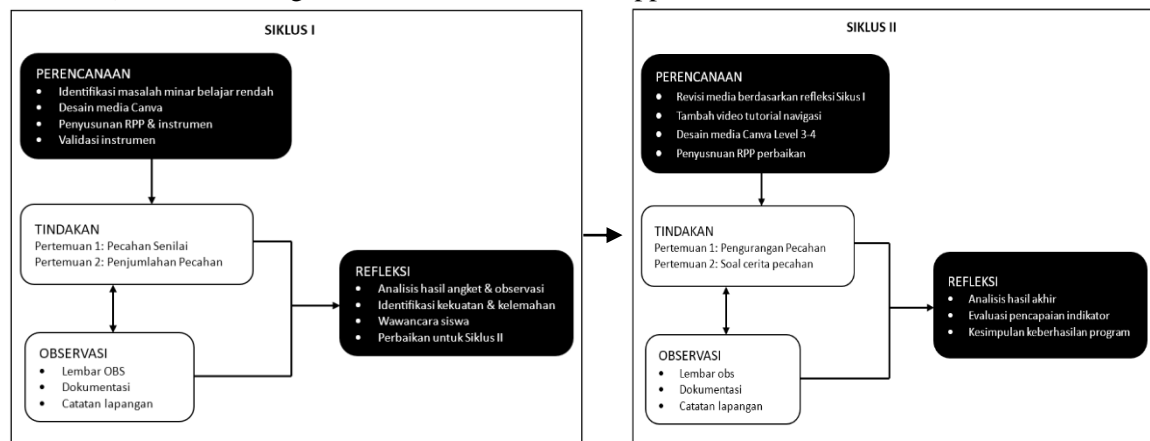


Figure 1. Classroom Action Research Flow Model Kemmis & McTaggart

Participants

Instructional Media Development The research subjects consisted of 54 sixth-grade students divided into three parallel classes: class 6A (18 students: 9 boys, 9 girls), class 6B (18 students: 10 boys, 8 girls), and class 6C (18 students: 8 boys, 10 girls). The average age of the students ranged from 11 to 12 years, corresponding to the cognitive development level of sixth-grade elementary school students. All three classes conducted learning at the same time (7:00 AM to 12:00 PM WIB) with relatively balanced characteristics in terms of academic ability, socioeconomic background, and learning experience, ensuring homogeneous learning conditions for the validity of the research.

The learning media was developed using Canva as the main platform (80%) with an attractive and interactive visual design. Gamification elements were cohesively designed in the media, including: (1) a guide avatar "Si Pecah" who invites students on a mathematical adventure to discover a treasure trove of knowledge; (2) four levels of learning (Equivalent Fractions, Addition of Fractions, Subtraction of Fractions, Fraction Story Problems) with clear progression mechanisms; (3) five types of badges (Beginner, Explorer, Master, Super Solver, and Champion Badge) that students can collect as a form of achievement; (4) a points system with visual representations of stars or coins that provide immediate feedback and positive reinforcement; and (5) a progress tracker in the form of a journey map that shows students' position in the overall learning process.

To enrich the learning experience and provide more dynamic assessments, Quizizz is used as a supporting tool (20%) for evaluation sessions and competitive challenges. Quizizz's integration with Canva is done through hyperlinks or QR codes embedded in Canva slides, allowing students to seamlessly transition from learning content in Canva to assessments in Quizizz. The point system in Quizizz is designed to be consistent with the point system in Canva, creating a unified gamification experience. The learning media is designed based on the principles of multimedia learning according to Mayer (2014): multimedia principle (combination of text and images), contiguity principle (text and

images are closely related), coherence principle (extra irrelevant material is removed), signaling principle (important elements are highlighted), redundancy principle (avoid duplication of information), personalization principle (use conversational language), and segmenting principle (complex material is broken down into small segments). The gamification elements are designed based on the Octalysis framework by Chou (2015) which identifies eight core drives of human motivation: epic meaning, accomplishment, empowerment, ownership, social influence, scarcity, unpredictability, and avoidance.

Data Collecting

The data collection instrument was designed using a mixed methods approach that combines quantitative and qualitative data. The quantitative instrument included: (1) a learning interest questionnaire developed based on five aspects (attention, interest, involvement, enjoyment, and willingness to learn) with a total of 20 statements using a Likert scale of 1-4; and (2) a student activity observation sheet with 15 indicators covering the five aspects with a rating scale of 1-4. The qualitative instruments included: (1) semi-structured interview guidelines for students (7 open-ended questions) and teachers (7 open-ended questions); and (2) documentation in the form of learning photos, 3-5 minutes videos per class, Canva media screenshots, student work results, and researcher field notes. All instruments were validated by two experts (mathematics education and learning evaluation) with a Content Validity Ratio (CVR) of 0.85 and a Cronbach's Alpha reliability of 0.89, indicating high validity and reliability.

Success Indicators

The indicators for the success of the RESEARCH are determined using the SMART principle (Specific, Measurable, Achievable, Relevant, Time-bound). The first main indicator stipulates that the average score of students' learning interest must reach the High category with a minimum target of 75%. The second main indicator requires a minimum of 80% of students or at least 43 out of 54 students to have a High or Very High learning interest category. Supporting indicators include: every aspect of learning interest must reach a minimum of 70%, observations of student activities must show a Good category (minimum 75%) in all classes, and interview results show a minimum of 80% positive responses. The improvement indicator stipulates that there must be an increase in the learning interest score of at least 15% from the pre-cycle to the end of the Research.

Implementation Procedures

The implementation of the RESEARCH began with the preparation stage (Week 1-2) which included observations of mathematics learning in the three classes, interviews with class teachers to identify problems, analysis of previous semester mathematics scores, distribution of pre-cycle learning interest questionnaires, development of Canva Level 1-2 media, preparation of Cycle I lesson plans, and validation of all research instruments. The output of this stage was the identification of low learning interest problems, baseline data, learning media for Cycle I, and validated research instruments. Cycle I was conducted in Weeks 3-4 with two meetings. Meeting 1 discussed Equivalent Fractions in all three classes in parallel, with complete observations and documentation. Meeting 2 discussed Adding Fractions, followed by the distribution of a post-Cycle I questionnaire to all students, in-depth interviews with 6-9 selected students, and a reflective discussion with the collaborating teacher to identify strengths and weaknesses that would form the basis for improvements in Cycle II.

The Cycle I reflection identified several obstacles: some students were still confused with media navigation (the forward and back buttons were unclear), the internet connection was interrupted in class 6C for about 5 minutes, the intro was too long (5 minutes) making learning time less efficient, and the group discussion activity was less structured making some students passive. Based on these findings, planned improvements for Cycle II include: adding a 1-minute navigation tutorial video at the beginning of the lesson, enlarging the size of the navigation buttons and clarifying the labels, shortening the intro duration from 5 minutes to 2 minutes, preparing a backup WiFi hotspot in case of connection

interruptions, and adding more structured group discussion activities with clear role divisions (chairperson, note-taker, presenter) to increase engagement.

Cycle II was implemented in Weeks 5-6 with the implementation of improvements. The fifth week began with revisions to the Canva media based on feedback from Cycle I, the development of a revised lesson plan, and the implementation of Meeting 1 on Fraction Reduction. The sixth week included Meeting 2 on Fraction Story Problems, the distribution of the post-Cycle II questionnaire, student and teacher interviews for the final evaluation, and a final reflection to ensure all success indicators were achieved. The improvements demonstrated positive results. Navigation video tutorials added at the beginning of the lesson helped students quickly grasp how to use the media, eliminating confusion when searching for the "Next" button. Backup hotspots successfully addressed internet connection issues. More structured group discussion activities significantly increased student engagement. Observations showed an increase in student activity to 81.3% in Meeting 1 of Cycle II and 85.3% in Meeting 2, categorizing it as "Very Good."

Monitoring and Evaluation

Implemented periodically through several mechanisms. Daily monitoring was conducted by researchers and class teachers by observing each learning session, noting any technical issues that arose (internet connection, devices, media navigation), and providing quick solutions to any issues that could be addressed immediately. Weekly monitoring was conducted through evaluation meetings every Friday afternoon that discussed the progress of learning in the three classes, analyzed the results of student activity observations, identified recurring problem patterns, and adjusted learning strategies if necessary. Monitoring per cycle is carried out through intensive reflection meetings at the end of each cycle with the agenda of analyzing the results of the learning interest questionnaire, analyzing the results of observations and interviews, identifying achievements and gaps from success indicators, and planning concrete improvements for the next cycle. The control instruments used include student activity observation sheets filled out at each meeting by an independent observer to ensure the objectivity of the measurements, researcher field notes documenting unique events and spontaneous student responses, a checklist of the implementation of the lesson plan to ensure each stage of learning is carried out according to plan, and a constraint and solution form documenting each problem, corrective actions taken, and the effectiveness of the solution for organizational learning.

Data Analysis

Quantitative data analysis was conducted using descriptive statistics. Questionnaire and observation data were inputted into Microsoft Excel, then scores were calculated per aspect using the formula: $\text{Percentage} = (\text{Sum of Item Scores} / \text{Maximum Score}) \times 100\%$. Results were categorized based on the following criteria: 81-100% (Very High), 61-80% (High), 41-60% (Medium), 21-40% (Low), 0-20% (Very Low). Comparison of pre-cycle, Cycle I, and Cycle II scores was conducted to identify improvement trends, with improvement calculated using the formula: $\text{Improvement} = \text{Final Score} - \text{Initial Score}$. Qualitative data analysis was conducted using thematic analysis. Interview recordings were transcribed verbatim, then coded by assigning codes to text segments relevant to aspects of learning interest. Similar codes were grouped into categories (e.g., "enthusiasm for gamification," "ease of navigation," "intrinsic motivation"), which were then generalized into main themes. Triangulation was conducted by comparing quantitative findings (increased learning interest based on the questionnaire) with qualitative findings (students' subjective experiences from the interviews) to confirm or explain the patterns found, ensuring the validity and reliability of the research results.

RESULT AND DISCUSSION

This research was conducted from September 5 to October 10, 2025 at Nabilah Islamic Elementary School, Batam City, involving 54 6th grade students from three parallel classes. The study used the Classroom Action Research (CAR) design model Kemmis & McTaggart with two cycles, each

consisting of two learning meetings on fractions mathematics. Learning media was developed using Canva (80%) which was integrated with comprehensive gamification elements: the guide avatar "Si Pecah", four levels of progressive learning, five types of badges, a point system, and a progress tracker. Quizizz was used as a supporting tool (20%) for evaluation and competitive challenges integrated through hyperlinks and QR codes. Implementation was supported by adequate technological infrastructure (LCD projectors and WiFi in all classes), full support from the principal and mathematics teacher, and students who were familiar with learning technology. Challenges in Cycle I included unstable internet connections in class 6C, 30% of students having difficulty navigating, the intro being too long (5 minutes), and an unclear group discussion structure. Improvements in Cycle II included providing backup hotspots, a 1-minute navigation video tutorial, trimming the intro to 2 minutes, and a clear division of discussion roles (chairperson, note-taker, presenter), which proved effective in improving the smoothness of learning.

The level of student participation showed a consistent and significant increase. Attendance reached 100% in all meetings (24 learning sessions), indicating high student commitment. Activity observation data using a 15-indicator observation sheet (scale 1-4) showed: Cycle I Meeting 1 reached 72.7% (Good category), increasing to 76.0% in Meeting 2. In Cycle II, the increase was more dramatic: 81.3% in Meeting 1 and 85.3% (Very Good category) in Meeting 2, indicating a total increase of 12.6% from the beginning of Cycle I. Qualitative observations revealed significant behavioral changes: (1) the frequency of questions increased from 5-7 to 12-15 questions per class, indicating higher curiosity and cognitive engagement; (2) positive competition to operate Canva media in front of the class; (3) group discussion dynamics increased sharply with active contributions from all members; (4) consistent positive emotional expressions when getting badges or leveling up; and (5) no students showed boredom or lost focus during the 70 minutes of learning, in contrast to pre-cycle conditions where 40% of students lost focus after 20 minutes of conventional learning. Measuring learning interest using a 20-item questionnaire (Likert scale 1-4) covering five aspects showed very significant improvements in all aspects. Table 1 presents a comprehensive comparison between cycles.

Table 1. Comparison of Student Learning Interests Per Aspect Between Cycles

Aspects of Learning Interest	Pra-Cycles (%)	Cycle I (%)	Cycle II (%)	Improvement (%)
Attention	58,3	72,1	85,2	+26,9
Interest	52,8	68,5	82,4	+29,6
Engagement	48,2	65,3	80,1	+31,9
Enjoyment	55,1	70,4	83,6	+28,5
Willingness to Learn	50,6	67,8	81,2	+30,6
Average	53,0	68,8	82,5	+29,5

Notes: $N = 54$ students. Categories: 81-100% = Very High; 61-80% = High; 41-60% = Medium; 21-40% = Low; 0-20% = Very Low

The main findings showed a significant increase in all aspects (26.9%-31.9%). The engagement aspect showed the highest increase (+31.9%), indicating that the gamification-integrated Canva media was very effective in transforming students from passive recipients to active participants. The willingness to learn aspect (+30.6%) indicated a transformation in motivation from extrinsic to intrinsic. The interest aspect (+29.6%) confirmed that the gamification elements successfully created sustained engagement. The enjoyment aspect (+28.5%) showed that mathematics learning transformed from scary

to enjoyable. The attention aspect (+26.9%) increased sharply in Cycle II (from 72.1% to 85.2%) after design simplification, confirming Mayer's (2014) coherence principle.

The average learning interest increased from 53.0% (Medium category) to 82.5% (Very High category), a 29.5% increase, exceeding the target of 75%. The trajectory of improvement shows: pre-cycle to Cycle I (+15.8%) and Cycle I to Cycle II (+13.7%), indicating effective iterative improvements in CAR. The data per class showed consistency: Class 6A (+29.6%), 6B (+28.7%), 6C (+30.5%), with a range of only 1.8%. Interestingly, Class 6C with the lowest initial interest (50.8%) showed the highest increase (+30.5%), indicating a compensatory effect where struggling students benefited the most from gamification media (Cheung & Slavin, 2013). The distribution of interest categories transformed dramatically: Pre-cycle - 11 students (20.4%) High/Very High, 22 students (40.7%) Average, 21 students (38.9%) Low/Very Low. Cycle II - 48 students (88.9%) High/Very High, 6 students (11.1%) Average, 0 students Low/Very Low. The achievement of 88.9% exceeded the target of 80%, with an excess of 9.2% above the target.

The program's success can be explained through three theoretical perspectives. First, Self-Determination Theory (Deci & Ryan, 2000) explains that gamification elements fulfill three basic psychological needs: autonomy (students freely choose the level and pace of learning), competence (immediate feedback and badges as recognition), and relatedness (learning together in a fun atmosphere). This explains the increase in learning willingness (+30.6%) due to the transformation of extrinsic motivation into intrinsic motivation.

Second, Multimedia Learning Theory (Mayer, 2014) explains that Canva's combination of multiple modalities (text, images, animation, and narrative) facilitates multiple coding processes. The engaging visual design (bright colors, cartoon illustrations, and clean layout) successfully captured attention (+26.9%). Adherence to multimedia principles (proximity, tagging, and coherence) contributed to reduced cognitive load. Third, Gamification Theory and Flow Theory (Csikszentmihalyi, 1990) explain that gamification elements (points, badges, levels, progress bars, storytelling) create a flow experience. A progressive level structure with appropriate scaffolding, immediate feedback, and narrative context transforms learning from an arbitrary task into a meaningful pursuit.

Comparative Analysis: Sailer and Homner's (2020) meta-analysis showed gamification had an effect size of $d = 0.67$ for interest and engagement. This study produced an effect size of Cohen's $d \approx 1.18$ (a large effect), 76% greater than the meta-analysis average. Several factors explain this superiority: (1) depth of integration - holistic integration rather than just superficial additions; (2) platform capabilities - Canva provides ease of use and robust design capabilities; (3) contextual appropriateness - the media was specifically designed for Indonesian elementary school students; (4) iterative refinement - two cycles of CAR resulted in optimal media.

A comparison with Huang et al.'s (2020) study on digital game-based mathematics learning for elementary schools in Taiwan ($d = 0.52$ for motivation) showed this study to be 126% more effective. The difference was explained by the integration of gamification with systematic instruction and cultural appropriateness. Lie et al.'s (2020) study on Canva in high school English learning found significant increases in motivation but without specific impact measures. This study extends these findings by: a different focus (elementary mathematics), the addition of a gamification layer, and the use of a rigorous methodology with validated instruments.

Impact Beyond Interest: Despite the focus on interest, qualitative observations indicated improved conceptual understanding. Teachers reported that students could explain equivalent fractions using visual representations, demonstrate fraction operations with area models, and solve word problems by identifying relevant information. Analysis of Quizizz responses revealed an increase in accuracy from 52% (beginning of Cycle I) to 78% (end of Cycle II). More importantly, the quality of explanations improved: students provided step-by-step solutions with visual diagrams, verbal explanations, and real-world analogies, indicating deep conceptual understanding.

Implementation Variation: Although the core media were identical, teachers adapted different strategies. Teacher 6A emphasized intergroup competition with a leaderboard, effective for high-achieving motivation but potentially frustrating for losing teams. Teacher 6B emphasized collaboration with heterogeneous grouping and explicit roles, creating an inclusive environment but at a slightly slower pace. Teacher 6C implemented a hybrid approach with physical stickers and a “Math Hero Wall,” appealing to diverse preferences but requiring additional effort. These variations resulted in comparable gains (2.6% difference), suggesting the media are robust enough to support diverse pedagogical approaches.

This study has five major limitations: (1) lack of a control group - CAR focuses on within-group improvements, making it difficult to attribute improvements solely to the intervention versus the Hawthorne effect or natural maturation; future research needs an experimental design with a control group; (2) short duration (6 weeks) - questions of sustainability remain unanswered; longitudinal follow-up 3-6 months post-intervention is needed to assess retention; (3) single school site with adequate conditions - generalizability to schools with limited infrastructure is questionable; future research should examine diverse contexts; (4) exclusive focus on interests - lack of validated pre-post achievement tests limits claims of cognitive impact; future iterations need comprehensive assessment; (5) potential researcher bias - as the developer of the tool, there is potential for confirmation bias; external evaluators are needed for credible evaluation.

Recommendations include: conducting experimental studies with control groups; implementing longitudinal follow-up; replicating in diverse contexts; integrating rigorous cognitive assessments; investigating individual differences; comparing with alternative interventions; examining cost-effectiveness; and developing teacher professional development programs. Practical implications for teachers: (1) choosing a user-friendly platform such as Canva; (2) adapting gamification to cultural contexts; (3) maintaining visual and content balance; (4) strengthening digital literacy and instructional design.

The geographical context of the Riau Islands (94.6% water) presents challenges in the distribution of learning innovations. Digital media can be distributed online, enabling teachers on remote islands to access the same quality media, in line with the principle of equality. As a province bordering Singapore, Malaysia, and Thailand, the Riau Islands need to prepare a generation competent in technology and mathematics. This research shows that technology integration is highly effective, in line with the Ministry of Education, Culture, Research, and Technology's vision for transformative learning towards a Golden Indonesia 2045.

Theoretical Contribution: Studies on Canva-gamification integration for Indonesian elementary school mathematics are still limited; this study fills the gap with empirical evidence of effectiveness. The validated instrument (CVR 0.85, reliability 0.89) can be used by other researchers, increasing the rigor of educational research. This study demonstrates that with creativity, commitment, and stakeholder support, teachers can develop innovative media that significantly improve the quality of learning. The Canva-gamification integration represents a 21st-century learning paradigm: student-centered, technology-enhanced, and engaging.

CONCLUSION

Success in achieving the main objective of increasing interest in learning mathematics at 6th grade students of SD Islam Nabilah through Canva-based learning media integrated with gamification. The results showed a very significant increase with an average interest in learning increasing from 53.0% (Medium category) to 82.5% (Very High category), a total increase of 29.5% which exceeded the target of 75%, with an impact size of Cohen's $d \approx 1.18$ (large impact). All success indicators were exceeded: 88.9% of students (48 out of 54) reached the High/Very High interest category (target 80%); all aspects of interest in learning exceeded 80% - involvement (80.1%), willingness to learn (81.2%),

interest (82.4%), pleasure (83.6%), and attention (85.2%); observation of student activities reached 85.3% (target 75%); interviews showed 100% positive responses (target 80%). The consistency of improvement across the three parallel classes (range 1.8%) indicates the effectiveness of the media for various student characteristics, with the finding that students experiencing difficulties benefited the most (compensation effect). The distribution transformation from 38.9% of students in the Low/Very Low category in the pre-cycle to 0% in Cycle II demonstrates the successful uplift of all students.

Theoretical interpretations through Self-Determination Theory, Multimedia Learning Theory, and Gamification Theory explain the mechanism of motivation transformation from extrinsic to intrinsic, the dual coding process that enhances attention and comprehension, and the flow experience that creates sustained engagement. The study's effect size is 76% greater than the international meta-analysis average ($d = 0.67$), indicating the superior effectiveness of the holistic integration of Canva-gamification in the Indonesian context. Qualitative findings reveal a profound transformation of students' perceptions of mathematics from "scary and boring" to "fun and interesting," with previously passive students showing a dramatic shift to become confident learners. The Classroom Action Research (CAR) approach with iterative improvements proved effective, resulting in an increase in activity from 72.7% (initial Cycle I) to 85.3% (final Cycle II). The resulting concrete products (Canva media with 4 levels and 25 interactive slides, validated instruments with a CVR of 0.85 and a reliability of 0.89, lesson plans, user guides, video tutorials) have high practical value and can be replicated. This study provides multidimensional contributions: for students (transformative learning experiences), teachers (innovation models and professional development), schools (quality and reputation improvement), the Education Office and KGTK (best practices for dissemination), and the academic community (empirical contributions to the Indonesian mathematics education literature). In the context of the Riau Islands, with 94.6% water, digital media offers a solution to overcome geographical barriers and promote equality.

ACKNOWLEDGMENT

The team would like to express its deepest gratitude to Nabilah Islamic Elementary School for providing the opportunity and support in carrying out this research from start to finish.

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