Development of Mathematics Learning Media Using Kvisoft Flipbook Application for Linear Programming Material

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Abstract

This research aims to produce valid and practical mathematics learning media using the Kvisoft flipbook application for linear programming material, and to evaluate its potential effect on student learning outcomes. This study employed the ADDIE method (Analysis, Design, Development, Implementation, and Evaluation). Data collection techniques included observation, interviews, validation sheets, questionnaires, and a test consisting of 5 post-test questions. The validity test was conducted by material experts, media experts, language experts, as well as a material expert assessment of the post-test questions. The subjects of this study were 24 students from class XI 5 of SMA N 5 Jambi City. The small group product trial was conducted at the implementation stage with 10 students from class XI 2, while the large group trial was conducted on 24 students from class XI 4. The assessment results showed a percentage of 95.3% for material with a "very valid" category, 96% for media with a "very valid" category, and 96% for language with a "very valid" category. For practicality, the percentage obtained was 97% with a "very practical" category by the subject educator. In the small group trial stage, the Kvisoft flipbook learning media for linear programming material obtained a percentage of 97.69% with a "very practical" category, and in the large group trial stage, the practicality questionnaire percentage was 95.51% with a "very practical" category. For effectiveness, the percentage obtained was 87.50% with a "very effective" category. Based on the analysis results of the validator questionnaires, student and teacher responses, it can be concluded that the Kvisoft flipbook learning media for linear programming material for class XI is valid, practical, and has a potential effect on student learning outcomes.

Keywords: Learning media, Kvisoft flipbook, linear programming material

Introduction

At the moment, the development of the 21st century is extremely rapid, and humans are required to develop their quality and skills in various fields. Education is a critical component that significantly influences human life in the globalization era. Good education can mold individuals who possess the quality for their future (Segara et al., 2023). The Indonesian national education system consists of diverse levels, encompassing three main categories: formal, non-formal, and informal education. Formal education, as one of its components, is divided into three stages: basic, secondary, and higher education. Each stage follows a curriculum specifically designed according to its level (Barlian et al., 2022).

Secondary education is a crucial part of the formal education structure in Indonesia, with its primary focus on the development of individual students. The goal of secondary education is to enhance students' capacity as members of society. This is achieved by encouraging them to apply the knowledge acquired at school within real-life contexts. This process involves active interaction with the social, cultural, and natural environment, allowing students to integrate theory and practice in their daily lives (Salsabila et al., 2024). Mathematics is one of the important subjects in the world of education. Mulyatna et al. (2023) state that mathematics is a global branch of science, both in the educational world and the real world. Mathematics has been introduced in schools even since children first attended kindergarten.

Mathematics learning is very important because it not only equips students with logical and analytical thinking skills but also helps them understand basic concepts required in daily life, such as financial management, measurement, and problem-solving. Furthermore, mathematics serves as the foundation for various other disciplines, such as physics, engineering, and economics, thus a strong understanding of mathematics can open wider opportunities in academic and career fields. Therefore, investment in mathematics learning will provide long-term benefits for students' cognitive development and problem-solving abilities (Alhikmah & Roza, 2024). However, despite its importance, students often perceive mathematics as a boring and difficult subject, and they tend to be uninterested in studying it (Sahira Lestary, 2023).

Teaching materials are fundamentally important to the educational process; without them, instructors face significant challenges in the effective implementation of learning (Wijayanti et al., 2025). Linear programming material is a part of mathematics where its solutions use linear equations and inequalities, aiming to find maximum or minimum optimization problems (Rahmania et al., 2023). The characteristics of linear programming material are the ability to overcome problem constraints given in the form of inequalities, the ability to overcome more than one constraint present in the given problem, and the limits of linear programming material are the objective function and linear constraints (Nurajijah et al., 2023). Linear programming material is mathematics material that is often related to real-life (Mutmainah et al., 2023).

Based on the results of observations at SMA N 5 Jambi City, students often find it difficult to understand and find solutions to mathematics problems, especially linear programming material. Students have never received teaching media in the form of a

flipbook that contains material, problems, and detailed solutions all at once. Learning media is one of the supporting factors in determining whether the objectives of mathematics learning are achieved or not. Learning at SMA N 5 Jambi City is still dominated by the teacher, with students only being taught material through books and practice questions. Mathematics learning, particularly the linear programming material and its sub-material of linear inequalities in two variables, is dominated by formulas and calculations, making it difficult for some students to visualize the material. This is suspected to be one reason why student interaction and activity are hindered during the teaching and learning process.

In this era of global advancement, various multimedia technologies are available that can be utilized as learning aids in educational institutions. Nevertheless, the presence of libraries providing a collection of the latest books still plays a vital role as a central source of knowledge for the entire school community in the teaching and learning process. In line with this development, the use of various types of multimedia as learning media is being intensely promoted, given its suitability with the current conditions and demands of the time (Muhammad et al., 2023). According to (Baihaqi, 2023), learning media is a tool used in the learning process to convey teaching material.

In designing learning media, it is important to consider the characteristics of students (Eviota & Liangco, 2020). Furthermore, learning media also needs to be aligned with the latest advancements in science and technology. The utilization of learning media that uses the Android platform can be considered an innovative breakthrough to overcome various challenges in the world of education (Nurafifah et al., 2024). With the presence of Android-based learning media, it is hoped that an effective tool can be created to transform lesson material. This is expected to have a positive impact on the teaching and learning process, creating a learning atmosphere that is more engaging and encouraging active interaction between educators and students.

The Kvisoft Flipbook Maker application is not limited to text; it also offers the capability to embed motion animation, video, and audio, thereby making the learning experience more interactive and engaging. With these features, users can create dynamic and enjoyable content, which can increase student engagement and help them understand the material in a more pleasant way. Additionally, the flexibility of this application allows users to customize the flipbook according to the needs and preferences of the audience, so that learning no longer feels monotonous, but rather like an inspirational adventure

(Hairani & Amini, 2023). The Kvisoft flipbook Android-based media is one of the appropriate media to use in mathematics learning because it is practical and flexible to use anytime and anywhere.

One of the benefits of digital media is that students find it easy to understand the material, and the presented material becomes more attractive, while students can use it for independent learning (Aprima, 2021). With the ability to open each page like a book, Kvisoft Flipbook Maker software can create and convert PDF files, photos, or images into physical albums or books. The results can be saved in SWF, EXE, or HTML format. Each Flipbook page contains a series of different images, has an attractive appearance, and its language is easy to understand. Flipbooks can complement electronic books or modules with interactive learning activities and have features for editing videos, images, audio, hyperlinks, and hotspots (Candra Eka Setiawan et al., 2020).

According to Utami & Yuwaningsih (2024), Kvisoft Flipbook software allows for a rich and engaging display of electronic modules by adding various elements such as images, graphics, links, animations, audio, and video, thereby creating interactive and engaging learning media. This program also offers a unique reading experience with a page-flipping animation, or flipbook, so students can enjoy the electronic module as if they were opening a real physical book. Furthermore, Kvisoft Flipbook provides flexibility for its users, allowing the created modules to be accessed both online and offline through various electronic devices, including computers and smartphones. With these features, learning becomes more enjoyable and allows students to interact with the material in a more creative and dynamic way (Farida et al., 2024).

Method

This research utilized the ADDIE model, an acronym for Analysis, Design, Development, Implementation, and Evaluation, which serves as a guide for producing and implementing products. This section describes how the research was conducted. The main materials described in this section are the research design, the population and sample (target of research), data collection techniques and instrument development, and data analysis techniques. The research subjects consisted of 24 students from class XI 5 of SMA N 5 Jambi City. The small-group trial was conducted on 10 students from class XI 2, while the large-group trial was conducted on 24 students from class XI 4. The use of research instruments is essential for collecting data effectively. These instruments help

researchers gather and measure information about the variables of study. Furthermore, instruments serve as tools in the data collection process, and their quality significantly influences the quality of the data obtained (Sugiyono, 2019).

The data collection techniques employed include interviews, questionnaires, and test. Interviews were conducted with the eleventh-grade mathematics teacher at SMA N 5 Jambi City to analyze students, curriculum, and the learning environment, aiming to understand the instruction implemented and ensure the media development aligned with the needs of teachers and students. Additionally, the researcher interviewed students in class XI to gather information regarding the practicality of the developed teaching materials. Another instrument used was the questionnaire, administered for expert validation and practicality response. Specifically, validation questionnaires were administered to material experts, media experts, and language experts.

Material experts utilized questionnaires (validation sheets) to assess the suitability of the linear programming material within the Kvisoft flipbook, covering content feasibility, presentation, and language aspects of the developed product. Media experts evaluated the product's appearance, focusing on the attractiveness and usability of the Kvisoft flipbook media, with scoring indicators including the simplicity, balance, form, and color of the media. Validation by language experts was conducted to ensure the Kvisoft flipbook utilized appropriate and easy-to-comprehend language, with assessment aspects covering linguistic clarity and suitability for the target audience. Furthermore, a response questionnaire was distributed to one of the mathematics teachers and students at SMA N 5 Jambi City to test the practicality of the Kvisoft flipbook for linear programming material and to gauge student interest in the well-developed and validated features. A post-test consisting of 5 questions was administered by the researcher to observe the potential effect of the developed product on student learning outcomes.

Results and Discussion

This section discusses the research findings based on the sequential steps of the ADDIE development research method, which have been elaborated upon in the preceding chapter. The product resulting from this development is the mathematics learning media utilizing the Kvisoft Flipbook application for linear programming material. This chapter covers the development steps of the media carried out throughout the development process. The following is an explanation of the phases of the ADDIE development research, namely

the analysis, design, development, implementation, and evaluation stages that have been conducted.

Analysis

The initial phase, Analysis, involved several key activities: curriculum and material analysis, student analysis, and environmental analysis. Based on the interviews conducted, the curriculum used at SMA N 5 Jambi City is the Merdeka Curriculum. The material to be developed within the Kvisoft flipbook media was tailored to the Merdeka Curriculum, specifically aligning with the Core Competencies (SK), Basic Competencies (KD), and the intended Achievement Indicators for students on the linear programming material.

The student analysis was carried out to understand the characteristics of students in the mathematics learning process. The researcher first determined SMA N 5 Jambi City as the research location, with the research subjects being eleventh-grade students. Discussions with the mathematics teacher, Mr. Asmadi, S.Pd., revealed that students still exhibited a low interest in mathematics learning. Consequently, students require learning media, such as a flipbook, that is expected to increase their interest and motivation in studying mathematics.

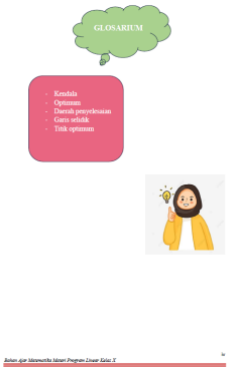
Environmental analysis was performed to determine whether the environment at SMA N 5 Jambi City was conducive to conducting research using the Kvisoft flipbook application-based learning media. The researcher's observations indicated that SMA N 5 Jambi City already has an internet network that supports application-based research. Furthermore, all students at SMA N 5 Jambi City, especially those in the eleventh grade, possess smartphones that can be used as a platform for the learning process utilizing the media.

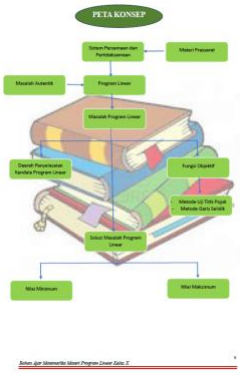
Design

Following the results of the analysis stage, the Design phase involved the researcher planning the Kvisoft flipbook-based mathematics learning media for linear programming material, as well as designing the validation sheets for the developed media. The first step was Material Design, where the researcher created the draft of the linear programming material by collecting it from several sources and references aligned with the Merdeka Curriculum. This material was then loaded and inputted into the layout design of the Kvisoft flipbook media. The second step was Layout Design, where the researcher designed the layout of the Kvisoft flipbook media in MS Word, which would subsequently be converted into a PDF file. The displays included in this learning media are the cover,

glossary, table of contents, instructions for using the teaching material, an introduction containing basic competencies, indicators, and learning objectives, a concept map, the material display, and a practice questions display. This completes the explanation of the design for each page of the Kvisoft flipbook application-based mathematics learning media for linear programming material.

Table 1. Design of the Kvisoft Flipbook Learning Media Display.

No.	Design of the Kvisoft Flipbook Learning Media Display	Description
1.	Cover Design 	The cover page is the initial display page that appears when the learning media is opened and operated. This page contains options to open the home page, material, or video.
2.	Table of Contents Design 	This page contains the table of contents, providing information on the corresponding page for the desired information in the learning media.
3.	Glossary 	A list of important words or terms used in the Kvisoft Flipbook-based mathematics teaching material for linear programming.
4.	Concept Map	This page contains the title of the concept map for the linear programming material.

		
5.	Introduction Design 	This page contains a description of the teaching material, prerequisites, instructions for using the teaching material, final learning outcome objectives, and Important Information related to the materials that must be mastered first before studying linear programming.
6.	Care Competencies 	Contains the core competencies, basic competencies, learning indicators, and learning objectives.
7.	Video Display Design 	Contains learning videos related to linear programming material that can be accessed and watched by students when opening the teaching material.
8.	Closing	Contains the conclusion and the researcher's expectations regarding the

		developed teaching material

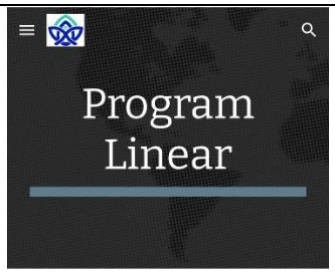
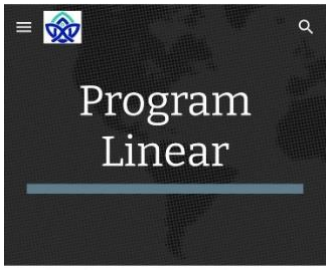
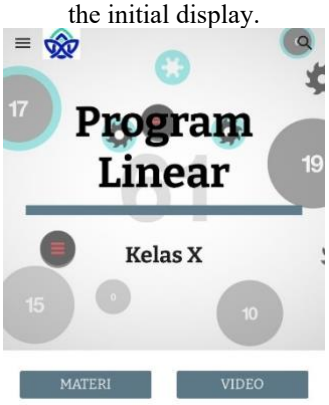
Development

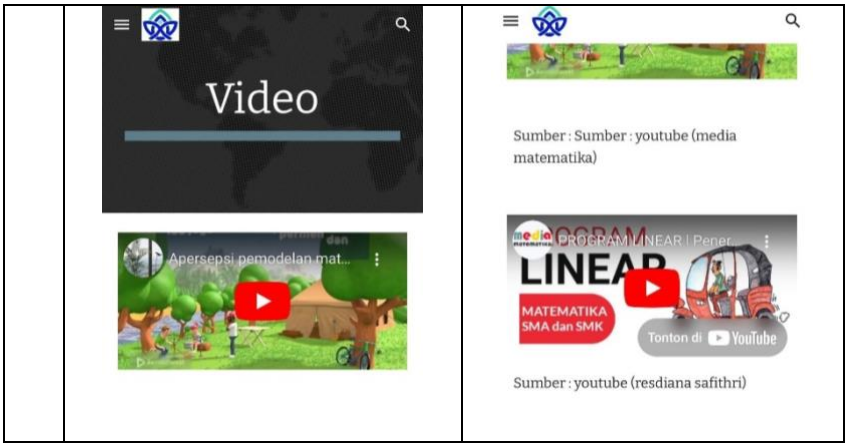
At this stage, the researcher created the Kvisoft flipbook learning media for linear programming material by initially drafting the teaching material in Ms. Word, then converting the file to PDF, after which complementary materials like internet-sourced images were gathered and integrated into the PDF file, followed by inputting the final PDF file into the Kvisoft flipbook application, and finally adding YouTube-sourced videos within the application, starting with opening the application and clicking New Project.

The phase following product creation was the validation stage, carried out by validators. In this research, the validation was conducted in August 2024. Validation was performed by the media expert validator, Ibu Desy Rahmawarni, M.Pd, a lecturer at UIN Sulthan Thaha Saifuddin Jambi, who assessed the aspects of display and programming. The material expert validator, Ibu Chintya Putri Pratiwi, M.Pd, also a lecturer at UIN Sulthan Thaha Saifuddin Jambi, assessed the aspects of learning, material content, language, questions, and usability. The results from the expert validation were used as a reference to improve the learning media, ensuring its suitability for use. The results of the validation assessment by the validators can be seen in the following table:

Table 2. Suggestions and Revisions from Validators on the Kvisoft Flipbook Mathematics Learning Media for Linear Programming Material

No.	Before Revision	After Revision
1.	The color on the media's initial display should be made more attractive and include class information.	Make the initial display color more attractive and provide class information.

		
2.	Include options for a navigation menu on the initial display. 	Add navigation menu options on the initial display. 
3.	Provide information regarding the source of the video included.  	Include the source information for the listed videos.  Sumber : Youtube (Matt-Asiik)  Sumber : Sumber : youtube (media matematika)
4.	Add a video created by the researcher themselves.	Add a video created by the researcher.



The instructional media link is available here
https://sites.google.com/view/testingflipbook/home?

Implementation

The subsequent phase, after the product was declared valid based on the validation results, involved conducting product trials on eleventh-grade students at SMA N 5 Jambi City, encompassing two groups: a small-group trial and a large-group trial. The small-group trial was executed on Friday, August 30, 2024, involving 10 students from class XI (categorized as having high, moderate, and low abilities), who were given a questionnaire to assess the practicality of the developed product for the learning process after being provided access to the Kvisoft flipbook media via their smartphones and tasked to provide feedback, comments, and suggestions regarding the media. The results of the small-group trial can be observed in the following table:

Table 3. Results of the Small-Group Trial Questionnaire.

No.	Respondents	Percentage
1.	R3, R9, R10	100%
2.	R1, R2	98,46%
3.	R4, R5, R7, R8	96,92%
4.	R6	95,38%

Based on Table 3, the average percentage from the small-group trial questionnaire assessment on 10 students (with high, moderate, and low abilities) was 97.69%, thus indicating that the Kvisoft flipbook learning media for linear programming material is highly practical. Furthermore, the students provided comments and suggestions regarding the developed product.

Evaluation

The subsequent step involved the large-group trial, which engaged 24 students from class XI 5 of SMA N 5 Jambi City. This stage was conducted across three mathematics lessons to thoroughly assess the practicality of the Kvisoft flipbook learning media for linear programming material. During the third meeting, conducted on September 18, 2024, students were administered a post-test (consisting of 5 expert-validated essay questions) after utilizing the Kvisoft flipbook. The main purpose of this phase was to evaluate the potential effect of the media on student learning outcomes, using a Minimum Completeness Criterion (KKM) of 75. The post-test results showed that out of 24 students, 21 students (87.50%) met the KKM, while 3 students did not, thus demonstrating the effectiveness of the e-module based on student completeness. The percentage of e-module effectiveness calculated from student learning outcomes, viewed through student completeness, is as follows:

$$p = \frac{p_a}{p_b} \times 100\%$$

$$p = \frac{21}{24} \times 100\%$$

$$p = 87{,}5\%$$

Based on the percentage obtained, it can be concluded that the Kvisoft flipbook learning media for linear programming material is highly effective. This potential effect is evident from the extent to which the Kvisoft flipbook media fulfilled the validity and practicality criteria, as well as the students' learning outcomes. The results indicate that this learning media is capable of providing a relevant and applicable learning experience, supporting a better understanding of mathematical concepts, and ensuring that student learning outcomes meet the comprehensive criteria. This signifies that the Kvisoft flipbook learning media for linear programming material has a significant impact on learning outcomes.

Discussion

The discussion section of the report confirms that this research is a development study aimed at producing, developing, and validating the Kvisoft Flipbook media specifically for Linear Program material in Mathematics, with the entire development process strictly adhering to the ADDIE model, which stands for Analysis, Design, Development, Implementation, and Evaluation. The initial analysis stage, which involved interviews with the mathematics teacher at SMA N 5 Kota Jambi, successfully identified a

key problem: a lack of student interest in mathematics due to the absence of varied learning media, despite the availability of technological resources, leading to the decision to develop the engaging and practical Kvisoft flipbook. Following development, the media underwent rigorous validation by material, media, and language experts, and the results consistently placed the media in the "Very Valid" category across all aspects, thereby confirming its suitability as a teaching material with only minor revisions needed. Furthermore, the practicality of the media was thoroughly assessed through feedback from both the teacher and the students during small and large group trials; specifically, the subject teacher rated the media's practicality as 97%, or "Very Practical," while student responses from the large group trial yielded a similar score of 95.51%, also classified as "Very Practical." Qualitative feedback universally praised the Kvisoft flipbook for being helpful in understanding the subject matter, motivational, concise, visually attractive, and practical for flexible learning.

Finally, the evaluation stage measured the media's potential effect on student learning outcomes using a posttest, which revealed an effectiveness percentage of 87.50%, thus categorizing the Kvisoft Flipbook media as "Very Effective." In summary, the discussion concludes that the Kvisoft Flipbook media developed for the Linear Program material is highly validated, immensely practical for classroom use, and demonstrates a significant potential effect on improving student learning outcomes.

Conclusion and Suggestion

Based on the results of the research and development conducted, it can be concluded that the Kvisoft flipbook mathematics learning media on linear programming material is declared very valid according to assessments from the material, media, and language experts. The validation covered aspects of content feasibility, presentation, language, and graphics, with the material expert percentage at 95.3% ("very valid" category), the media expert at 96% ("very valid" category), and the language expert at 96% ("very valid" category). This shows that the Kvisoft flipbook learning media is very valid and suitable for use as teaching material with minor revisions.

Student responses during the small-group trial stage, indicated by a percentage of 97.69%, demonstrate that the Kvisoft flipbook learning media is highly practical for use in learning. Furthermore, in the large-group trial stage, this learning media obtained a percentage of 95.51%, confirming that the Kvisoft flipbook learning media is highly

effective when used in teaching and learning activities for linear programming material. Moreover, learning using the Kvisoft flipbook media possesses a potential effect on learning outcomes, evidenced by the post-test results where 87.50% of students achieved mastery criteria (completed) and 12.50% did not. Thus, the percentage of the potential effect of the Kvisoft flipbook learning media, viewed from student completeness, is 87.50%, classifying it as very effective in enhancing student learning outcomes for linear programming material.

Several suggestions can be proposed based on the results of this research and development. Firstly, students are recommended to increase their learning intensity through various learning media, both digital and conventional, to enhance their skills in solving problems. Secondly, for teachers, the Kvisoft flipbook learning media serves as a new learning resource, and they are encouraged to utilize various available media to develop competence in the learning process. Lastly, for future researchers, it is suggested to broaden the scope by adding or exploring new variables. The use of more diverse variables will yield more comprehensive conclusions and provide useful references for future research.

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