

Development of ULTAGRAM Media Based on Quizwhizzer in an Effort to Increase Interest and Learning Outcomes

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Abstract: The role of learning media is crucial in enhancing the educational experience, helping students engage with the material and optimize their learning achievements. This study aimed to outline the design, assess the feasibility, and evaluate the effectiveness of ULTAGRAM learning media, which utilizes Quizwhizzer, specifically for the Pictogram topic in Mathematics for fourth-grade students at SDN Pakintelan 02. ULTAGRAM media is an acronym for media Ular Tangga Piktogram. The research was conducted as a development method using the ADDIE model, which encompasses five phases: problem analysis, product design, product development, product implementation, and product evaluation. Data were gathered through interviews, observations, surveys, and tests (pretest-posttest). The analysis of data involved normality tests to ensure that the data was normally distributed, homogeneity tests to ensure that the data was homogeneous, T-tests to determine the influence of the media, and N-Gain tests to determine the effectiveness of media use. The findings from this development research demonstrate that the ULTAGRAM media, based on Quizwhizzer, was successfully created and received a very favorable assessment from both material and media experts based on a validation test using a questionnaire, each of which received a score of 92 % with a very feasible category. Furthermore, the evaluation of the research data regarding the development of ULTAGRAM learning media indicates that it was effectively designed and significantly enhanced the interest and learning outcomes of fourth-grade students regarding Pictogram concepts at SDN Pakintelan 02 seen from the average increase in student learning outcomes from 65 to 80 and the percentage of learning interest questionnaires which increased by 43%.

Keywords: Learning interest; Learning media; Learning outcomes; Pictograms

Introduction

The advancements of the 21st century have significantly influenced numerous aspects of human existence. One of these areas is science and technology, which has led to various developments and shifts. In the realm of education, there have also been many advancements, such as in curriculum design, teaching methodologies, learning resources, instructional

materials, assessment tools, and more. This endeavor fosters virtue and enhances the effectiveness of learning, aiming to deliver high-quality education and achieve the best possible outcomes. Developments in the 21st century require education to be more oriented towards the formation of 21st century skills and maximizing students cognitive processes as provisions for facing the future (Ahmar et al., 2023). Education serves as a means to transform attitudes and behaviors, impart new

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knowledge, and enrich life experiences through the learning process, enabling students to develop greater maturity in their thinking and actions (Pristiwanti et al., 2022). This aligns with Law No. 20 of 2003 on the Education System, which defines education as a deliberate and systematic effort to create an environment conducive to learning and teaching, allowing students to actively cultivate their potential for spiritual strength, self-discipline, character, intelligence, moral integrity, and practical skills for life in society. Education is crucial in guiding the inherent potential of students, helping them grow into well-rounded individuals and contributing members of society, enabling them to achieve optimal levels of safety and happiness (Sutianah, 2022).

The aim of education serves as a fundamental element that is crucial for the effectiveness of the educational process. Moreover, the aim is also understood as all the objectives that should be accomplished through educational endeavors (Nurrohmah & Syahid, 2020). To effectively achieve educational objectives, it is essential to have support from all stakeholders within the educational realm, including students, teachers, principals, staff, and student guardians, to ensure success (Sangsurya et al., 2021). The essence of education centers around learning, which is the process of facilitating optimal and impactful learning experiences for students (Ramadhan & Khairunnisa, 2021). Therefore, various strategies are implemented, such as modifying the curriculum based on evaluations and improvements from the previous version. Employing diverse student-centered learning models, utilizing teaching media to enhance comprehension, creating a conducive learning environment, providing adequate facilities and infrastructure, and offering encouragement and motivation from teachers and parents are all crucial elements (Deviyanti, 2024). From the discussion above, we can infer that education is a journey individual undertake to foster improved knowledge and attitudes that ultimately guide them toward safety and fulfillment.

Mathematics one of the most important and fundamental subjects in education and daily life (Nahdania & Ain, 2024). It begins at the early childhood education level, is further developed in elementary school, and is explored more deeply in middle school and college. Mathematics is a discipline that is intrinsically linked to numbers and computations (Ruqoyyah, 2021). On the other hand, according to Rohmah (2021), Mathematics represents a mode of thought that incorporates structure and evidence. Furthermore, Mathematics is regarded as a language that employs precisely defined, clear, and accurate

terms, along with symbols to express concepts and substitute for verbal descriptions (Martiwati, 2023).

Mathematics holds valuable applications in our daily lives; often, we may not realize how intertwined human activities are with Mathematics, such as when we calculate expenses while shopping, measure distances, or count attendees at a meeting (Jannah & Hayati, 2024). According to Permendikbudristek No. 8 of 2024, which outlines Content Standards for Early Childhood Education, Elementary Education, and Secondary Education, the Mathematics curriculum for elementary schools covers number concepts, arithmetic operations, recognition of numerical and non-numerical patterns, flat and solid shapes, measurement, and data analysis. Teaching Mathematics at the elementary level is essential because the concepts learned serve as the foundation for various calculations in the future (Rahmalia & Safari, 2024). Consequently, educators must recognize that students possess varying abilities and that not everyone shares the same enthusiasm for Mathematics (Ms, 2023). Thus, teachers are expected to enhance students' creativity and skills by delivering effective and efficient lessons that align with the curriculum and cater to the students' cognitive levels (Mayangsari et al., 2024).

Learning media serves as an instrument that facilitates the acquisition, processing, and transmission of messages, information, or knowledge from the communicator (teacher) to the recipient (student) (Karomah et al., 2024). By utilizing suitable media, students can more effectively gain knowledge, skills, and attitudes through the interactions that take place during the educational process (Nurfadhillah, 2021). The process of learning that incorporates various media enhances the skills of both teachers and students (Mukarromah & Andriana, 2022). Utilizing media in educational activities allows teachers to develop their communication and instructional management abilities (Virmayanti et al., 2023). For students, media serves as a means to enhance their cognitive skills, abilities, and attitudes (Nurhikmah et al., 2023). The integration of media is crucial in facilitating the learning experience, ensuring that educational activities are conducted more efficiently and that the established learning goals can be met (Inayah, 2023).

The actual situation in the classroom often contrasts with previous explanations. For elementary school students, learning Mathematics can feel intimidating. Many students lack interest in studying Mathematics, which undoubtedly affects their academic performance. According to observations and interviews conducted by the researcher with Andreas Trasilo, S.Pd., the homeroom teacher for grade IV at Pakintelan 02 Elementary School, it was mentioned that teachers

infrequently utilize learning media and continue to rely on conventional teaching methods, leading to student boredom and disinterest; moreover, the learning process is predominantly teacher-centered. In addition, data was obtained showing that the average value of students' mathematics learning outcomes is still below the KKTP (Criteria for Achieving Learning Objectives). The average value of students Mathematics learning outcomes in grade IV is 63 while the KKTP for Mathematics is 75. This contributes to the low levels of student engagement, ultimately resulting in less-than-optimal learning outcomes.

Given the issues outlined previously, researchers suggest creating digital-based gaming learning resources utilizing educational game models. The gaming learning approach is particularly well-suited to elementary school students who enjoy engaging in play activities (Zakiyah et al., 2024). This educational media is digitally oriented, allowing students to familiarize themselves with existing technology and gain firsthand experience of its advantages (Kasmawati et al., 2025). In this development study, a digital snake and ladder educational tool was created for Pictogram content using the Quizwhizzer platform, referred to as ULTAGRAM based on Quizwhizzer. Quizwhizzer is a digital learning tool that offers a platform for quiz games and material presentations in various formats, is freely accessible, features an appealing visual design, provides multiple templates, and ensures easy access (Hidayatika & Nurhamidah, 2024). ULTAGRAM media aims to make it easier for students and facilitate student learning so that they are more interested in learning Mathematics and can improve students Mathematics learning outcomes.

Research utilizes pictogram materials derived from current issues, where these materials encompass functions such as addition, subtraction, multiplication, division, as well as the capability to interpret and visualize data. Pictograms serve as a method for displaying statistical information through the use of symbols. In pictograms, data is represented as symbols that correspond to specific units of measurement based on the nature of the data (Beno et al., 2024). Pictograms are commonly encountered in numerous subjects as well as in daily life. For instance, in science education, pictograms are frequently utilized to display information about animal populations, plant development, weather patterns, and several other topics. Numerous prior studies indicate that utilizing snakes and ladders as a learning tool can enhance student motivation and improve academic performance (Wati, 2021). The research conducted by Fachrudi et al. (2024) revealed an improvement in students' skills and attention levels during the study. Additionally, the

findings of Novita & Sundari (2020) concluded that digital snakes and ladders learning media boosts students' motivation, engagement, and academic results.

The unique aspect of this research lies in its emphasis on creating a product using snakes and ladders as a learning tool. This study concentrates on developing learning media designed to boost student engagement and performance in Mathematics. Furthermore, the ULTAGRAM learning media product, which is a digital snakes and ladders game base on Quizwhizzer has features such as slides, quizzes, images, videos, time limits, and rankings that are played individually using a cellphone so that each student has the opportunity to play. How the ULTAGRAM media works is that students first encode the QR code that has been displayed by the teacher on the projector screen. Then students fill in the number code according to the teachers' instructions and fill in the name in the column provided. After that, students together understand the material presented and pay attention to the teachers' explanation. In the quiz menu, each student gets a quiz that must be answered. If the answer to the quiz is correct the player gets the opportunity to advance 1 column and if the answer is not correct then go back 1 column in the snakes and ladders. Player can see the ranking and match the answers with the answer key displayed after all participants have answered. The winner in this snakes and ladders game is the player who is the fastest and most accurate in answering all the quizzes.

Following the explanation provided, the researcher concentrates on three main aspects: detailing the media design, evaluating its feasibility, and assessing its effectiveness. This research will specifically examine the application of ULTAGRAM learning media utilizing Quizwhizzer in Mathematics education, with a particular focus on Pictogram content for fourth-grade students at SDN Pakintelan 02.

Method

This study employs a research design that integrates both research and development. The methodology utilized is a mixed approach, incorporating both qualitative and quantitative methods. This research follows the ADDIE model for research and development. As stated by Sugiyono (2019), the research and development approach is a methodology aimed at creating specific products and assessing their effectiveness.

According to Cheung in Rohaeni (2020) the ADDIE model is a straightforward framework that can be utilized for any curriculum aimed at teaching knowledge, skills, or attitudes. Furthermore,

Mulyatiningsih in Rohaeni (2020) contends that the ADDIE model is more logical and comprehensive compared to other models. This development research utilizes the ADDIE model, which includes five stages: Problem Analysis, Product Design, Product Develop, Product Implement, and Product Evaluation (Syahfitri et al., 2023).

In Figure 1, the ADDIE model steps start from analyzing the problems that occurs in the field and then continue with designing a product to solve the problem based on the problem based on the problems that have been encountered. The next step is to develop the product that has been designed by providing novelty to the product. After being developed, the product will be applied in the field. The product that has been developed in the field is then evaluated for future improvements and re-analyzed whether it can answer the problems that occurs.

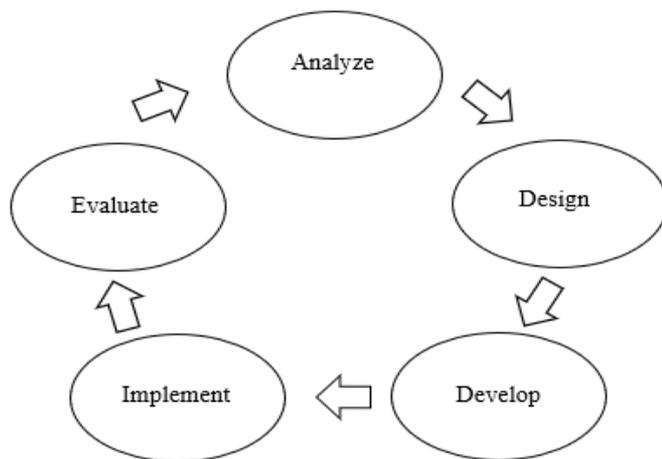


Figure 1. Steps of the ADDIE research and development model (Rayanto & Sugianti, 2020)

In this research, the data comprises both qualitative and quantitative information collected from multiple sources, including observations of the school environment, interviews with teacher, student and teacher questionnaires, and learning outcomes tests. Qualitative data is defined as information that cannot be quantified or expressed numerically (Ardiansyah et al., 2023). In this research, qualitative data were gathered through observations and interviews. On the other hand, quantitative data consists of numerical values that facilitate precise information analysis (Siregar, 2021). In this study, quantitative data were collected via questionnaires and tests. Qualitative data is analyzed by interpreting the results of observations and interview that have been obtained. While Quantitative data is analyzed through various test such as normality, homogeneity test, t-test, and n-gain test. The results of which are then interpreted. The sources of data include

both primary and secondary data. Primary data was gathered directly from the source by observing the teaching process and interviewing grade IV teachers at SDN Pakintelan 02 in Semarang City. Conversely, secondary data consists of information obtained from indirect sources such as relevant books, documents, and journals related to this research topic (Sulung & Muspawi, 2024). The participants of the study included classroom teachers and fourth-grade students from SDN Pakintelan 02 in Semarang City, with the population examined in this study being all students attending SDN Pakintelan 02, and the sample selected was specifically fourth-grade students from that school. The sampling technique in this study was non-probability sampling with the purposive sampling type considering the use of large groups and small groups in this development research (Fachreza, 2024).

Result and Discussion

Utilizing the ADDIE development model, the researcher conducted the design process for ULTAGRAM learning media that integrates Quizwhizzer through a series of defined stages.

The initial step involves assessing the challenges and requirements at SDN Pakintelan 02 Semarang City. The issues faced include students struggling with Mathematics, leading to a lack of enthusiasm and low interest in the subject. The characteristics of grade IV students at SDN Pakintelan 02 indicate a preference for play and a lack of focus on learning, highlighting the need for innovative teaching methods to make lessons more engaging and less monotonous (Nuryani & Abadi, 2021). Teachers currently utilize traditional learning materials and have not explored game-based learning resources, relying on conventional teaching methods and approaches that are primarily teacher-centered.

The second phase is Design. During this phase, the researcher created the initial design for the snakes and ladders media using the Canva application. Canva is beginner beginner-friendly online graphic design app that can be used on both mobile and desktop. It offers a variety of features and tools to support creativity in creating various designs (Jannah et al., 2023). Furthermore, subsequently organized the content for the ULTAGRAM media based on Quizwhizzer Pictogram material that aligned with the Learning Achievements and Objectives. Additionally, the researcher searched for complementary image elements associated with the Pictogram material on the Internet and crafted game instructions and rules applicable to the ULTAGRAM media in relation to Quizwhizzer.

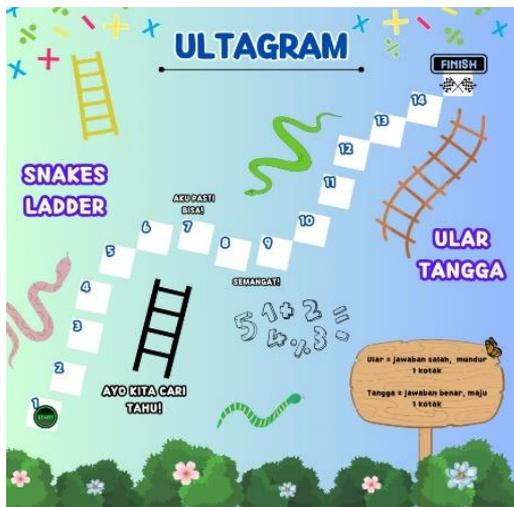


Figure 2. ULTAGRAM media design

The third phase is the development phase. During this phase, the researcher will prepare the content to be included in the learning media by collaborating with the fourth-grade teacher of SDN Pakintelan 02, then create the snakes and ladders media by incorporating elements and symbols in accordance with the game's rules and instructions, while merging the developed materials and designs on the Quizwhizzer platform. On the Quizwhizzer platform, the researcher created a digital snakes and ladders educational tool featuring both content and quizzes. Once development has been finalized, the materials and media will be presented to material experts and media experts. At this point, they will evaluate the media and provide recommendations and feedback.



Figure 4. Quiz display on the student's mobile phone

The fourth phase involves implementation. In this research, the implementation was conducted with a small group of six fourth-grade students from SDN Pakintelan 02, who were selected randomly. Additionally, a test was administered to a larger group of sixteen students from the same class. Each trial took place over two sessions, with each session comprising two hours of instruction. During the first session, the researcher introduced the study and provided instruments that included an initial interest questionnaire and a pre-test, followed by instruction based on the Pictogram teaching module that had been developed. The initial interest questionnaire aimed to gauge students' interest in Mathematics lessons. In contrast, the pre-test served to evaluate students' skills or knowledge related to Mathematics learning focused on Pictogram material. At the second session, learning continued using the Pictogram teaching module, after which students completed a final set of instruments comprising a post-test, a final interest questionnaire, and a response questionnaire. This interest questionnaire assessed students' interest in Mathematics after their engagement with the ULTAGRAM learning media product based on Quizwhizzer in class. Additionally, the post-test was administered to assess students' abilities or understanding of Mathematics related to the Pictogram material taught through the ULTAGRAM media based on Quizwhizzer. The response questionnaire aimed to gather student feedback regarding their learning experience utilizing the ULTAGRAM learning media based on Quizwhizzer. The designed instruments adhere to academic standards for measuring specific objects or gathering data on the variables being studied (Novita & Sundari, 2020). In this research, a questionnaire was employed to evaluate



Figure 3. Display on the material on the student's cellphone

interest in learning Mathematics, and a test was used to assess students' learning outcomes.

The fifth phase is assessment, and following the trials performed, there are multiple elements that require enhancement in the ULTAGRAM learning media product derived from Quizwhizzer. The researcher modified the learning objectives stated in the media to reflect the adjustments made earlier to the module, the ULTAGRAM box size was increased, and several sentences as well as images in the material and quiz content were updated. Additionally, information about the developers, definitions of the media, learning outcomes, game instructions, and timers on the quiz display were incorporated.

The feasibility assessment in this developmental research was conducted through a validation process involving both material and media experts (Salsabila & Aslam, 2022). Data analysis from the questionnaires based on the criteria of Sugiyono (2019) the two experts revealed that they each rated it at 92%, which falls within the "very feasible" category. The material validation questionnaire evaluated aspects of content, language usage, and presentation. Meanwhile, the media validation questionnaire assessed media design, learning aspects, and media usage. Additionally, the initial questionnaire on mathematics learning interest resulted in a score of 44%, categorized as "low," while the final learning interest questionnaire showed a score of 87%, classified as "very high." The initial interest questionnaire was distributed prior to learning with ULTAGRAM media based on Quizwhizzer, and the final questionnaire was administered after the learning session using ULTAGRAM learning media based on Quizwhizzer. From the data collected through the questionnaires, it can be concluded that there was an increase in students' interest in learning Mathematics by 43%.

The effectiveness of learning is evaluated through student learning outcomes, particularly focusing on cognitive factors related to the comprehension of the material taught. This research utilized tests to assess the learning achievements in Mathematics for both small and large groups. Evaluations were conducted prior to the intervention (pretest) and following the completion of the research intervention for each group (posttest). In this investigation, the assessment method employed was a cognitive test in the form of a written multiple-choice examination. To determine the effectiveness of the ULTAGRAM learning media designed with Quizwhizzer, several analyses were performed, including tests for normality, tests for homogeneity, t-tests, and N-gain assessments.

In the initial test, the average score was 65. This pretest was given prior to the learning process and the implementation of ULTAGRAM media utilizing Quizwhizzer. On the other hand, the average score for the posttest, which was conducted after completing two learning sessions, was 80. This posttest aimed to assess the extent of improvement in student learning outcomes following the use of ULTAGRAM learning media based on Quizwhizzer. Based on the KKTP (learning Objectives Achievement Criteria) for Mathematics subjects, which is 75, the average pretest result of 65 is below the KKTP standard. Meanwhile, the average posttest result is 80 means it is above the KKTP standard. This shows that there is an increase in the average value of student learning outcomes. Below are the results of the effectiveness evaluation conducted by the researcher.

A Normality Test is conducted to assess whether the samples in the study follow a normal distribution in both the pretest and posttest data. This was accomplished by evaluating normality with the SPSS application. The detailed test scores from both the pretest and posttest outcomes are compiled in the table below.

Table 1. Pretest-posttest normality test results

Action	Statistic	df	Sig.	Category
Pretest	0.949	22	0.307	Normal
Posttest	0.947	22	0.272	Normal

According to the results of the normality test highlighted in table 1, the pretest data yielded a significance value of 0.307, while the posttest data showed a value of 0.272. Since both values exceed 5% or are above 0.05, we can conclude that the data follows a normal distribution.

Following that, the homogeneity test is performed to analyze the consistency of variations across multiple data sets within the population. In this research, the homogeneity test was executed using the SPSS software, yielding the results shown below.

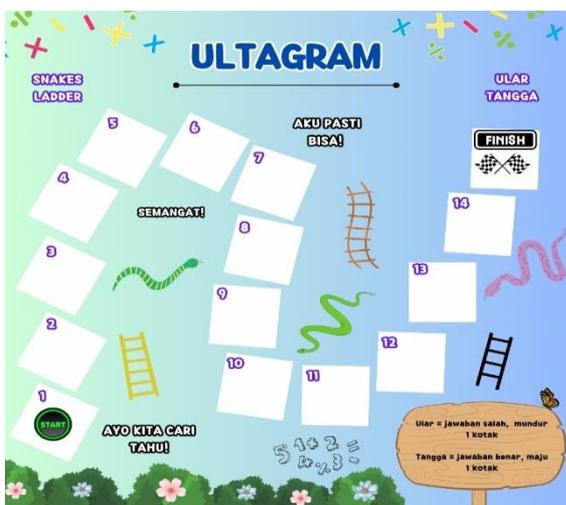


Figure 5. ULTAGRAM media design view after evaluation

Table 2. Homogeneity test results

Levene Statistic	df1	df2	Sig.
1.373	9	31	0.242

According to the findings from the homogeneity test presented in table 2, the pretest and posttest data yielded a significance value of 0.242. Since this value exceeds 5% or is > 0.05, we can determine that the data is homogeneous.

The analysis for this study utilized a t-test employing a Paired Sample T-Test design. The objective of this test was to assess the impact of ULTAGRAM learning media, which is based on Quizwhizzer, on the Mathematics learning of Pictogram material conducted in class IV SDN Pakintelan 02 by implementing two assessments: a pretest conducted prior to the learning process and a posttest executed after the learning with the media. Acknowledging the significance of normally distributed data conditions for parametric statistical analysis, the researcher initially performed a normality test. Furthermore, the variance of the data in the paired sample t-test does not need to be homogeneous, as homogeneity of variance is not a strict requirement for this type of test. The outcomes of the t-test will be displayed in the subsequent table.

Table 3. Paired sample T-test results

Data	Pretest-Posttest
Mean	-15.273
Std. deviation	5.608
t	-12.775
df	21
Sig. (2-tailed)	0.000

According to the data analysis performed using the Paired Sample T-Test shown in Table 3, a significance level of 0.000 was found, which is less than 0.05. This implies that H0 is rejected and Ha is accepted. Therefore, it can be concluded that there is a significant difference in the average learning outcomes between the pretest and posttest. This indicates a positive impact of ULTAGRAM learning media based on Quizwhizzer on enhancing learning outcomes in Mathematics, particularly for Pictogram material among fourth grade students at SDN Pakintelan 02.

Additionally, the N-gain test is performed to assess how effective a specific treatment is in research that utilizes a one-group pretest-posttest design or involves a control group. In this investigation, the N-gain test was executed using the SPSS software, and the results are presented below.

Table 4. N-Gain results

Data	Mean
N-gain Score	0.4413

According to the analysis presented in table 4 of the SPSS output, the mean value recorded is 0.4413, which falls under the "Moderate" category. This indicates that the effectiveness of the ULTAGRAM learning media utilizing Quizwhizzer is at a moderate level (Sukarelawan et al., 2024). This can be indicating that there is an increase in student learning outcomes after using ULTAGRAM media based on Quizwhizzer which is quite effective.

Moreover, the ULTAGRAM learning media developed using Quizwhizzer garnered favorable feedback from teachers and students at SDN Pakintelan 02, Semarang City. This feedback was collected from a questionnaire distributed to teachers and fourth-grade students at the school, where the students' questionnaire obtained a score of 45%, which is included in the quite interesting category. While the teacher questionnaire obtained a score of 95%, with a very interesting category.

Conclusion

Based on evaluations from material experts, learning media specialists, and fourth-grade students at SDN Pakintelan 02 in Semarang City, who are users of the product, the ULTAGRAM media utilizing Quizwhizzer has been assessed as "Highly Suitable" and "Effective" for the Mathematics learning process, particularly regarding Pictogram material. This is based on the results of the t-test and N-gain tests that support the findings, where the t-test obtained a significance result of 0.000, which is smaller than 0.05. This indicates that H0 is rejected and Ha is accepted. Thus, it can be concluded that there is a significant change in the average learning outcomes between the pretest and posttest. Furthermore, The N-gain test obtained an average value (Mean) of 0.4413 which is included in the "Moderate" category, which can be concluded that the application of ULTAGRAM media based on Quizwhizzer is quite effective. The implementation of ULTAGRAM media based on Quizwhizzer has shown to enhance student learning outcomes and generate greater interest in Mathematics, especially concerning Pictogram material. Furthermore, both teachers and students provided favorable feedback regarding this educational media. ULTAGRAM media can be used as a learning media for teachers because this media is interactive which involves teachers and students in learning activities. In addition, the digital snake and ladder game method can increase students' interest in learning. In this research, teachers must ensure an internet connection to activate media during learning. If the network is disconnected, students must log in back. Further research can be conducted to explore the influence of other factors on the effectiveness of the

ULTAGRAM media or to test the effectiveness of this media in different learning contexts.

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Author Contributions

This article is a collaboration between the first author, T.N.'A. and the second author, I.R. Both contributed to the creation of media and learning tools, implementation of the research, data analysis, and writing of the manuscript. All authors have reviewed and approved the final version of this article.

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Conflicts of Interest

All author declared that there is no conflict of interest.

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