

Development of SPLTV Learning Media using the Clickteam Fusion 2.5 Mobile Application

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ABSTRACT

This development research is driven by technological advances that continue to develop rapidly but have not been utilized optimally by educators. This can be seen from the lack of innovation in creating interesting learning. Monotonous learning activities cause students to feel bored and affect their learning outcomes, especially in the material of the three-variable linear equation system. This research aims to develop a learning media based on the Clickteam Fusion 2.5 mobile application that is valid, practical, and effective. This research uses the Research and Development (R&D) development method. The model used in the development process of ADDIE. The subjects of this study are teachers and students of class X of St. Thomas Aquino Catholic High School Tulungagung which totals 95 students. The data collection method uses validity questionnaires from media experts and material experts, questionnaires of teacher and student responses, and student learning outcome tests. The results of the validity test from media experts showed a score of 90% with a very valid category, while material experts obtained a score of 80% with a fairly valid category. The practicality test by teachers showed a score of 80.86% and by students 89.56%, both in the very practical category. The media effectiveness assessment obtained a score of 89% with the category of very effective.

INTRODUCTION

In the current era of digitalization, the use of technology in learning activities has become inevitable (Nur, 2020). Technological developments have affected various areas of life, including the field of education which has undergone significant transformations. In line with this, the role of teachers in conveying their knowledge is no longer the only foundation for students (Chusna & Utami, 2020). The existence of the internet and various electronic media that are increasingly accessible provides flexibility for students to learn independently, not bound by time and place not dependent on the presence of teachers (Hariyadi et al., 2023). The use of technology in the realm of learning activities has given rise to new alternatives, such as its use as a learning medium in the classroom (Salsabila et al., 2020).

One of the learning media is a flexible mobile device, namely a smartphone because it is easy to carry around. In today's technological era, almost all students have access to smartphones (Zulfitria, 2023). However, the existing facts show that the use of smartphones by students has not been maximized to support the learning activity process. In this context, students using their smartphones to access applications related to mathematics is still rare, because the majority of them are more likely to use smartphone devices for activities outside the context of learning, such as entertainment, which is usually the activity of students (Nurasiah et al., 2022).

Along with the development of science and technology, teachers are encouraged to continue to innovate and use available technology in the process of learning activities (Kusnandi, 2019). Mobile applications, especially games, are generally known as a form of entertainment, but it becomes more useful if games can also be a learning medium for users. However, Akbar, (2020) explained that the interest generated by games is often the cause of addiction for players. However, the use of information technology in the form of games and animations can certainly be applied to create visualizations in mathematics learning media, making it a supportive addition to the process of mathematics learning activities (Ariessanti et al., 2020).

One of the materials taught in mathematics lessons in high school is about the Three-Variable Linear Equation System. The application of this concept in daily life is also quite common, so many problems can be represented using material on the Three-Variable Linear Equation System (Kristanto, 2019). However, some problems occur to students in solving problems for the Three-Variable Linear Equation System. This is in line with the explanation from Baskorowati & Wijayanti, (2021) where according to the Ministry of Education and Culture, the results of the 2018 national exam related to algebra material decreased from the previous year, from 43.75% to 39.48%. In 2019, there was a slight increase but did not meet expectations, reaching 45.49%. One of the algebraic concepts that is closely related to everyday situations at the high school level is the Three-Variable Linear Equation System. The low percentage of expected values shows that the Three-Variable Linear Equation System is still not sufficiently mastered by most students.

To overcome these problems, the step that teachers can take as learning facilitators is to create innovative mathematics learning media to improve the quality of learning. One of the alternative media that needs to be worked on is the development of game-based learning media as a means of education (Ariessanti et al., 2020). The mathematics learning media that will be developed in the context of the Three-Variable Linear Equation System material is designed so simply but still maintains its validity, practicality, and effectiveness.

As for the previous research by Fadil & Isnani, (2018) stated that the learning model using learning media is better than the conventional learning model. Research conducted by Oktaviani et al., (2023) concluded that game-based learning media has significant benefits in learning activities. This relevant research is a reference in conducting this research, based on the lack of research on the development of game-based learning media developed using Clickteam Fusion 2.5.

LITERATURE REVIEW

Learning media is a collection of intermediaries tasked with supporting the success of the ongoing teaching and learning process (Rizky & Faizah, 2021). Arsyad in Sari & Cahyono, (2020) explained that learning media is an instrument that can send or convey learning messages. In line with this, Nurrita, (2023) also explained that learning media is a tool that helps in the teaching and learning process, ensuring that the message conveyed becomes brighter and the goals of education or learning can be achieved effectively and efficiently.

Ekayani, (2021) stated that learning media is anything that can be used to stimulate students' thoughts, emotions, attention, and abilities or skills to encourage the learning process. Tafonao, (2018) also explained that learning media is anything that can be used to send messages from the sender to the recipient to arouse students' thoughts, feelings, attention, and interest so that they want to learn.

Mobile applications are software programs that are specifically designed for use on devices such as tablets and smartphones (Krisantyo & Hidayat, 2021). Firdaus, (2017) explained that a mobile application is software that operates on a mobile device. This mobile device allows users to carry out various activities easily and has open-source characteristics.

Jainuri et al., (2021) explained that mobile applications refer to applications that are made specifically for use on mobile platforms such as iOS, Android, or mobile windows. In line with this, Chrestella et al., (2022) explained that a mobile application is software that can be used by users to achieve the desired goals of creating the application. In the general context, a mobile application is a practical tool that is specially designed and integrated according to the advantages and capabilities of each application.

Clickteam Fusion 2.5 is a game and application development software that allows users to create games and applications visually without having to have in-depth programming knowledge ("Fusion", 2023). Clickteam Fusion 2.5 provides an intuitive, drag-and-drop-based interface for designing, organizing, and programming elements in a game or application.

Using Clickteam Fusion 2.5, users can create 2D games, interactive applications, multimedia presentations, and more. The software offers a wide range of features such as system physics, animation, sound, scripting, and integration with hardware such as touch screens and accelerometers on mobile devices ("Clickteam", 2023). Clickteam Fusion 2.5 also supports multi-platform, so games or apps built with this device can run on different platforms such as Windows, macOS, iOS, Android, and more.

Clickteam Fusion 2.5 is popularly used by indie and amateur developers who want to create games or applications quickly and easily without having to master complex programming languages. With Clickteam Fusion 2.5, users can focus on the design and creative content of their game or app without having to get bogged down in complicated programming details.

The Three-Variable Linear Equation System is a mathematical concept applied to solve situations that cannot be solved using one- or two-variable linear equations (Zubandi, 2018). In line with this, Anggraini, (2020) also explained that the Three-Variable Linear Equation System is a group of linear equations that have three variables and use the same set of variables. The Three-Variable Linear Equation System is a mathematical configuration consisting of three variables, and visually or geometrically, formed as a flat plane that, when two flat planes intersect each other, produces lines, and when these lines intersect, will form a point (Agustina, 2018).

METHODOLOGY

The model used in this development process is the ADDIE (Analyze, Design, Development, Implementation, and Evaluation) development model. This model was chosen because a series of stages in the ADDIE model describe a systematic approach to instructional development (Rohaeni, 2020). The product resulting from this development is a mathematics learning media in the form of a mobile application developed with Clickteam Fusion 2.5 software.

The research and development we carry out is research and development at level 3, namely researching and testing to develop existing products. As has been stated, R&D is development to improve existing products.

Analyze

The analysis stage is the first stage in the ADDIE model which is useful for identifying students' learning needs and possible obstacles. A needs analysis was carried out on the curriculum and competency standards applicable to the Three-Variable Linear Equation System material in class X of Saint Thomas Aquino Catholic High School. Furthermore, information is collected related to students' understanding of the material to be taught and the

identification of various challenges or obstacles that students often face in understanding the material.

Technology analysis is based on available resources, including mobile devices owned by students and teachers. An analysis was also carried out on the technological infrastructure in the school, the availability of internet access, and the platform used to distribute the developed application.

In the input and suggestion analysis stage, survey students and teachers to get comprehensive input on students' learning needs, preferences related to learning media, and expectations for the Clickteam Fusion 2.5 mobile-based application.

Design

Preparation of material delivery flow in the form of flowcharts, creation of media storyboards, and collection of resources needed in media development. This series of activities is structured as part of a process that starts from setting learning objectives, creating learning scenarios that are by the selected media, designing learning media designs, preparing subject matter, and designing evaluation instruments to evaluate the feasibility of learning media. The process of designing this learning media has a procedural nature and will be the basis for the next stage of development.

Development

In the development stage, a prototype has been prepared. The designed product is made according to the storyboard that has been prepared beforehand. This stage is a stage in making a game made with Click Fusion 2.5 software from the flowchart and storyboard that has been created. This stage will later be tested on the validity aspect of this product.

Implementation

Products that have been developed and have proven their validity will be run or tested by grade X students at St. Thomas Aquino Catholic High School as an implementation step. At this stage, data will be collected through questionnaires and test sheets used by students to assess the use of learning media. The collected data will be managed and analyzed to assess the extent to which the learning media meets the needs of students, and whether there are any necessary revisions.

Evaluation

Evaluate the results of the learning media trials that have been developed. The data that has been collected is statistically analyzed to get a clear picture of the effectiveness of this learning medium. Assessing the suitability and effectiveness of learning media in improving students' understanding of the Three-Variable Linear Equation System material. This

assessment is carried out by comparing the results of the evaluation with the learning objectives that have been set previously. Based on the analysis of evaluation data, the researcher concluded the effectiveness of this mathematics learning media in improving student's understanding of the material of the Three-Variable Linear Equation System. This conclusion is the basis for identifying further improvements and developments that may be needed.

Product Trial Test

At the product trial stage, assessments by material experts and media experts are carried out through responses from experts in the field of materials and media. This step aims to review the initial product, provide input for improvement, and validate the product as a ready-to-use medium; Testing by math teachers, where the product is tested by teachers who engage with students in grade X. The purpose of this testing phase is to detect minor errors that may have been missed in the observation of media and material experts, so that they can be corrected before being tested to the intended user; Testing in small groups, or testing limited to Android smartphone users consisting of 6-10 students from two different classes; The field test was carried out by involving 95 Android smartphone users in the high school class X environment.

The subject of the product trial or target media users in the test are grade X students of St. Thomas Aquino Catholic High School for the 2023/2024 school year who use Android-based smartphone or tablet PC devices. The sampling method used is a nonprobability sampling technique, namely purposive sampling, which means that the selection of samples is based on certain considerations (Firmansyah & Dede, 2022). The sample data sources that were considered in the sampling were students who used Android smartphones in class X of high school.

Data Collection

Quantitative data was obtained from media assessments conducted by validators and students. Meanwhile, qualitative data was obtained from the evaluation of validators which included input, suggestions, reviews, and also based on the responses of students who had participated in the trial. In this development research, data collection techniques involve validity questionnaires, response questionnaires from teachers and students, and learning outcome tests. The questionnaire given to teachers and students aims to evaluate the practicality of the learning media that has been made. To analyze how effective the media is in the learning process, learning outcome test questions are used that are assessed from the student's side.

Data Analysis

In this study, the data analysis technique used is a qualitative descriptive analysis that describes the results of product development that has been made. The data obtained from the instrument test is analyzed to obtain an assessment of the product that has been developed.

Validators play an important role in assessing media because of their expertise and competence in their field. The data from their evaluation is used to determine the validity of the media that has been created. There are three validators in this study, namely two material expert validators assessed by the lecturer in charge of the Mathematics Education Study Program at Bhinneka PGRI University and a class X mathematics teacher at Santo Thomas Aquino Catholic High School, as well as one media expert validator assessed by a lecturer who is competent in application development.

Assessments from material experts include aspects such as basic concepts, accuracy, and relevance of the material to the learning process. Meanwhile, assessments from media experts include basic appearance, media presentation, and media operational functions. A medium is said to be valid and can be used after being declared valid by all three validators.

Data analysis can use the formula described by Maesari et al., (2019), namely:

$$\text{Validity Percentage (\%)} = \frac{\text{Result Score}}{\text{Maximum Score}} \times 100\%$$

Table 1. Validity Percentage

No.	Questionnaire Value	Validity Category
1.	85% < x ≤ 100%	Very Valid
2.	70% < x ≤ 85%	Enough Valid
3.	50% < x ≤ 70%	Less Valid
4.	x ≤ 50%	Not Valid

Source: (Astuti et al., 2021)

Media is considered valid when the percentage of results from validity testing reaches at least 70% or is classified as “enough valid”. If the percentage is less than 70%, a revision of the media is needed. The response from teachers and students is an assessment of the practicality of the media. This assessment aims to assess how practical the media has been developed. To analyze the data, the formula presented by Maesari et al., (2019) was used, namely:

$$\text{Practicality Percentage (\%)} = \frac{\text{Result Score}}{\text{Maximum Score}} \times 100\%$$

Table 2. Practicality Percentage

No.	Value %	Practicality Category
1.	85 - 100	Very Practical
2.	75 - 84	Practical
3.	60 - 74	Enough Practical
4.	40 - 59	Less Practical

5.	0 - 39	Not Practical
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Source: (Astuti et al., 2021)

The media is considered practical if it is rated at least in the “practical” category. If the assessment is less than that category, a revision is needed on the media, as conveyed by Astuti et al., (2021). The product effectiveness test is based on a student learning outcome test that is assessed following the Minimum Completeness Category (KKM) that has been determined. In the mathematics subject class X at St. Thomas Aquino Catholic High School, the KKM score is 75. To analyze the data, a formula was used that referred to the source from Maesari et al., (2019), namely:

$$Effectiveness\ Percentage\ (\%) = \frac{Result\ Score}{Maximum\ Score} \times 100\%$$

Table 3. Effectiveness Percentage

No.	Percentage	Effectiveness Category
1.	$x \geq 80$	Very Effective
2.	$60\% \leq x < 80\%$	Effective
3.	$40\% \leq x < 60\%$	Enough Effective
4.	$20\% \leq x < 40\%$	Less Effective
5.	$x \leq 20\%$	Not Effective

Source: (Astuti et al., 2021)

Media effectiveness can be considered achieved if the student’s learning test reaches at least 60% of the KKM score or is included in the “Good” category, as explained by Astuti et al., (2021).

RESULTS

Analyze

The majority of students in class X showed a lack of understanding of the concept of three-variable linear equation system material. Therefore, to increase the effectiveness of learning, learning media that use games is a more valid, practical, and effective choice if you use a Clickteam Fusion 2.5 mobile application that can be accessed using smartphone media so that all students can use it as a learning medium that is assembled as a game.

Technology analysis includes all the needs in the media development stage, such as hardware and software, that are needed to produce a game that works properly. In this development, the researcher used Website APK 2 builder to convert HTML into a smartphone application. The hardware used by researchers to make games is in the form of laptops.

Curriculum research is conducted to ensure that the content in the game is by the curriculum standards applied in learning at St. Thomas Aquino Catholic High School. The three-variable equation system material for class X follows the Independent Curriculum which includes Learning Outcomes and Learning Objectives.

Making Games

The game creation stage on the smartphone as a whole uses Clickteam Fusion 2.5. All components, from flowcharts to storyboards to game prototypes, are implemented into Clickteam Fusion 2.5 as the main software in game creation, with Canva being used as supporting software for graphic design creation.

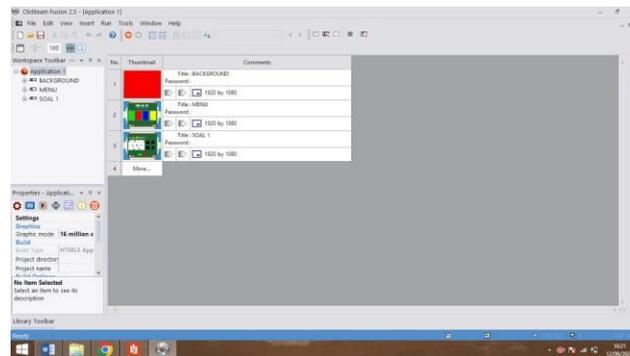


Figure 1. Clickteam Fusion 2.5 Display

The design stages in the game include:

Table 4. The Design Stages In The Game

- | | |
|--|---|
| 1. Design the initial display of the game to attract student's interest in playing the game. | 2. Design in-game menus that contain various buttons, including curriculum, materials, exercises, quizzes, and hints. |
|--|---|



Figure 2. Game Initial Display



Figure 3. Game Menu Display

- | | |
|---|--|
| 3. The creation of a material menu that includes the presentation of the material is divided into several explanations, starting from sample questions to the discussion. This learning material menu can be accessed repeatedly to improve students' understanding of the three- | 4. The preparation of the exercise menu which includes questions about the three-variable linear equation system, is arranged in several levels of difficulty, ranging from easy to difficult. After completing the exercise, there is a discussion for each |
|---|--|

variable linear equation system material.

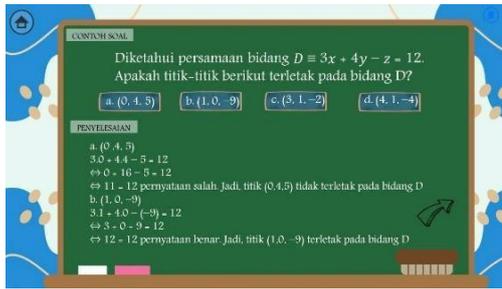


Figure 4. Display of The Game Materials Menu

question given as a learning tool for students.



Figure 5. Game Practice Menu Display

5. The creation of a set of questions consisting of 10 multiple-choice questions about a three-variable linear equation system, where each question has its level of difficulty. These questions aim to measure the extent of students' understanding of the three-variable linear equation system material that has been explained earlier.

The creation of a score at the end of the question linked to the Google Drive link is used as material for the teacher's assessment, and at the end of the score there is a discussion of the questions that have been given.



Figure 6. Game Question Menu Display



Figure 7. Game Score Display

Media Expert Validation

The media validation process was carried out by Mr. Agung Prasetya, M.Kom., a lecturer from the Informatics Study Program at the Faculty of Science and Technology, Bhinneka PGRI University. The media expert validation sheet consists of 21 assessment indicators.

Table 5. Media Expert Validation Result

Value Earned	Total Score	Percentage	Category
99	110	90%	Very Valid

Material Expert Validation

The material was validated by Mr. Antonius Hadi Handoko, S.Pd., a Class X Mathematics Teacher at St. Thomas Aquino Catholic High School. The material expert validation sheet includes 23 assessment indicators.

Table 6. Material Expert Validation Result

Value Earned	Total Score	Percentage	Category
80	100	80%	Enough Valid

Media Practicality Test

The practical testing of the media was carried out using a questionnaire to get responses from the mathematics teacher of class X, Mr. Antonius Hadi Handoko, S.Pd., as well as all students of class X of Saint Thomas Aquino Catholic High School totaling 95 people. Before the practical testing of the media is carried out, the questionnaire has passed the validation process by a validator.

Table 7. Media Practically Test Result

Value Earned	Total Score	Percentage	Category
93	115	80.86%	Very Practical

Result for the students:

$$\text{Validity Percentage (\%)} = \frac{7232}{8075} \times 100\%$$

$$\text{Validity Percentage (\%)} = 0.8956 \times 100\%$$

$$\text{Validity Percentage (\%)} = 89.56\%$$

Media Effectiveness Test

Research on the effectiveness of media was conducted to determine whether the media developed could support students in learning the material of the three-variable linear equation system. Based on the results of the learning test of students who used the game, it was found that 85 students achieved a score above the KKM.

$$\text{Validity Percentage} = \frac{85}{95} \times 100\%$$

$$\text{Validity Percentage} = 0.89 \times 100\%$$

$$\text{Validity Percentage} = 89\%$$

DISCUSSION

The results of the validity test conducted by media experts and material experts show ratings with the categories of "Very Valid" and "Enough Valid", which means that the game created by the author has a good design and operation in the software and is by the applicable curriculum.

Based on the results of the practicality test through a questionnaire that collects responses from teachers and students, the assessment obtained is in the

category of "Very Practical". This shows that both teachers and students feel comfortable using the games that the author made as a learning medium.

Based on the results of the learning test that used the material from the game, the effectiveness of its use is classified in the category of "Very Effective." This is evidenced by the fact that 86 out of 95 students achieved KKM completeness when answering questions. This shows that the games created by the author are very effective for students.

Based on this discussion, the results of the researcher are by several theories, namely one of the alternative media that needs to be worked on is the development of game-based learning media as a means of education according to Ariessanti et al, (2020). Teachers are encouraged to continue to innovate and use available technology in the learning process of Kusnandi, (2019).

The use of information technology in the form of games and animations can certainly be applied to create visualizations in mathematics learning media, making it a supportive addition to the process of mathematics learning activities according to Ariessanti et al, (2020). One of the materials taught in mathematics lessons in high school is about the Three-Variable Linear Equation System. The application of this concept in everyday life is also quite common, so many problems can be represented using material on the Three-Variable Linear Equation System according to Kristanto, (2019). The creation of this game is done using Clickteam Fusion 2.5 software which has advantages, namely being able to insert various media such as images, audio, video, and flash. These media are easy to distribute anywhere and can be optimized using the web.

CONCLUSIONS AND RECOMMENDATIONS

The results of the media validity test from the media expert validator showed a score of 90%, which is included in the "Very Valid" category. Meanwhile, the material expert validator gave a score of 80%, which belongs to the "Enough Valid" category. In conclusion, media in the form of this game is considered to have validity in the "Very Valid" category.

Based on the results of the questionnaire, the practicality of the media from the teacher's response received a score of 80.86% in the category of "Very Practical". Meanwhile, the responses from all grade X students of St. Thomas Aquino Catholic High School received a score of 89.56% in the category "Very Practical". By looking at the overall response from teachers and students, it can be concluded that this media in the form of a game has a high level of practicality so it is suitable to be used as a learning medium.

The media effectiveness test was carried out on all grade X students at St. Thomas Aquino Catholic High School, which amounted to 95 students. The results showed that 86 students achieved the graduation standard (KKM), while 9 students did not achieve it. The percentage effectiveness of this game media reaches 89%, which is included in the "Very Effective" category. Therefore, it is concluded that this game media is very effective to be used in student learning activities.

FURTHER STUDY

Based on the media that has been developed, there are still some limitations or shortcomings that can be corrected in the next research. Some aspects that can be further developed are that Media needs to be further developed because currently, it is only available for Android and iOS 7 users. The curriculum currently used is still limited to the Independent Curriculum.

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