Development of Canva-Based Mathematics Learning Media to Improve Conceptual Understanding of the System of Linear Equations in Two Variables for Grade VIII Students

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ABSTRAK

This study aims to develop Canva-based learning media that are valid, practical, and effective in improving students' conceptual understanding of the System of Linear Equations in Two Variables (SLETV) among eighth-grade students at SMP Negeri 1 Padang Bolak Julu. The research employed a Research and Development (R&D) method using the ADDIE model, which includes the stages of Analysis, Design, Development, Implementation, and Evaluation. The research instruments consisted of questionnaires and tests to measure the validity, practicality, and effectiveness of the media. The validation results indicated that the Canva-based learning media met the valid criteria, with an average score of 75% from media experts, and were categorized as highly valid in the material and language aspects with scores above 80% and 91.4%, respectively. The practicality tests conducted by teachers and students obtained scores of 96% and 90.02%, respectively, categorized as very practical, while the effectiveness test showed a high N-Gain value, indicating a significant improvement in students' conceptual understanding. The novelty of this study lies in the integration of the Canva platform as a systematically designed interactive digital medium that supports engaging, communicative, and meaningful mathematics learning. The results indicate that the Canva-based learning media improved students' conceptual understanding of the system of linear equations in two variables. In addition, the learning process showed increased student participation compared to the pre-implementation stage.

Keywords: Canva, Mathematics Learning Media, SLETV

INTRODUCTION

Conceptual understanding in mathematics is a fundamental competence that determines students' ability to solve problems logically and systematically. Students with strong conceptual understanding are better able to connect mathematical ideas and apply them in various problem-solving situations. However, many students still experience difficulties in developing conceptual understanding, particularly in algebraic topics such as Systems of Linear Equations in Two

Variables (SLETV). Previous studies report that limited conceptual understanding often leads to difficulties in identifying relationships between variables and applying mathematical concepts in new contexts (Muhammad Fuad Tiew et al., 2023). In many classrooms, the learning process still emphasizes procedural fluency and memorization of formulas rather than conceptual reasoning, which reduces students' opportunities to develop deeper mathematical understanding (Suraji et al., 2018). As a result, students' conceptual mastery remains low and significantly affects their learning achievement, which in many schools still falls below the Minimum Mastery Criteria (KKM) (Ferita & Retnawati, 2016)

In several schools, including SMPN 1 Padang Bolak Julu, mathematics learning is still conducted conventionally, with teachers as the main center of instruction (teacher-centered). The teaching process is mostly one-way, dominated by lectures, and relies heavily on textbooks and static videos that lack interactivity. As a result, students' active engagement is minimal, learning experiences are shallow, and mathematical concepts are not optimally constructed through meaningful activities.

Preliminary observations revealed that only 4 out of 25 students (16%) achieved the Minimum Mastery Criteria (KKM) in the SPLDV topic. This indicates that most students struggle to understand SPLDV concepts, both in routine and contextual problems. Such conditions strongly signal the need for more innovative learning strategies that actively involve students, making the learning process more interactive, engaging, and conceptually oriented.

In today's digital era, integrating technology into learning is no longer an option but a necessity. One innovation that can be implemented is the development of Canva-based mathematics learning media. Canva is a graphic design platform equipped with diverse visual features and interactive templates that enable teachers to design digital learning materials that are both informative and aesthetically engaging, easily accessible on mobile devices and computers (Tiani et al., 2019).

By using Canva, teachers can create learning materials that combine text, images, illustrations, symbols, and activity links, encouraging students to learn independently or collaboratively. The attractive visualizations and interactive features offered by Canva have been proven to maintain students' focus, enhance motivation, and strengthen engagement in the learning process (Kariimah & Fatikhah, 2024)

Previous studies also confirm that interactive digital learning media effectively improve learning outcomes and motivation. For example, research on students' mathematical conceptual understanding at the junior high school level revealed that their comprehension remains low and requires concept-oriented learning interventions (Riri Hoeriyah & Lessa Roesdiana, 2025). In addition, a study found that the use of interactive digital worksheets for Grade 7 significantly increased both motivation (from 62.48 to 82.71) and classical completeness (from 63.33% to 90%) in mathematics learning(Yona, n.d.). Another study showed that the integration of computer-assisted interactive multimedia for mathematics problem solving significantly elevated scores (pre-test 44.81 → post-test 76.92) and improved student motivation (73.64% positive response) when implemented in junior high school mathematics classes (Indu & Djara, 2024). Together, these findings strongly underscore the critical role of interactive digital media in enhancing both motivation and deeper conceptual understanding in mathematics learning. However, previous studies mainly focused on general digital learning media and have not specifically developed Canva-based learning media for the topic of Systems of Linear Equations in Two Variables (SLETV). In addition, there is still limited research that systematically evaluates the validity, practicality, and effectiveness of Canva-based learning media using the ADDIE development

model for this topic. Therefore, this study aims to develop Canva-based mathematics learning media using the ADDIE model to improve students' conceptual understanding of SLETV.

Therefore, developing Canva-based mathematics learning media for SPLDV has great potential to enhance the quality of mathematics learning at the junior high school level. However, research specifically focusing on Canva-based media for SPLDV material in junior high schools remains limited.

Hence, this study focuses on developing a valid, practical, and effective Canva-based mathematics learning media to improve students' conceptual understanding of SPLDV in Grade VIII at SMPN 1 Padang Bolak Julu. This media is expected to serve as a relevant and innovative alternative to enhance the quality of mathematics learning, especially for fundamental yet essential topics such as SPLDV.

LITERATURE REVIEW

1. The Concept of Mathematics Learning and Conceptual Understanding

Conceptual understanding in mathematics learning is crucial so that students do not merely memorize procedures but truly comprehend why a method is used and how concepts interrelate, enabling them to solve new problems logically and systematically. A book emphasizes that students' ability to "explain, connect, and apply" mathematical concepts is the main indicator of conceptual understanding (Jin, 2022). Furthermore, Pólya (1945) stated that success in solving mathematical problems largely depends on understanding the problem itself before applying the procedures for its solution.

2. SPLDV

The topic of SPLDV is one of the essential subjects in junior high school mathematics as it serves as a bridge between basic and advanced algebra. Textbooks highlight that students must be able to model real-life problems mathematically, solve them using elimination/substitution methods, and interpret the results in real contexts (Sihite, n.d.). In addition, a practical mathematics handbook explains that students who only memorize formulas without understanding the fundamental ideas—such as coefficients, variables, and relationships among variables—often struggle to solve problems and to apply the concepts in new contexts (Nurcahyono, 2018).

3. Learning Media in the Digital Context

Studies show that interactive digital learning media can enhance student engagement, reinforce conceptual understanding, and increase learning motivation compared to conventional media. For example, a study on developing digital media for geometry learning demonstrated that the ADDIE-based model produced a high n-gain score and highly positive student responses (Intan Januarisa Setyawati Fermansyah et al., 2025). Moreover, another study found that interactive digital media designed with consideration of visual, auditory, and kinesthetic learning styles improved students' achievement scores by up to 80% (Hasbi, 2025).

4. Canva as an Interactive Learning Medium

The use of graphic design platforms such as Canva in mathematics learning allows the integration of text, images, illustrations, animations, and interactive elements that can be accessed through mobile or computer devices, supporting both independent and collaborative learning (faishal, 2025). Another study reported that interactive learning media based on Canva

were proven valid and effective in improving students' motivation and comprehension in mathematics, particularly among those with initially low motivation (Sindi Awaliya et al., 2025)

5. Previous Related Studies

Several previous studies, especially at the junior high school level, have shown that Canva-based or other interactive digital media can improve students' learning outcomes and motivation while facilitating deeper conceptual learning. For instance, research on Canva-based interactive media for teaching fractions in elementary schools reported very high validity, practicality, and effectiveness (Rahmawati & Nurafni, 2024). Furthermore, the development of Canva-assisted interactive multimedia for geometry transformation in Grade VIII junior high school proved feasible and potentially applicable in mathematics classrooms (Lestiana et al., 2025).

METHODOLOGY

This study employs a Research and Development (R&D) method using the ADDIE model (Analysis, Design, Development, Implementation, and Evaluation) to produce a Canva-based learning media that is valid, practical, and effective in improving students' conceptual understanding of the System of Linear Equations in Two Variables (SLETV) among eighth-grade students at SMPN 1 Padang Bolak Julu. The research was conducted from August 30 to September 30, 2025, involving eighth-grade students in the 2025/2026 academic year. The The population of this study consisted of all students of SMP Negeri 1 Padang Bolak Julu. The sample was one class of Grade VIII students consisting of 25 students who had studied the topic of Systems of Linear Equations in Two Variables (SLETV) according to the applicable curriculum. This class was selected as the participants in the implementation of the Canva-based mathematics learning media developed in this research.. Data collection instruments included questionnaires and tests. The questionnaires consisted of student and teacher response questionnaires used to assess the practicality and user responses toward the Canva-based mathematics learning media. In addition, a conceptual understanding test on the topic of Systems of Linear Equations in Two Variables (SLETV) was administered to measure students' conceptual understanding after the implementation of the developed media.. The questionnaire was used to assess the validity, practicality, and user responses toward the Canva-based learning media, while the test was used to measure the effectiveness of the media through a comparison of pretest and posttest results.

Validity data were obtained through expert validation conducted by six validators from UIN Syekh Ali Hasan Ahmad Addary Padangsidimpuan. The validators consisted of two media experts, two material experts, and two language experts. The media experts were lecturers specializing in instructional media, the material experts were lecturers in mathematics education, and the language experts were lecturers specializing in linguistics. The validation process used a Likert scale ranging from 1 to 5. Each expert assessed the learning media according to their area of expertise. The media experts evaluated aspects of media design and content presentation, the material experts assessed the suitability of the learning materials with the Grade VIII junior high school mathematics curriculum, and the language experts evaluated the linguistic aspects and clarity of language used in the media. Practicality data were collected through teacher and student response questionnaires, while effectiveness data were obtained from the results of students' conceptual understanding tests on the topic of Systems of Linear Equations in Two Variables (SLETV). The collected data were analyzed descriptively.

Table 1. Criteria for Media Validity Results

No	Interval	Criteria
1	81 % ≤ P ≤ 100 %	Very Valid
2	61 % ≤ P < 80 %	Valid
3	41 % ≤ P < 60 %	Quite Valid
4	21 % ≤ P < 40 %	Non Quite Valid
5	0 % ≤ P < 20 %	Not Valid

Practicality data obtained from teacher and student response questionnaires were also analyzed using percentage analysis. The formula for the N-Gain score is as follows:

$$N_{Gain} = \frac{Score\ of\ Posttest - Score\ of\ Pretest}{Score\ of\ Ideal - Score\ of\ Pretest}$$

After the percentage value is obtained, the results are categorized based on the criteria shown in the following table.

Table 2. Criteria of Gain Termomalization

Score of N-Gain	Interpretation
$0,70 \leq g \leq 100$	High
$0,30 \leq g < 0,70$	Moderate
$0,00 < g < 0,30$	Low
$g = 0,00$	No Increase
$-1,00 \leq g < 0,00$	Decrease

Table 3. Criteria of Effectiveness

Percentace (%)	Interpretation
< 40	No effective
40-55	Less effective
56-75	Quite effective
>76	effective

Meanwhile, the effectiveness of the learning media in improving students' conceptual understanding was analyzed using the normalized gain (N-Gain) formula proposed by Hake, which compares the pre-test and post-test scores to determine the level of learning improvement. (Hake, 1999).
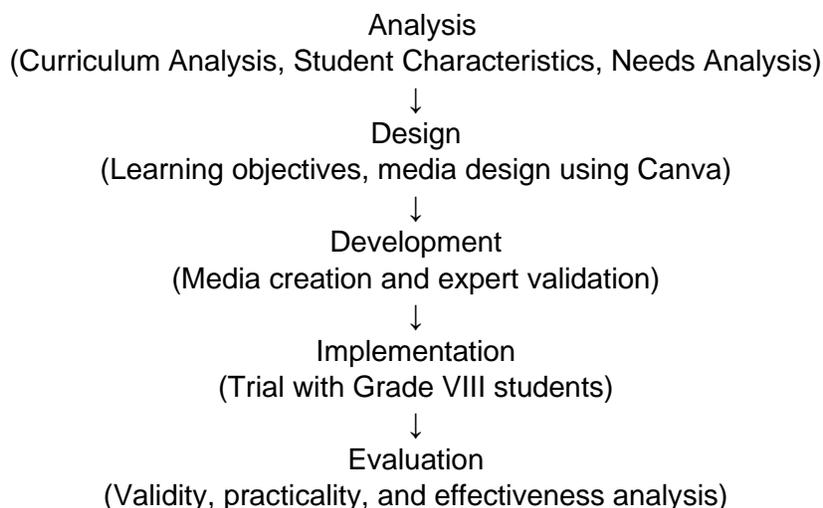
Analysis
(Curriculum Analysis, Student Characteristics, Needs Analysis)
↓
Design
(Learning objectives, media design using Canva)
↓
Development
(Media creation and expert validation)
↓
Implementation
(Trial with Grade VIII students)
↓
Evaluation
(Validity, practicality, and effectiveness analysis)

Figure 1. The stages of the ADDIE development model

RESULTS

A. Analysis

The analysis stage is a crucial initial step in this research to identify the fundamental needs for designing a Canva-based learning media effectively. The analysis was conducted on the curriculum, learning needs, and characteristics of eighth-grade students in the topic of System of Linear Equations in Two Variables (SLETV). The results of this analysis serve as the foundation for developing the media to ensure it meets students' needs and enhances their motivation, engagement, and conceptual understanding in learning mathematics.

1. Analysis of Curriculum

    SMP Negeri 1 Padang Bolak Julu implements the Merdeka Curriculum, which emphasizes flexible, student-centered learning focused on conceptual understanding. The development of this Canva-based learning media refers to the Learning Outcomes (CP), Learning Objectives Flow (ATP), and Learning Objectives (TP) outlined in the 2022 Ministry of Education and Culture regulations. The SLETV material is designed to be relevant to real-life contexts through interactive, visual, and contextual presentations that enhance students' critical and analytical thinking skills. This media is developed to support the Merdeka Curriculum's demand for innovation and independent learning.

2. Analysis of Student Characteristics

    The analysis of student characteristics focused on learning styles, prior knowledge, and attitudes toward mathematics. The results of the questionnaire distributed to 30 students showed that 80% of students preferred visual learning, 73% preferred interactive learning, and 67% preferred contextual examples in mathematics learning. In addition, 90% of students were able to operate Android devices for learning purposes, indicating that students have adequate digital literacy. These findings indicate that students are ready to use digital learning media in the learning process.

Table 4. Student Learning Preferences

Learning Preference	Percentage
Visual learning	80%
Interactive learning	73%
Contextual learning	67%
Able to use Android devices	90%

3. Analysis of Needs

    The needs analysis was conducted through observations and interviews with teachers and students. The results showed that 85% of students stated that mathematics learning mostly relied on textbooks, while only 15% of students had experienced digital learning media in mathematics classes. In addition, 78% of students expressed interest in learning mathematics using technology-based media. Therefore, the development of Canva-based media is seen as an innovative solution to increase students' motivation, engagement, and conceptual understanding in mathematics learning.

Table 5. The Result of Needs Analysis

Indicator	Percentage

Learning uses textbooks only	85%
Learning uses digital media	15%
Students interested in digital learning media	78%

B. Design

1. Product Spesification

         This Canva-based learning media was developed to enhance students' understanding of the System of Linear Equations in Two Variables (SLETV) in eighth-grade students at SMP Negeri 1 Padang Bolak Julu. The product features an engaging and interactive design that includes an introductory page, learning outcomes and objectives, and a systematic material flow, enabling students to learn actively, contextually, and meaningfully.
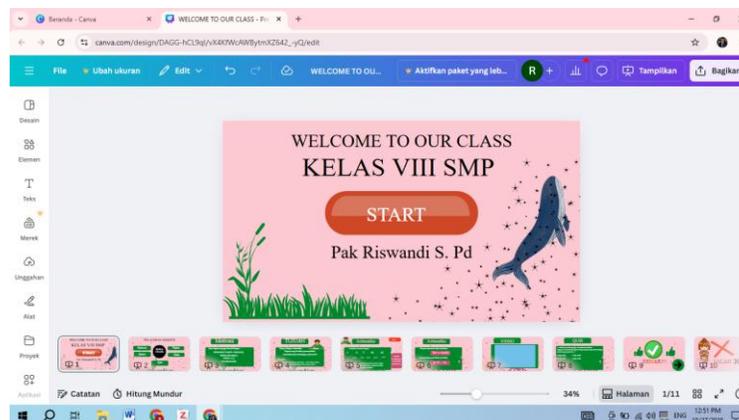
2. Prototype

Figure 2. The opening page of the Canva-based learning media was designed by the researcher to be as attractive as possible in order to match the interests of junior high school students.
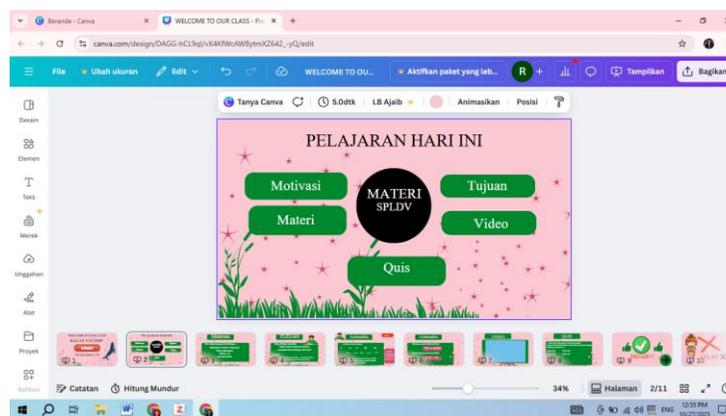

Figure 3. This page explains all the activities in the subtopic of the System of Linear Equations in Two Variables (SLETV). All the icons are clickable and directly linked to the corresponding pages.
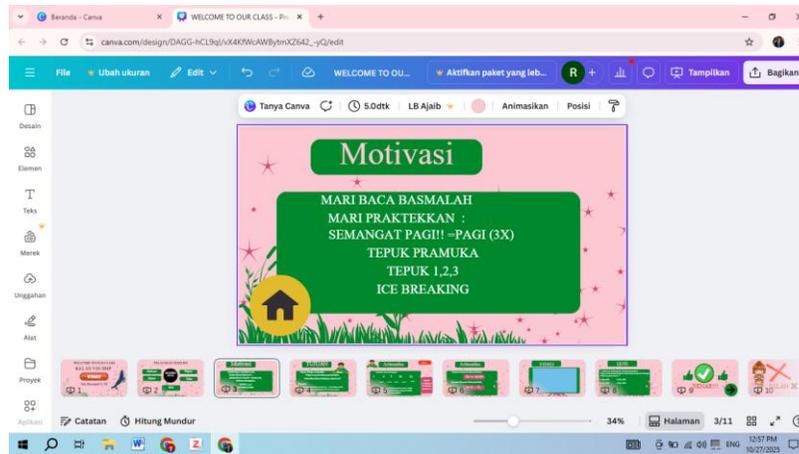
Figure 4. The researcher provides a page for student ice-breaking activities before starting the class.

Figure 5. The researcher presents the learning objectives at the beginning by providing stimulating questions.
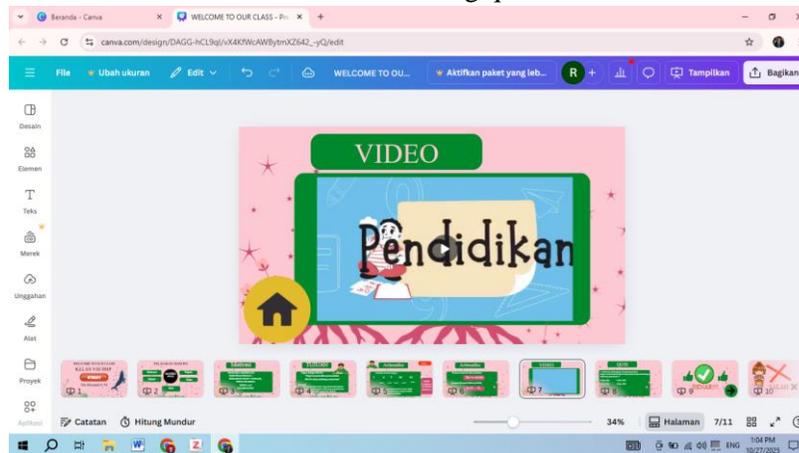

Figure 6. There is a video to watch and discuss together during the learning process.
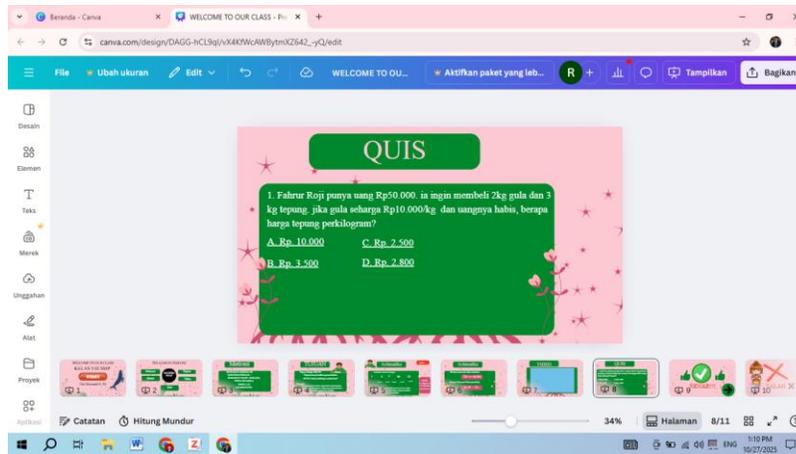
Figure 7. A quiz page is provided to assess students' understanding, containing multiple-choice questions that, when clicked, directly indicate whether the answer is correct or incorrect.
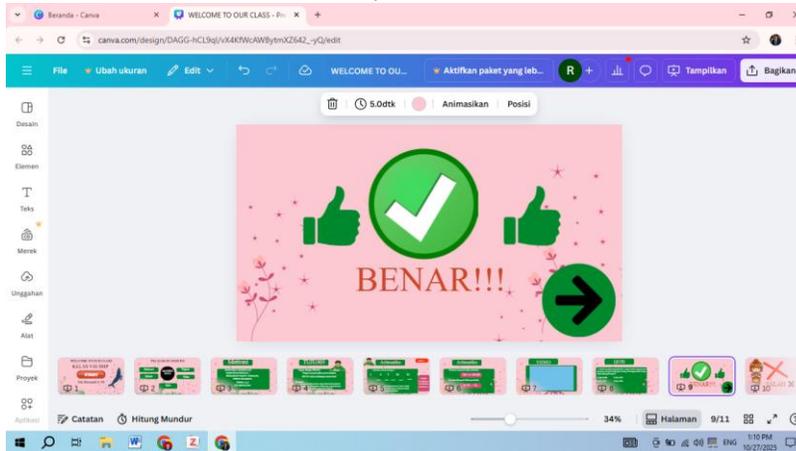

Figure 8. The page will automatically navigate here if the answer selected in the multiple-choice question is correct.
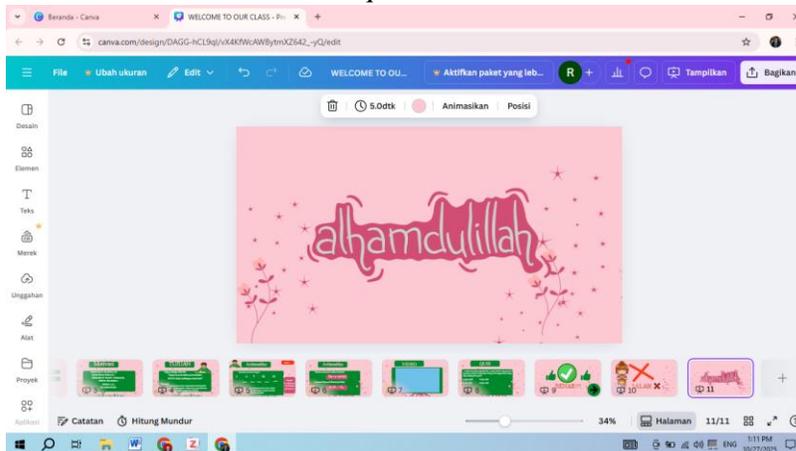

Figure 9. The last page of canva-based learning media

C. Development
1. The Results of The Material Expert's Assessment

Table 6. The Results of The Material Expert's Assessment

No	Aspect	∑ Score per Aspect		Score of Max	%	Category
		I	II			
1	Learning	12	13	25	30	83%	*Very Valid*
2	Content	8	8	16	20	80%	*Valid*
3	Language	4	4	8	10	80%	*Valid*
4	Question	4	4	8	10	80%	*Valid*
5	Function	11	13	24	30	80%	*Valid*
	Total	**39**	**42**	**81**	**100**	**81%**	*Very Valid*

Based on the results of the material expert's assessment, the learning aspect obtained a score of 25 out of 30 (83%), the content aspect 16 out of 20 (80%), the language aspect 8 out of 10 (80%), the question aspect 8 out of 10 (80%), and the usability aspect 24 out of 30 (80%). Overall, based on the validity criteria presented in Table 1, the Canva-based learning media obtained an overall score of 81%, which falls into the very valid category. the average validity score reached 81% of the maximum score of 100, indicating that the Canva-based learning media is highly valid and suitable for use in the learning process.

2. The Results of The Media Expert's Assessment

Table 7. The Results of The Media Expert's Assessment

No	Aspect	∑ Score per Aspect	Score of Max	%	category
1	View	28	40	70	*Valid*
2	Programing	32	40	80	*Valid*
	Total	**60**	**80**	**75**	*Valid*

Based on the results of the media expert's assessment, the display aspect obtained a score of 28 out of 40 (70%), and the programming aspect obtained a score of 32 out of 40 (80%). Overall, the average validity score reached 75% with a total score of 60 out of a maximum of 80, indicating that the Canva-based learning media meets the valid criteria.

3. The Results of The Language Expert's Assessment

Table 8. The Results of The Language Expert's Assessment

No	Aspect	Analysis	Validator	
			1	2
1	Content validity	Score	19	**16**
		Max Score	20	
		Mean	4.75	**4**
		Total of Mean	**4.38**	
		Persentase	**88.5**	
		Criteria	**Very Valid**	

2	Language	Total of score	37	
		Max Score	40	
		Mean	4.63	
		Total of Mean	**4,57**	
		Persentase	**92,3**	
		Criteria	**Very Valid**	
	Mean of Persentase	**91,4**		
	Criteria	**Very Valid**		

Based on the results of the language expert's validation, the Canva-based learning media received an assessment in the "Highly Valid" category across all evaluated aspects. The lowest validity percentage was 88.5%, while the highest reached 91.3%, with an overall average of 91.4%, classified as "Highly Valid." Thus, it can be concluded that the Canva-based learning media on the System of Linear Equations in Two Variables (SLETV) has met good and communicative language criteria and is suitable for the field trial stage.

D. Implementation

The practicality test of the Canva-based learning media was conducted involving one mathematics teacher and 25 eighth-grade students of SMP Negeri 1 Padang Bolak Julu. The practicality data were collected using questionnaires distributed to both the teacher and students after the implementation of the learning media. Each questionnaire consisted of 15 statement items measured using a Likert scale. The questionnaire items were developed based on three main indicators of practicality, namely media attractiveness, material aspect, and language delivery. The media attractiveness indicator evaluated the visual appeal and students' interest in using the media, the material indicator assessed the suitability and clarity of the learning content, while the language delivery indicator examined the clarity and comprehensibility of the language used in the media. The results of the questionnaires were then analyzed using percentage analysis to determine the level of practicality of the developed learning media.

1. The Teacher's Practicality Assessment

Table 9. The Teacher's Practicality Assessment

Angket Scoring	Total of Score
Angket for Response of teacher	72
Score of Max	75
Persentase	96%
criteria	Very Practical

Based on the data in the table regarding the teacher's practicality assessment of the Canva-based learning media in improving students' understanding of the System of Linear Equations in Two Variables (SLETV) in eighth-grade students at SMP Negeri 1

Padang Bolak Julu, a score of 72 out of a maximum of 75 was obtained. This result indicates that the media achieved a 96% score, which falls into the "highly practical" category.

2. **The Students' Practicality Assessment**

Table 10. The Students' Practicality Assessment

Angket Scoring	Total of Score
Angket for response of student	67,52
Mean of score	67,52
Score of Max	75
Persentase	90,02%
criteria	Very practical

After implementation, the results of the student response questionnaire toward the Canva-based learning media showed an average score of 67.52 out of 75, with an overall percentage of 90.02%. Based on the score interval and practicality categories, it can be concluded that the Canva-based learning media developed to improve students' understanding of the System of Linear Equations in Two Variables (SLETV) in eighth-grade students at SMP Negeri 1 Padang Bolak Julu meets the "highly practical" criteria.

E. Evaluation

Table 11. The Rresult of N-Gain Score

Scoring	Mean for Pretest Score	Mean for Posttest Score	Mean of N-Gain Score	Category
N-Gain Score	56	88,6	0,74	high

Based on the table, the high N-Gain results indicate a significant improvement in students' understanding after using the Canva-based learning media. All participants showed positive progress, with the majority achieving a high N-Gain category, confirming the effectiveness of the media in enhancing comprehension of the Linear Equation System in Two Variables (LES-Two Variables). These findings demonstrate that the use of Canva effectively improves students' conceptual understanding of the LES-Two Variables material.

DISCUSSION

The results of expert validation show that the Canva-based learning media developed in this study meets the valid criteria in terms of appearance, content, and language. The media expert validation obtained an average score of 75%, indicating that the visual design and interactive functions of the media are quite good, although some improvements are still needed in aesthetic aspects to make it more attractive and consistent. Meanwhile, the material and language expert validations were categorized as highly valid, with average scores above 80% and 91.4%, respectively. This finding confirms that the content structure and language used are in accordance with the characteristics of eighth-grade students and effectively support the understanding of the SPLDV concept in a systematic and communicative way. These results align with the study by (Asih & Yuliastuti, 2025), which developed Canva-based mathematics learning

media and found a high validity level, indicating that the media was feasible for use in mathematics learning at the junior high school level.

In terms of practicality, the results of teacher assessments and student responses indicate that the Canva-based learning media are very easy to use and engaging in the learning process. The practicality test involved one mathematics teacher and 25 eighth-grade students of SMP Negeri 1 Padang Bolak Julu. The teacher practicality score reached 96%, while the student response score was 90.02%, both of which fall into the very practical category based on the predetermined practicality criteria. These results indicate that the developed learning media are easy to operate, attractive in terms of presentation, and helpful in supporting students' understanding of the learning material. The high practicality scores also show that both teachers and students responded positively to the use of Canva-based learning media in mathematics learning.confirm that the The media can create an enjoyable and effective learning experience because the learning materials are presented through attractive visual designs, clear language, and interactive features that encourage students to actively engage in the learning process.. Teachers considered the media efficient and relevant to the learning objectives, while students felt that it helped them understand concepts through appealing and interactive visuals. Similarly, (Hasanah & Fernandes, 2024) found that Canva-based learning media designed with a Problem-Based Learning model enhanced practicality, student engagement, and learning motivation in mathematics significantly. Therefore, this study reinforces that Canva can be effectively used to support interactive and student-centered learning.

The effectiveness of the media is also reflected in the high N-Gain results, indicating a significant improvement in students' conceptual understanding after using the media. All students showed positive progress, with the majority achieving a high N-Gain category. This finding demonstrates that using Canva not only facilitates material delivery but also strengthens students' conceptual understanding of the System of Linear Equations in Two Variables. Supporting this, (Harahap et al., 2024) reported that the implementation of a flipped classroom model assisted by Canva significantly improved mathematics learning outcomes at the junior high school level. Thus, the Canva-based learning media developed in this study are proven to be valid, practical, and effective in improving students' learning outcomes and have the potential to be widely implemented in mathematics learning at the junior high school level.

CONCLUSION

This study aimed to develop Canva-based learning media for the topic of Systems of Linear Equations in Two Variables (SLETV) for eighth-grade students. The results indicate that the developed media meets the criteria of validity, practicality, and effectiveness. Expert validation showed that the media achieved high validity scores across the assessed aspects, while teacher assessments and student responses demonstrated that the media is very practical to use in the learning process. In addition, the N-Gain results indicate an improvement in students' conceptual understanding after using the media. These findings suggest that Canva-based learning media can serve as an effective and practical digital learning tool to support mathematics learning in junior high schools.

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It is hoped that the results of this study will provide meaningful contributions to the field of education, especially in improving students' conceptual understanding of the System of Linear Equations in Two Variables (SLETV) through the development of Canva-based learning media as an innovative tool in mathematics learning.

CONFLICT OF INTEREST STATEMENT

The author hereby declares that there is no conflict of interest in the conduct of this research. All data, analyses, and conclusions presented in this article are entirely the result of objective scientific work, free from any form of intervention or influence from other parties, whether financial, institutional, or personal, that could compromise the integrity of the study. Furthermore, this research did not receive any external funding or financial support that might create potential bias in the results or their interpretation.

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