

Edugame Development: Genius Learn Platformer to Increase Students' Learning Motivation and Learning Outcomes

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Abstract: This study aims to develop and test the effectiveness of the "Platformer Genius Learn" edugame to improve students' motivation and learning outcomes in the Fundamentals of Educational Technology course using the ADDIE development model. This limited trial subject consisted of one class with a total of 26 subjects who were first-semester students of the Educational Technology Study Program at Padang State University. The tools used in this study included validation sheets for subject matter experts and media experts, student learning motivation questionnaires, and pre-test and post-test assessments to measure the results. The results of the study show: 1) edugame: Platformer Genius Learn Suitable for use based on media expert validation showing an average score of 4.13 in the "Valid" category and the validation of a subject matter expert with an average score of 4.25 in the "Highly valid" category; 2) practicality of Edugame: Platformer Genius Learn at one to one trial obtained an average of 3.13 in the category of "quite practical", small group trial obtained an average of 4.03 in the "practical" category, and field trial obtained an average of 4.51 in the category of "very practical"; and 3) edugame effectiveness: Platformer Genius Learn proven through test analysis Paired Sample t-test show a significant improvement in student learning outcomes after using edugame media, and the results of the N-Gain Score calculation showed a value of 0.75, which is included in the high category. In addition, the results of the learning motivation questionnaire also show an average of 4.53, categorised as "very appropriate". Thus, Edugame Media: Platformer Genius Learn has been declared effective as an innovative, interactive learning medium that enhances learning motivation and outcomes among students in the Educational Technology Study Program at the State University of Padang.

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Introduction

Digital transformation in education has changed the learning paradigm from conventional to more dynamic, interactive, and technology-based. In the era of the Industrial Revolution 4.0, the use of digital technology is no longer an option, but a necessity to support the learning process that is relevant to the needs of the times and the characteristics of the digital generation (Setiawan & Nurjanah, 2020). Students today do not only learn through

books and lectures from lecturers, but also through digital devices such as smartphones and laptops that open access to various interactive and flexible learning resources (Rohmah & Prasetyo, 2022). This change is in line with the opinion of Reiser and Dempsey (2017), who emphasize that learning technology not only includes hardware and software, but also a systematic approach in designing, implementing, and evaluating the entire teaching-learning process efficiently and attractively. Therefore, the use of digital media must be framed with appropriate learning design principles in order to create meaningful learning experiences. Technology is no longer seen as a supplement, but rather as a core component in modern learning systems.

Although digital technology is increasingly integrated in education, there are still challenges in its optimal utilization, especially in increasing student engagement and motivation to learn. According to Aini et al. (2021), many digital learning media only function as information presenters without involving active student participation, so learning feels monotonous and less interesting. This opinion is in line with the opinion according to Armansyah and Sulton (2019), the use of e-book media and text-based books or books is still monotonous because it does not provide actual visualization, resulting in a lack of understanding of the material being studied, especially in learning that requires visualization.

In this context, constructivist learning-based approaches are very relevant, where learners build their own knowledge through direct experience and active interaction (Jonassen, 2000). The use of exploratory learning media such as edugames allows students to be actively involved in the learning process and relate the concepts they learn to real experiences. In line with this theory, Daryanto and Karim (2017) also emphasize the importance of interactive learning media in building a learning environment that allows students to participate actively and reflectively.

Along with these technological developments, educational games (edugames) began to receive attention as innovative learning media. Although higher education institutions are increasingly adopting digital learning platforms, various studies show that there are significant shortcomings in the use of edugames at the university level. A systematic review by Khaldi, Bouzidi, and Nader (2023) notes that low student motivation and engagement, as well as high dropout rates in online courses, are partly due to the lack of interactive and recreational learning elements such as edugames. Even though, some studies show that edugames have great potential in improving motivation and learning outcomes, as they combine elements of entertainment, challenge, and active engagement in the learning process (Yunita & Nugroho, 2020). In addition, according to a study by Indah (2020), around 87.8% of students fill their free time during campus breaks by playing online games on laptops or smartphones. This activity is often used as a means of entertainment and relaxation after facing a high academic load, but it can also interfere with concentration and study time if not managed properly.

Several previous studies have shown that the use of games in learning can significantly increase learning motivation and learner engagement (Smaldino et al., 2012; Beier et al., 2012). Edugames based on the platformer genre, which combines game elements with quizzes or academic material, are proven to be able to present material in a fun and challenging way. However, most edugame development still focuses on primary and secondary education. Research on the development of game-based learning media aimed specifically at university students, especially in the context of educational technology courses, is still relatively minimal. In fact, the characteristics of students as digital-native Generation Z are highly valid for a game-based learning approach. In line with that, Lestari et

al. (2021) stated that interactive digital-based learning can increase active participation, especially if it is developed according to the context of students' needs and learning environment.

The scientific novelty of this article lies in the development of a Platformer Genius Learn-themed edugame packaged specifically for educational technology students. This edugame not only functions as an educational entertainment media, but is also designed based on real needs in the field, namely the lack of student involvement in learning and the low utilization of interactive learning media in the classroom. This reinforces the view of Heinich et al. (2019), that the selection of appropriate learning media can increase the effectiveness of instructional message delivery and learner engagement.

The main problem in this study is the low learning motivation and learning outcomes of students in the Fundamentals of Educational Technology course, as well as the lack of interactive learning media that are suitable for the characteristics of the digital generation. Therefore, this study is relevant to the Fundamentals of Educational Technology course because it applies the basic principles of educational technology in the design and development of game-based digital learning media for students.

Therefore, this study aims to design, develop, and evaluate the feasibility, practicality, and effectiveness of the Genius Learn Platformer educational game in improving student learning motivation and learning outcomes, as well as recommending its use as an innovative learning medium in the context of higher education.

Research Method

This research is a development research (Research and Development) that uses the ADDIE model as the main reference in designing and developing learning media. According to Gall, Gall, and Borg (2019: 12) Research and Development (R&D) is simply defined as a research method that is deliberate, systematic, and aims to find, formulate, improve, develop, produce, and test the effectiveness of certain products, strategies, services, or procedures that are superior, new, effective, efficient, productive, and meaningful. This opinion is in line with Sukmadinata's (2013) opinion that research and development is a process or steps to develop a new product or improve existing products, and can be held accountable.

The researcher chose the ADDIE model in this study as developed by Robert Maribe Branch (2009). This model is widely used in the development of learning systems because it is systematic, flexible, and can be adapted according to the needs of the context and media developed. According to Angko (2013:4), there are several reasons why the ADDIE development model is still relevant today. First, the ADDIE Model is a model that can adapt well to various conditions that allow the model to be used today and the level of flexibility of this model to answer problems is quite high. The ADDIE model consists of five systematic stages, namely: Analysis, Design, Development, Implementation, and Evaluation. Each stage is carried out sequentially and interrelated to produce edugame media products that are valid, practical, and effective for use in learning.

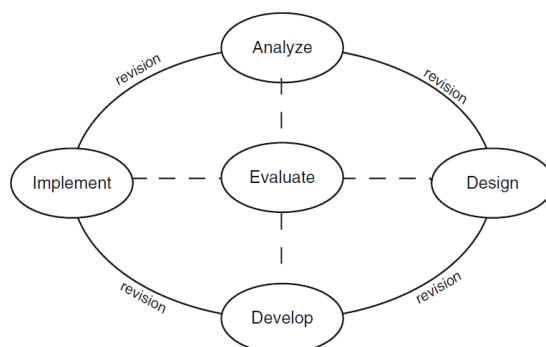


Figure 1. ADDIE Model (Source: Brach, 2009)

The population in this study were all first semester students of the Educational Technology Study Program at Padang State University. The sample was selected purposively, namely one class of 1st semester students who took the Fundamentals of Educational Technology course. The number of samples involved in the product trial was 26 students.

The selection of validators in learning media development research is carried out purposively based on competencies and professional experience relevant to the field of study. According to Sugiyono (2017), validators are selected from individuals who have expertise, experience, and a deep understanding of the topic being developed so that the validation process produces accurate and accountable input. The criteria for selecting validators generally include a minimum of a master's degree in a related field, teaching or research experience in the field of learning technology, instructional design, and interactive media development. In addition, to ensure the objectivity and reliability of the assessment, two experts were used as validators in this development study.

According to Sudaryono (2016: 76) data collection instruments are tools for researchers in data collection so that activities are organized and facilitated by them. Data is collected through several techniques, namely: (1) Observations and interviews, conducted at the analysis stage to identify user needs and problems in learning. (2) Validation questionnaire, used to assess the feasibility of media by material experts and media experts. The questionnaire uses a 5-point Likert scale. (3) Learning motivation questionnaire, used before and after using the media to measure the effect of edugame on student motivation. (4) Learning outcome tests (pretest and posttest), used to measure the improvement of student learning outcomes after using the media. And the instruments were validated by experts before use. The Likert scale and tests have been tested for reliability and validity in previous studies and adapted to the needs of this study.

The learning motivation instrument in this study was developed based on learning motivation theory, which includes intrinsic motivation, extrinsic motivation, as well as emotional aspects and learning satisfaction. Each aspect was measured using several statements tailored to the context of using Edugame: Platformer Genius Learn. For example, intrinsic motivation items describe the extent to which students feel interested, focused, and enjoy the learning process through edugames, while extrinsic motivation items assess students' motivation to complete the levels and challenges given. The emotional and satisfaction aspects assess the enjoyment and sense of self-control during the learning process.

Data analysis was conducted using quantitative and descriptive approaches. Analysis techniques include: (1) Validation analysis using a percentage of feasibility based on scores

from validators. (2) Practicality analysis is seen from the user (student) response to the media. (3) Effectiveness analysis was conducted with the Paired Sample t-Test test to see significant differences between pretest and posttest scores. Data normality test was conducted first with Kolmogorov-Smirnov Test to ensure that the data met the assumption of normal distribution.

Result and Discussion

1. Process of Product Development

The development of Platformer Genius Learn edugame media was carried out using the ADDIE model, which includes five stages, namely analysis, design, development, implementation, and evaluation. The analysis stage shows that in learning the Basics of Educational Technology course, especially in the submaterial of the five areas of educational technology, students have difficulty in understanding the concepts due to the presentation of material that is one-way, less visual, and minimal interaction. Based on the results of observations and interviews with lecturers, it was decided that it was necessary to develop more interactive and contextual learning media in the form of platformer-based edugames.

The initial design of the Platformer Genius Learn edugame was created in the form of a prototype, which serves as a detailed representation of the elements and visual media. According to Kristiyani (2014), a prototype is a type, form, or original example of something that is used as a reference or standard for things that are categorized similarly. The following is a prototype of the Platformer Genius Learn edugame.

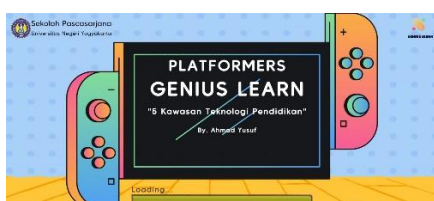


Figure 2. Loading screen



Figure 3. Intro screen

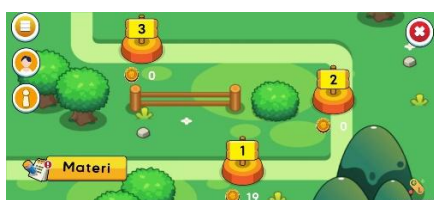


Figure 4. Main Menu Display

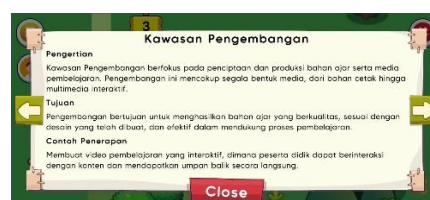


Figure 5. Material Menu Display

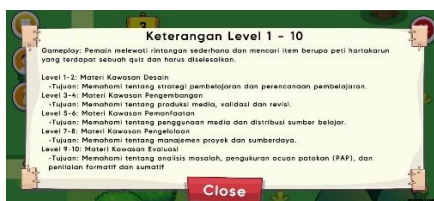


Figure 6. Information Display



Figure 7. In-Game view



Figure 8. Wordsearch Quiz Display



Figure 9. Anagram Quiz Display

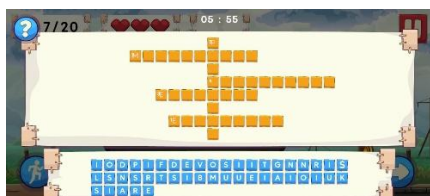


Figure 10: Crossword Quiz Display



Figure 11: Problem Instruction Display



Figure 12: Game View Completed



Figure 13: Sound Settings Display



Figure 14. Profile Display



Figure 15: Game Exit Display

2. Product Validation

The validation process was carried out by two experts, namely media experts and material experts. Media expert validation was carried out to determine the validity of the educational games developed. Media experts provided assessments and suggestions through product validation sheets covering aspects such as appearance, supporting elements, ease of use, challenges in the game, levels in the game, and evaluation. The following are the results of the product assessment by media experts.

Table 1. Assessment Results from Media Experts

No	Aspect	Item	Average	Description
1	Display	1-9	4,44	Highly Valid
2	Supporting Elements	10-11	4	Valid
3	Supporting Elements	12-13	4	Valid
4	In-Game Challenges	14-16	4,33	Highly Valid

5	Levels in Game	17-19	4	Valid
6	Evaluation	20	4	Valid
Total			4,13	Valid

The validation results from media experts showed an average score of 4.13, which was categorized as “acceptable” with minor improvements needed in terms of layout and navigation.

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Table 2. Assessment Results from Material Experts

No	Aspect	Item	Average	Description
1	Concept Correctness	1-3	5	Very precise
2	Presentation of Material	4-7	3,75	Exactly
3	Completeness of Material	8	4	Exactly
4	Levels in Game	9-10	4	Exactly
5	Evaluation	11-12	4,5	Very precise
Total			4,25	Very precise

The validation results from subject matter experts obtained an average score of 4.25, which falls into the “highly acceptable” category, with an emphasis on the suitability of the material content to the learning outcomes and the clarity of the narrative.

3. Product Practical Test

Practical testing was conducted in three stages: one-to-one trials, small group trials, and field trials. The following is a summary of the practical test results.

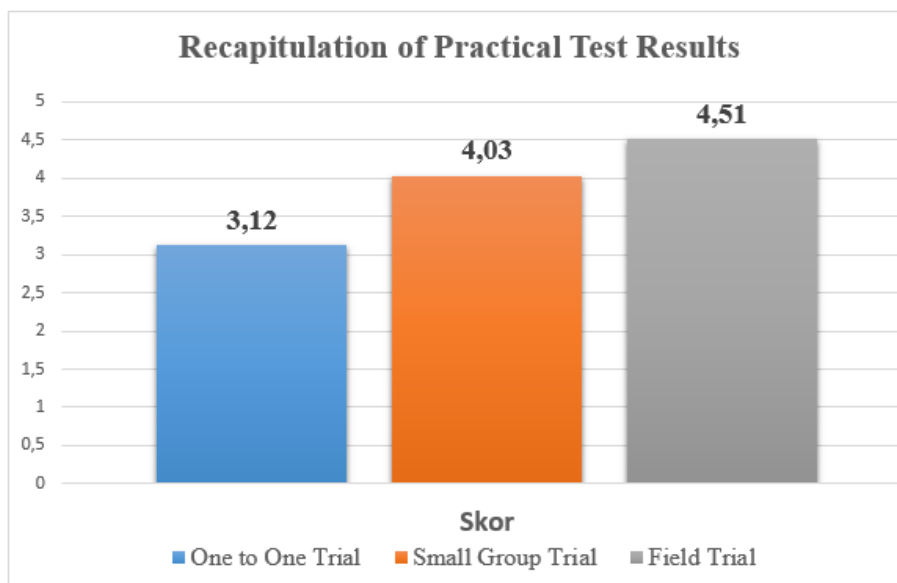


Figure 16. Practical Test Diagram

Based on the results of practical trials in the one-on-one trial phase (n=3), it was found that Edugame: Platformer Genius Learn obtained an average score of 3.12 with the criterion of “quite practical.” Meanwhile, small group trials achieved an average score of 4.03 with the criterion of “practical.” The field test achieved an average score of 4.51 with the criterion “very practical.” The test results showed an increase in scores, indicating that the product has undergone gradual improvements, particularly in terms of readability, visual appearance, and ease of navigation.

4. Product Effectiveness Test

The effectiveness of the product was tested from two main aspects, namely learning motivation and student learning outcomes.

a. Learning Motivation

Learning motivation was measured using a Likert scale questionnaire covering intrinsic motivation, extrinsic motivation, and emotional satisfaction. The following are the results of the students' responses.

Table 3. Effectiveness Test Results of Learning Motivation

No	Aspect	Item	Average	Description
1	Intrinsic Motivation	1-9	4,53	Highly Valid
2	Extrinsic Motivation	10-12	4,55	Highly Valid
3	Emotions and Satisfaction	13-14	4,50	Highly Valid
Total		18	4,53	Highly Valid

Based on the results of the learning motivation effectiveness test, the average score was 4.53 with a “highly valid” criterion, indicating that the use of Edugame: Platformer Genius Learn was able to significantly increase student learning motivation. This increase in

motivation occurred due to the interactive, challenging, and immediate feedback characteristics of edugames during the learning process. Game elements such as levels, challenges, scores, and rewards encourage students to continue to be actively involved and strive to achieve certain targets, thereby fostering intrinsic motivation in the form of curiosity and personal satisfaction. Meanwhile, the aspects of competition and achievement also strengthen extrinsic motivation, as students feel challenged to complete each mission and get better results.

b. Learning Outcome

The effectiveness of the learning outcomes of students was tested using a single-group pretest-posttest design. The results of the analysis showed:

Table 4. Decision Making

Sig	0,000000000000044	Sig < 0,05
Alpha	0,05	
H0 is rejected or Ha is accepted (there is a difference)		

Based on the table above, it can be seen that the results obtained are: Sig. (2-tailed) of 0.000 < 0.05 or p value < the significance level (0.05), it can be concluded that there is a significant difference in student learning outcomes for Pretest and Posttest.

The N-Gain test was conducted to measure the improvement of student learning outcomes. The interpretation of the N-Gain value refers to the classification proposed by Hake (1998), namely the range of values $g < 0.30$ the level of effectiveness is “low”, $0.30 \leq g < 0.70$ the level of effectiveness is ‘medium’, and $g \geq 0.70$ the level of effectiveness is “high”. The following data table shows the results of the student learning outcome effectiveness test.

Table 5. Learning Outcome Effectiveness Test

No	Variable	Score	
		Pretest	Posttest
1	Lowest Score	10	60
2	Highest Score	70	100
3	Average	39,62	83,85
Gain Score		0,75	
Gein Criteria		High	

Based on the results of the N-Gain Score calculation, it shows a value of 0.75, which is included in the high category. This shows that the use of Edugame media: Platformer Genius Learn can have a maximum impact on improving student learning outcomes, especially in the sub-material of 5 TP regions.

This improvement in learning outcomes cannot be separated from the role of game design applied to learning media. The Genius Learn Platformer Edugame is designed with level-based challenges that require students to think critically and actively solve problems. This challenging game structure helps students progress gradually from simple to complex concepts, in accordance with the principle of scaffolding learning. In addition, visual and interactive aspects also play an important role in creating an enjoyable learning experience.

Attractive visuals, dynamic animations, and interactive elements such as scores, sounds, and immediate feedback foster student engagement and focus during the learning process.

Theoretically, these results can be explained through the ARCS Model proposed by Keller (2010), which states that improved learning outcomes are greatly influenced by four main components, namely Attention, Relevance, Confidence, and Satisfaction. In this context, an engaging game design is able to attract students' attention through varied visuals and challenges, while the relevance of the game content to the five areas of educational technology helps students understand concepts in a contextual manner. Confidence grows through the success of completing each level, and ultimately satisfaction is created after achieving the learning objectives.

5. Discussion

The results of this study indicate that the Platformer Genius Learn edugame is effective in technology-based learning, especially in the context of higher education. The increase in motivation scores and learning outcomes supports previous findings (Loviga et al., 2019; Pakpahan et al., 2020) that game-based media can increase learner engagement and understanding. The presentation of material in the form of challenges and quizzes at each level allows students to learn actively and contextually. Apart from being a learning medium, this edugame also functions as a fun formative evaluation and encourages repeated reinforcement of the material.

Thus, the development of this edugame is relevant to be applied in digital-based learning, especially in courses that are theoretical and require strong visualization. This media can be a strategic alternative to improve the quality of learning in the era of the Industrial Revolution 4.0.

Conclusion

Based on the results of the study, it can be concluded that the Genius Learn Platformer edugame media developed through the ADDIE model is feasible, practical, and effective for use as a learning medium in higher education. Expert validation results show that this media has met the feasibility criteria in terms of both content and appearance. Practicality tests conducted in stages show that the edugame is easy to use, interesting, and able to optimally support student learning activities. In addition, the use of edugames has been proven to increase student learning motivation by creating an interactive, challenging, and enjoyable learning experience. The application of this media also has a positive effect on learning outcomes, where students show an increase in understanding and achievement after using edugames in the learning process. Overall, Platformer Genius Learn is effective as an innovative medium for increasing student motivation and learning outcomes, especially in technology-based education.

Recommendation

Future research is suggested to extend the content coverage, integrate real-time feedback systems, and explore the edugame's effect on higher-order thinking skills.

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