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Statblithz Game Media Development to Train Students' Mathematical Problem-Solving Skills

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ABSTRACT

Mathematical problem-solving skills are essential for students to succeed in the 21st century, yet many struggle to apply mathematical concepts in real-life situations. This research addresses the need for innovative learning media by developing Statblithz Game, an educational game designed to train and enhance students' mathematical problem-solving abilities. The study employed a Research and Development approach using the ADDIE model, involving stages of analysis, design, development, implementation, and evaluation. Participants included middle school students who engaged with the prototype and provided feedback through questionnaires, expert validations, and pre- and post-tests measuring problem-solving performance. The results indicated that Statblithz Game is highly feasible, with expert validation scores averaging 89%. Moreover, students' problem-solving test scores improved by an average of 25% after using the game. In conclusion, the Statblithz Game effectively enhances mathematical problem-solving skills and offers an engaging alternative to traditional mathematics instruction. The impact of this research lies in providing educators with an innovative and interactive tool that can foster critical thinking and improve student learning outcomes in mathematics.

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A. INTRODUCTION

In the context of global education, developing students' mathematical problem-solving skills is becoming increasingly important because these skills are the foundation for facing 21st-century challenges that every student must possess (Isriani, 2021). These skills include critical, analytical, and reflective thinking skills in dealing with everyday problems. However, many students still struggle to apply mathematical concepts to real-world situations, resulting in mathematics learning tending to be theoretical and lacking in meaning (Nailurrohmah, 2022; Suherman, 2021). This situation demonstrates the need for innovation in mathematics learning to foster higher-order thinking skills, which are currently a global demand (Setiawan et al., 2021). One of the skills that is a primary focus in the development of innovative learning is mathematical problem-solving skills.

Problem-solving skills are one of the goals of mathematics learning that students must achieve (Amin et al., 2021). In everyday life, we are constantly faced with various problems that

require logical thinking skills to solve them. This ability is a crucial cognitive aspect because it is used not only in academics but also in everyday life (Isriani, 2021; Yasin, 2020). One cause of low problem-solving skills is students' habits of not being actively involved in the learning process, as these habits significantly influence the level of problem-solving ability.

Traditional learning methods often focus on rote learning and procedural understanding, resulting in low engagement and limited critical thinking skills (Khusna, 2024). Several studies have highlighted the importance of innovative, interactive, and student-centered learning tools to bridge this gap, such as game-based learning, which has shown promising results in improving motivation and learning outcomes (Bariyyah, 2021; Bhowal, 2021; Rahman, 2024). As a result, students are less actively engaged in the learning process and are not accustomed to facing problems that require in-depth reasoning. Therefore, learning media are needed that can foster curiosity, encourage active participation, and provide fun, meaningful, and challenging learning experiences for students.

The use of learning media can foster students' interest in learning new things in the learning materials presented by teachers more easily, especially mathematical concepts (Mutodi & Mosimege, 2021). Through the use of learning media, teachers create experiences that can assist students' learning process, especially in mathematical understanding and solving math problems. Therefore, the application of technology as a learning medium is a form of innovation that can facilitate students' understanding of abstract mathematical concepts while simultaneously training students' skills in solving math problems.

Research related to the effectiveness of educational games in mathematics has been conducted by Turmudi (2021), who showed that math games can increase student engagement and understanding. Similarly, Nirwana (2022) examined the impact of digital learning media on students' problem-solving abilities. Meanwhile, Qohar (2024) explored the implementation of interactive learning and its impact on mathematical literacy and critical thinking. Despite these advances, most previous research has focused on general math games or digital media, without specifically targeting games designed to systematically train problem-solving skills through structured challenges and feedback.

The novelty of this research lies in the development of the Statblithz game, an interactive learning medium specifically designed, similar to the Mario game, to assess students' mathematical problem-solving abilities. This research integrates elements of gamification, adaptive learning, and direct assessment of problem-solving abilities, thus providing a new perspective on game-based mathematics education. Statblithz incorporates challenge elements based on Polya's theory, which have contextual challenges that require students to apply statistical concepts in everyday life.

The research gap addressed in this study is the lack of educational game media that systematically train and measure mathematical problem-solving abilities while maintaining student engagement and motivation (Bütüner, 2021; Lein, 2020; Nurwulandari, 2021). This research adopts the ADDIE instructional design model as its theoretical framework, which supports the systematic development and evaluation of educational media (Craven et al., 2022). The concepts used include gamification, interactive learning, and formative assessment, all integrated into the Statblithz Game to create an engaging and effective learning environment. By combining these theoretical and conceptual approaches, this research aims to produce a

new, empirically validated educational tool that addresses the cognitive and motivational aspects of mathematics learning, distinguishing it from previous research in this area.

B. METHODS

This study used a Research and Development (R&D) method with the ADDIE Model (Analysis, Design, Development, Implementation, Evaluation) (Harisman, 2023; Marsuki, 2020). This model was chosen because it has proven effective in developing game-based learning media and is able to improve learning outcomes and student motivation (Darmayanti et al., 2023). The stages of ADDIE model development are: (1) The Analysis stage is carried out by researchers to identify the need for product development, namely mathematics learning media consisting of material analysis, student characteristics, and media; (2) The Design stage is carried out by researchers by starting to design the overall structure of the learning media, including the preparation of materials, preparation of instruments, format selection, design plans, and the research flow that will be used; (3) The Development stage is carried out by researchers by developing products that have been designed that need to be evaluated with a systematic process to create or develop educational game-based learning media using GDevelop in training students' mathematical problem-solving abilities. While in the material section, mathematical problem-solving questions are in several levels in the game; (4) The Implementation stage is carried out by researchers with field trials using educational game learning media that have been developed will be applied to students in teaching and learning activities in the classroom. Researchers also need to ensure that students use the media in accordance with the objectives of the research, namely being able to train mathematical problem-solving abilities by solving problems that exist at several levels in the designed game; and (5) Evaluation stage, the researcher conducted an evaluation to assess the success of the Statblithz game-based learning media in mathematics learning and the materials used in accordance with the objectives of this study. This evaluation was assessed to determine the feasibility of the product and help students practice solving mathematical problems in statistics material before and after learning using the Stathblitz game-based learning media, as shown in Figure 1.

The research subjects were seventh-grade students of Muhammadiyah 5 Lekok Junior High School, Pasuruan Regency, in the even semester of the 2024/2025 academic year, consisting of 10 male students and 11 female students. The selection of these subjects was based on methodological considerations and students' cognitive development. Junior high school students are in the early adolescent developmental stage, where they begin to be able to think abstractly, organize knowledge into problem-solving strategies, and demonstrate a need for challenging and interactive learning. Game-based learning and problem-solving approaches are very suitable for these characteristics, as they can increase motivation, collaboration, and learning independence (Aprilani et al., 2023).The Statblithz game media development procedure was carried out to improve problem-solving-based mathematics learning, through several important stages designed to ensure the resulting media is effective and engaging for users. The first stage is needs analysis, which identifies the needs of students and teachers in the context of mathematics learning, including understanding the difficulties faced in learning and the desired features in learning media, so that the developed game can address these needs

and provide relevant solutions. The second stage is game design, which involves creating gameplay, features, and an interactive user interface, taking into account aspects such as ease of use, visual appeal, and the ability to motivate students to learn.

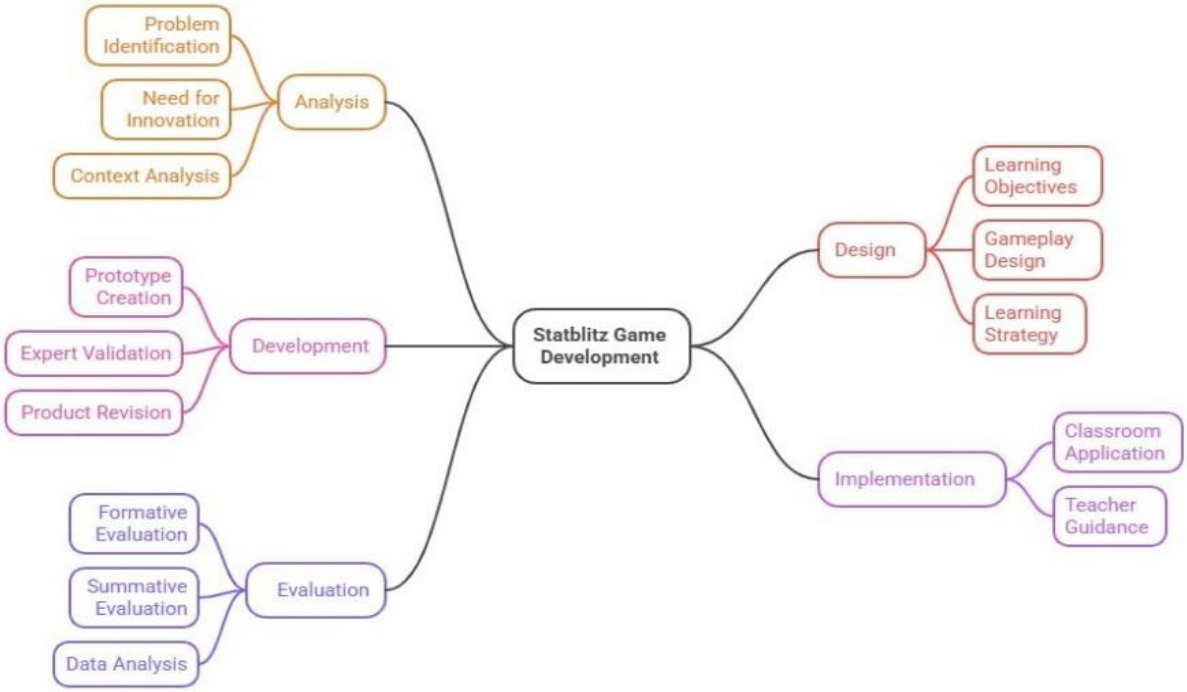


Figure 1. ADDIE model development research procedures

The game was designed using the GDevelop platform, with a gameplay mechanism that includes learning stages: concept presentation, problem solving, scoring, and feedback. The gameplay is designed in stages, requiring students to complete challenges at the previous level before moving on to the next. Once the design is complete, the next step is to develop a game prototype using an appropriate digital platform, reflecting the previously developed design. This involves programming, initial testing, and feature refinement to ensure the game functions properly. The implementation phase then involves testing the game on students, with the goal of observing how the game functions in a real-life learning environment and how students interact with the media, as well as gathering valuable feedback for further improvement. The final stage of the development process is evaluation, where the game's effectiveness is measured based on the results of the trials and user feedback, which is then used to make necessary revisions to better meet its objectives. Previous research confirms that following a systematic development process is key to producing effective and engaging learning media, so each step in this procedure must be carried out carefully and measurably. The data collection techniques used to obtain the data collection process for this research are presented in Table 1.

Table 1. Data Collection Techniques

No	Data	Data collection technique	Instrument
1	Observation Results	Teacher and Student Observation Sheets conducted by observers	Observation Sheet
2	Test Results	Mathematical Problem-Solving Ability Test Results	In-game practice questions
3	Validity Results	Validation Sheet by Material Experts and Media Experts	Expert Validity Sheet
4	Student Response Questionnaire Results	Distribution of questionnaires to students after the trial	Student Response Questionnaire

Data analysis was conducted quantitatively and qualitatively. Quantitative data from the test were analyzed using descriptive statistics (mean, percentage increase). Qualitative data from interviews and observations were analyzed using content analysis techniques. This approach aligns with recent research emphasizing the importance of data triangulation in evaluating game-based learning media. The analysis results are needed to determine whether Android educational game-based learning media meets the criteria of validity, practicality, and effectiveness. The results of the validity level calculation using the assessment qualification criteria can be seen in Table 2 below (Lestari, 2021).

Table 2. Media Validity Criteria

Category	Percentage Score (%)
Very Valid	80% - 100%
Valid	60% - 80%
Quite valid	40% - 60%
Less Valid	20% - 40%
Very Less Valid	0% - 20%

Effectiveness analysis is conducted based on observations of teacher and student activities during the teaching and learning process using media. This is to determine how the learning is implemented and its impact on the learning process. Assessments are conducted on a scale of 1–5. Activity scores are calculated using the following formula (Qomaria et al., 2025):

$$P = \frac{Skor\ yang\ dicapai}{Skor\ Maksimum} \times 100\% \quad (1)$$

Table 3. Media Effectiveness Criteria

Category	Percentage Score (%)
Very Valid	87,50% – 100%
Valid	75,00% – 87,49%
Quite valid	50,00% – 74,99%
Less Valid	0% – 49,99%
Very Less Valid	

Problem-solving ability analysis was obtained based on test results consisting of challenging questions contained in game media. The goal was to determine whether the use of educational game learning media had a significant influence (ease of learning, use, and understanding) on students' mathematical problem-solving abilities. Test data were then

calculated and expressed as a percentage of completion, which indicates the number of students who achieved the KKM score. Next, the researcher analyzed the obtained scores. The results of the students' written tests were collected by the researcher. The results were sorted by the researcher to determine students who were truly experiencing difficulties, as determined by reference to problem-solving indicators based on (Pathuddin, 2024). The following equation was used to calculate the percentage of classical completion:

$$Classical\ Completion = \frac{Number\ of\ Students\ Who\ Completed}{Total\ Number\ of\ Students} \times 100\% \quad (2)$$

Mathematical problem-solving ability in mathematics is said to have improved when the final score is greater than the initial score.

C. RESULT AND DISCUSSION

This research resulted in the Statblitz game media designed to train junior high school students' mathematical problem-solving skills. The development process followed the ADDIE stages, starting with needs analysis, design, development, implementation, and evaluation. The analysis stage was carried out by the researcher to identify product development needs. This study analyzed the material, characteristics of the analysis media, and the analysis media used at Muhammadiyah Lekok Junior High School, Pasuruan.

The design phase was guided by the results of the analysis phase. The researcher designed the product in accordance with the learning competencies for the material determined by the analysis and the information obtained during the analysis phase. At this stage, the researcher began designing the overall structure of the learning media, including material preparation, instrument development, format selection, design plan, and research flow (Kiong et al., 2022). The design was tailored to the characteristics of seventh-grade junior high school students and the objectives of statistics learning, specifically to develop mathematical problem-solving skills.

This game was designed using the GDevelop platform with a game mechanism that includes learning stages: concept presentation, problem solving, scoring, and feedback. The game design is tiered, requiring students to complete challenges in the previous level before advancing to the next. The game will be called "Statblitz," meaning "calculate statistics quickly." The game will be designed similarly to the coin-op game Mario, but will use different characters and include contextual questions about measuring central metrics at each level.

This development phase will take place before the field trial. During this phase, researchers will create learning materials from start to finish. Once the learning materials are complete, the researchers will validate the materials and materials by expert validators. Based on the assessment results, validator 1 gave a score of 51, equivalent to a validity percentage of 92.73%. Meanwhile, validator 2 gave a score of 52, with a validity percentage of 94.55%. Thus, the average validity of the statistical materials on the topic of calculating central metrics reached 93.64%, which is categorized as "Very Valid" for use in the learning process, as shown in Figure 2.

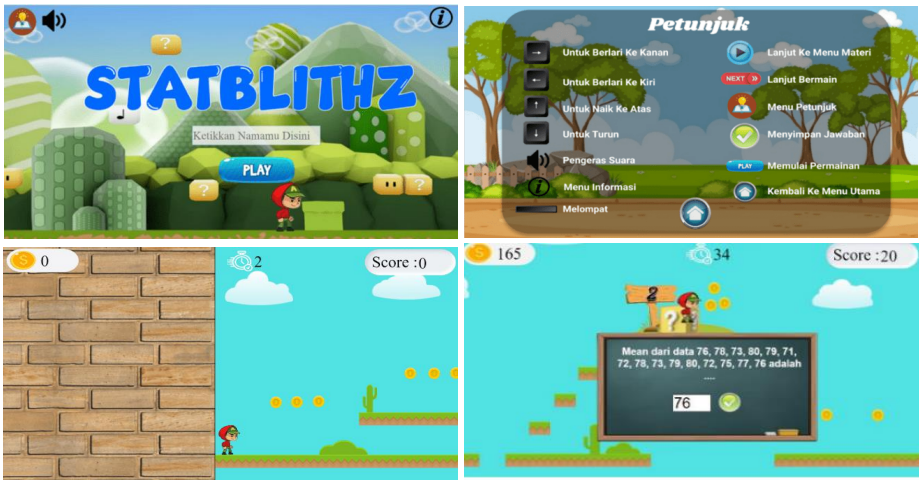


Figure 2. Statblithz Media

The implementation process was carried out with 23 students of grade VII-A at Muhammadiyah Lekok Junior High School as the trial subjects. The implementation process was also accompanied by direct observation using observation sheets to assess student engagement during the media use, such as reading instructions, answering questions, and understanding the discussion presented in the game. After completing the activity, students were asked to complete a response questionnaire to assess the media's appeal, ease of use, and usefulness in helping them solve math problems.

The Statblithz learning media implementation was carried out over two days, with activities tailored to learning objectives and the availability of school facilities. The study was conducted in seventh-grade Mathematics, focusing on the topic of calculating central tendency measures. Through this learning trial, students experienced a fun and engaging learning experience, both through conventional learning with the teacher and independently through digital media. The implementation demonstrated that integrating educational game media into statistics learning significantly increased student participation, understanding, and motivation, particularly in mathematical problem-solving.

In the evaluation phase, researchers conducted an evaluation to determine the extent to which the objectives of developing the educational game media had been achieved, particularly in terms of developing students' mathematical problem-solving skills. The evaluation was conducted to assess the feasibility of the media that had been developed as well as to measure the understanding of mathematical problem solving before and after using the designed educational game-based learning media. Statblithz learning media was introduced to 23 seventh-grade students at Muhammadiyah Lekok Junior High School to assess their effectiveness and engagement in mathematics learning related to measures of central tendency. The two-day activity combined traditional methods and interactive digital media.

On the first day, classroom learning focused on the mean, median, and mode. Students were then divided into groups to enhance critical thinking and collaboration skills. On the second day, students engaged in independent learning using a Windows-based educational game in the computer lab, with the teacher acting as a facilitator. The game was designed to encourage students to think logically and solve problems independently. Observations and questionnaires

showed that Statblithz increased student participation, understanding, and motivation, making the learning process more enjoyable and effective.

The measurement of students' mathematical problem-solving ability test was carried out by providing contextual questions contained in the Statblithz educational game-based learning media. Each student was given questions with a maximum score of 100. Based on the results obtained from 21 students, all participants obtained a score of ≥ 70, with the description "Completed". This means that each student has met the minimum completeness limit (KKM) set, namely a score of ≥ 70 with a completion percentage of 83%, and was able to solve problem-solving questions well. These values indicate that students not only understand the material on data centralization measures, but are also able to apply the concept in the form of contextual questions, which require critical thinking processes, strategic planning, solution implementation, and reflection on the results. Based on the test conducted by the researcher. The percentage of student answers for each question item is presented in the following Table 4.

Table 4. Percentage of Students' Mathematical Problem Solving Ability

Question	Indicator			
	Understanding the Problem	**Planning Strategy**	**Solve the problem**	**Checking Again**
1	95%	100%	95%	90%
2	80%	90%	90%	90%
3	95%	95%	95%	95%
Overall Percentage	90%	95%	95%	91,67%

From the table above, it can be seen that the subject's mathematical problem-solving ability on contextual questions is already in the high category. Where it can be seen that each indicator for each question item has been able to evenly exceed 60%. The highest percentage of each question item is in the first indicator where the overall percentage reaches 90%, the second indicator is also among the highest where the overall percentage reaches 95%, the third and fourth indicators are also among the highest where the overall percentage reaches 95% and 91.67%.

1. Statblithz Learning Media

Based on the research results, it was found that the process of developing Statblithz educational game-based mathematics learning media requires special attention in selecting and designing games that are appropriate for the characteristics of junior high school students. In developing this media, researchers utilized the GDevelop application Chanchí (2019, 2020) an open-source platform that enables the creation of interactive educational games without requiring complex programming skills and offers a variety of game development features (Alagöz, 2022; Chwastek, 2021; Seppänen, 2024). However, the limitations of free accounts forced researchers to be more creative in finding supporting assets such as character images, backgrounds, and other game elements. Therefore, researchers utilized other platforms such as Pinterest and various websites that provide free assets to meet the visual requirements, making the developed media more engaging and tailored to student preferences.

The chosen game model was inspired by the Super Mario game concept due to its simple storyline and easy-to-understand nature. However, the model was modified to suit the learning material, namely statistics. The developed media was named Statblitz to identify statistics-based educational games, presented in an engaging manner through challenging adventures and contextual questions. This media also successfully addresses limitations in statistics learning, such as lack of visualization, poor contextualization of material, and limited use of computer laboratories. Statblithz media optimally utilizes the potential of the laboratory and becomes an interactive and challenging learning tool, directly impacting students' critical thinking skills.

The development of Statblithz, an educational intervention media, follows the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation. This model has been empirically proven to improve the quality of educational interventions through a systematic and structured approach. In the Analysis stage, student needs are thoroughly identified to understand the learning context, student characteristics, and learning objectives. The Design stage then designs the structure and content of Statblithz, taking into account pedagogical and technological aspects. Next, the Development stage realizes the design into a ready-to-use product, followed by trials and revisions. Implementation involves introducing Statblithz to students, emphasizing the importance of training for teachers and students to maximize the use of the media. The Evaluation stage aims to assess the effectiveness and efficiency of Statblithz and is conducted continuously to gather feedback and identify areas for improvement. By applying the ADDIE model, the development of Statblithz resulted in high-quality, relevant, and responsive educational interventions tailored to student needs. This model offers a systematic approach, ensuring each stage of media development is well-planned, enhancing learning effectiveness, enabling continuous improvement, and facilitating the measurement of learning outcomes.

Several challenges arose during the development of the Statblithz learning media: (1) Researchers struggled to program objects such as birds and enemies into the game; and (2) Researchers also struggled to find game assets on various websites because they had to adapt them to the game's theme. During the field trials, several computer issues occurred. Some computers were unusable, requiring students without computer access to attend a second session (Bhowal, 2021). Furthermore, limited class time was also a constraint that could impact the media's practicality, necessitating guidance and monitoring in its use as a learning medium.

2. Mathematical Problem-Solving Skills

Statblithz is an educational game that challenges students to solve contextual math problems with an interactive approach, fostering critical and analytical thinking skills. Developed based on constructivist and cognitive load theory, the game emphasizes students' active role in learning, building knowledge through experience and reflection (Abdulah, 2020; Amin et al., 2021; Nahar et al., 2022). By managing cognitive load, Statblithz improves understanding and problem-solving skills. Students not only understand mathematical concepts but also apply them to different situations. Empirical data shows that Statblithz users improve in independent and creative problem-solving strategies, using contextually relevant problems.

Mathematical problem-solving is an important skill in mathematics learning. This skill not only trains students to solve problems but also trains them to think critically, logically, systematically, and creatively in finding solutions to problems they face, both routine and non-routine. Polya uses four stages to solve problems (Fauza et al., 2022; Riyadi, 2021; Yapatang & Polyiem, 2022), namely understanding the problem, making a plan, implementing the plan, and reviewing the results, as shown in Figure 3.

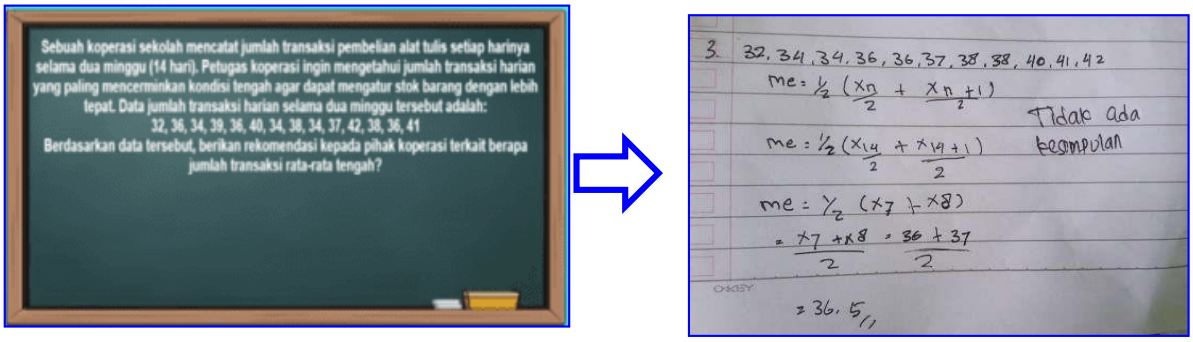


Figure 3. Example of student answers to question number 3

Figure 3 shows the results in accordance with the following indicators: First, in the problem-understanding stage, students were able to identify important information from the problem: the data shows the number of transactions over 14 days and the question is the median of the data. This demonstrates that students can distinguish between known data and what is required. Second, in planning their strategy, students arranged the data in order from smallest to largest, an important initial step in determining the median. Arranging data in order is an appropriate basic strategy for solving problems involving measures of central tendency.

Third, in implementing the strategy, students calculated the median position using the median position formula for even data. This demonstrates that students were able to perform the calculation correctly. Furthermore, in the rechecking stage, students did not conclude that the median or middle average value of the data was 36.5, which was the recommendation to the cooperative. This demonstrates that students not only solved the problem but also related the results to the context of the problem, as shown in Figure 4.

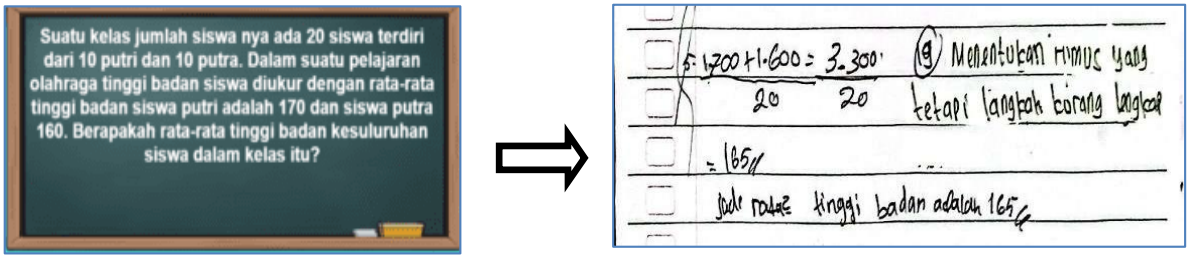


Figure 4. Example of student answers to question number 3

From the answers in Figure 4, the results obtained correspond to the following indicators: First, at the understanding stage, the student demonstrated the ability to identify important information provided in the problem: the number of male and female students is 10 each, the average height of female students is 170 cm, and the average height of male students is 160 cm.

The student also understood that the objective of this problem is to find the average height of all students in a class.

Second, at the strategy planning stage, the student chose the combined average formula as the solution approach. The student realized that to obtain the average for all students, it is necessary to multiply the average for each group by the number of students in that group, add the results, and then divide by the total number of students. This demonstrates that the student was able to choose the appropriate strategy based on their understanding of mathematical concepts. However, in the answer, the student wrote the result directly and did not provide a detailed explanation. Third, at the strategy implementation stage, the student correctly applied the calculations. Finally, at the evaluation stage, the student concluded that the average score for all students is 165. This demonstrates the ability to reflect on the solution obtained.

From the questions analyzed above, it can be concluded that the Statblitz educational game-based learning media can train students' mathematical problem-solving skills comprehensively (Miranda & Mamede, 2022). Each question presents contextual problems close to everyday life, thus requiring students not only to master statistical concepts (median, mode, and combined mean) but also to apply them in real-life situations that require logical, critical, and systematic thinking. The results of this study are in line with the results of research that educational game learning media can provide facilities for students to practice and improve their mathematical abilities.

3. Student Enthusiasm

The use of the Statblithz game in mathematics learning has shown a significant positive impact on student participation. Recent research has shown that this medium can increase active student engagement, in line with the principles of game-based learning (GBL) that promote active participation. Statblithz offers engaging and fun challenges, which not only increase participation but also help students understand mathematical concepts better. The game's immediate feedback allows students to assess their understanding and correct mistakes quickly, in line with GBL theory, which emphasizes the importance of immediate feedback (Alam, 2022; Eltahir, 2021). Furthermore, student motivation in learning mathematics significantly increases thanks to game elements such as incremental challenges and rewards for achievement, which motivate students to continue learning and improve their skills. Empirical data shows that students who use Statblithz are more enthusiastic and engaged, supporting the theory that game-based learning can improve cognitive and affective learning outcomes (Yang, 2020). With this innovative approach, learning mathematics becomes a more enjoyable and rewarding experience, proving that technology can be an effective tool in improving learning outcomes and making the learning process more engaging.

This student enthusiasm arose because learning was no longer monotonous like lectures, but instead provided a new and enjoyable experience through game elements. Educational game-based learning media engaged students more because learning felt like play, yet still included challenges that stimulate logical and mathematical thinking. This aligns with Maligaya (2025) who stated that game-based learning media can increase student motivation and enthusiasm for learning because it utilizes visual elements, challenges, and interaction.

Based on observations and questionnaires, students responded very positively to this educational game. During the implementation in the computer lab, students appeared active, focused, and motivated. The game, packaged like a Mario-like platformer, but with educational content, successfully captured students' interest. The previously passive and conventional learning atmosphere transformed into a more dynamic and enjoyable one. Students learned not only cognitively but also affectively through enjoyable interactions with the game (Chen, 2020; Nadeem, 2023).

Recent research demonstrates consistency with previous studies, such as those conducted by Turmudi (2021); Nirwana (2022); Costa (2020), which found that game-based learning media is effective in increasing student motivation, engagement, and understanding of mathematics. These studies highlight the effectiveness of the game-based learning approach, which is becoming increasingly popular in modern education, using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) model in its development, which has been shown to have a positive impact on students' cognitive and affective learning outcomes, especially at the junior high school level. Recent meta-analyses and systematic reviews also support these findings, stating that game-based learning not only improves students' understanding but also improves problem-solving skills and increases students' active engagement in the learning process. Thus, the results of this study strengthen empirical evidence that the integration of educational game media in mathematics learning not only improves students' problem-solving skills but also significantly increases their engagement in the learning process, indicating that innovation in learning methods, particularly through game-based media, is an effective step to improve the quality of education in today's digital era.

The sample size in this study was quite small, which limits the generalizability of the results. With a larger and more diverse sample size, the external validity of the study results could have been increased, providing a more accurate picture of the intervention's effectiveness. Furthermore, the implementation of Statblithz was short-term, so the long-term impact of its use could not be fully evaluated. Long-term observation is needed to understand the sustained effects of this intervention. This study was also conducted in only one school, so the results may not be representative of the broader population. To address this, research in multiple locations or additional educational institutions could provide broader insights and improve the generalizability of the results.

Statblithz can be integrated into mathematics lessons to increase student engagement and problem-solving skills, creating a more interactive and enjoyable learning experience. Teachers and media developers can use the ADDIE model to create innovative learning media tailored to the needs of junior high school students. This approach ensures that the developed media is effective and aligned with learning objectives. Furthermore, training for teachers is essential to enable them to implement game-based learning effectively and adaptively, maximizing the benefits for students. Further research is recommended with a larger and more diverse sample to increase external validity and provide more comprehensive results. Using a longitudinal design could provide insight into the long-term impact of Statblithz use. Comparative studies between elementary and middle schools could explore the effectiveness of interventions at different stages of student development. Finally, examining the integration of Statblithz with

adaptive technology or AI could provide a learning experience more tailored to each student's individual needs.

D. CONCLUSION AND SUGGESTIONS

Based on the research into the development of the Statblithz educational game, which aims to train students' mathematical problem-solving skills, it can be concluded that this game is highly suitable for use as a learning tool. Expert validation showed an average feasibility score of 89%, and pre- and post-test results indicated a 25% increase in students' problem-solving abilities after using the game. The Statblithz Game is not only effective in improving mathematical skills but also offers a more engaging and interactive learning method than traditional approaches. Scientifically, this research strengthens the theory of game-based learning by emphasizing the integration of mathematical problem-solving elements and adaptive feedback, which are able to increase students' engagement, motivation, and higher-order thinking skills.

This study still has limitations, including the limited number of subjects and trial duration, so further research is needed with broader mathematical material and a longer implementation period. Practically, teachers can integrate Statblithz into contextual learning on statistics or other relevant topics to increase student engagement and understanding. This Statblithz educational game can only be used on the Windows 10 operating system, so it is not compatible with other versions of Windows.

Developers are encouraged to continue developing the features within the Statblithz Game to accommodate students of various ability levels. Integrating this game into schools by teachers is expected to improve student motivation and learning outcomes in mathematics. Further research is needed to understand the long-term impact of its use, involving more participants and for longer durations. Special training for teachers is needed so they can effectively utilize this game in their lessons. With these steps, the Statblithz Game is expected to contribute significantly to improving students' mathematical abilities.

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