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INTEGRATING CLASSPOINT INTO PRESENTATION MEDIA FOR ENHANCING INTERACTIVE LINEAR ALGEBRA INSTRUCTION

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Abstract

The limited participation and motivation of students in conventional, lecturer-centered learning environments highlight the necessity for technological innovations that actively promote student engagement. This study aims to design and develop an interactive learning medium utilizing ClassPoint for the Linear Algebra course. The research adopted the ADDIE development model, encompassing the analysis, design, and development phases, and was limited to the validation stage. Two experts served as validators: one in content and the other in instructional media. Validation data were analyzed through quantitative descriptive techniques by calculating the mean percentage score and categorizing feasibility across four assessment aspects—content, presentation, language, and visual design. The validation results revealed that the ClassPoint-based learning media achieved a "highly valid" classification, with an average score exceeding 83%. These findings indicate that the developed media are suitable for classroom implementation and have strong potential to enhance students' motivation and engagement through interactive features. Future research is recommended to evaluate the effectiveness of the media during the implementation stage, particularly concerning learning outcomes and the development of 21st-century skills..

Keywords: ClassPoint, interactive learning media, media validation, Linear Algebra, ADDIE model.

INTRODUCTION

The rapid advancement of digital technology has brought significant transformations across various aspects of life, including education. The current generation of university students often referred to as *digital natives* is accustomed to interacting with technology and exhibits learning preferences distinct from previous generations. In this context, the Education 4.0 framework underscores the importance of an adaptive education system that aligns with technological progress and emphasizes the development of 21st-century competencies such as digital literacy, critical thinking, and technology-based collaboration (Suhery et al., 2022). In parallel, the theory of Connectivism posits that learning in the digital age occurs through networks connecting humans and technology, whereby students construct knowledge through links with multiple sources of information, including digital media (Siemens, 2023). This paradigm shift calls for changes in instructional approaches at the higher education level, particularly in courses characterized by abstract and complex content such as Linear Algebra.

Linear Algebra is a foundational course in mathematics education programs, encompassing abstract concepts such as vector spaces, matrices, and linear transformations. Mastery of

these topics requires high-level conceptual thinking. However, many students face difficulties comprehending these abstract ideas, especially when instruction relies heavily on conventional lecture-based methods that lack conceptual visualization and technological interactivity. In this regard, the use of instructional media capable of presenting abstract concepts in a more concrete and interactive manner has become increasingly essential (Engelbrecht & Borba, 2023; Flood et al., 2020).

A considerable body of theoretical and empirical literature supports the significance of cognitively and pedagogically designed digital learning media. One of the most widely applied frameworks is the Cognitive Theory of Multimedia Learning (CTML), which highlights the need to present information simultaneously through visual and verbal channels while managing cognitive load to prevent mental overload (Mayer, 2024). Furthermore, the Technology-Mediated Learning approach emphasizes that technology serves not merely as a delivery tool but also as a medium that facilitates meaningful interaction among students, instructors, and learning materials (St Omer et al., 2025). Together, these frameworks provide a robust theoretical foundation for designing meaningful and effective technology-enhanced learning environments (Ní Shé et al., 2023).

One promising technological innovation that can be integrated into this context is ClassPoint, a PowerPoint add-in that provides a range of interactive features, including quizzes, polls, live annotations, and real-time feedback. These features enable instructors to foster active participation among students during lessons, allowing learners to explore concepts directly while receiving immediate feedback. The use of such interactive tools not only enhances student engagement but also strengthens conceptual understanding. Several studies have demonstrated that interactive digital media can significantly improve both student motivation and learning outcomes, particularly in higher education mathematics courses (Ní Shé et al., 2023; Cevikbaş et al., 2023). Recent empirical studies further support the use of ClassPoint specifically as an interactive tool that enhances student motivation and engagement. For instance, Saadah and Indrawatiningsih (2024) reported that 100% of students were active or very active during mathematics instruction using ClassPoint (Saadah & Indrawatiningsih, 2024), and Muliani (2023) found that the use of ClassPoint media significantly improved students' motivation in physics learning (Muliani, 2023).

Despite the increasing integration of technology in mathematics education, the application of ClassPoint in the specific context of Linear Algebra instruction remains underexplored in academic literature. Most previous studies have focused on the use of Learning Management Systems (LMS) or visualization software such as GeoGebra (Prahani et al., 2022; Zakariashvili, 2022; Chen et al., 2022), with limited attention given to the potential of ClassPoint as an interactive teaching tool tailored to the characteristics of the subject matter and the learning needs of contemporary students. This gap highlights the need for research focused on developing ClassPoint-based interactive learning media designed specifically to support conceptual understanding in Linear Algebra.

Accordingly, this study focuses on developing an interactive ClassPoint-based learning medium for Linear Algebra courses, limited to the product validation phase without extending to classroom implementation. This limitation is intentional and methodologically grounded, as the study is part of a multi-year Research and Development (R&D) project. The first year emphasizes product development and expert validation to ensure the instructional media meets feasibility and quality standards before implementation. Given that R&D requires a sequential and

time-intensive process, each stage is distributed across different phases of the project to maintain depth and focus. The subsequent phase, planned for the second year, will involve classroom implementation and evaluation to measure the media's effectiveness in improving student learning outcomes. This scope was intentionally defined to ensure that the development process concentrated on the design, content validity, linguistic clarity, and graphical quality of the media prior to classroom application. Based on this context, the research question guiding this study is: "How is the development process and validation outcome of the ClassPoint-based interactive learning media for Linear Algebra courses?" The results of this research are expected to contribute meaningfully to the advancement of innovative and effective technology-based learning strategies that address the evolving needs of students in the digital era.

METHOD

This study is a Research and Development (R&D) study that aims to produce interactive learning media based on ClassPoint for the Linear Algebra course. According to Gall, Gall, and Borg (2003), educational research and development is a systematic process used to develop and validate educational products. In line with this, Dick, Carey, and Carey (2015) explain that research and development in the educational context include the process of translating design specifications into physical forms related to systematic instructional design, development, and continuous evaluation to create effective products.

The development model used in this study is the ADDIE model, which consists of five main stages: Analyze, Design, Develop, Implement, and Evaluate (Branch, 2009). This model was chosen because it is systematic, flexible, and widely used in instructional media development research (Kasmawati et al., 2023). However, this study was limited only to the development and product validation stages (the Develop phase), so the Implement and Evaluate stages were not fully carried out.

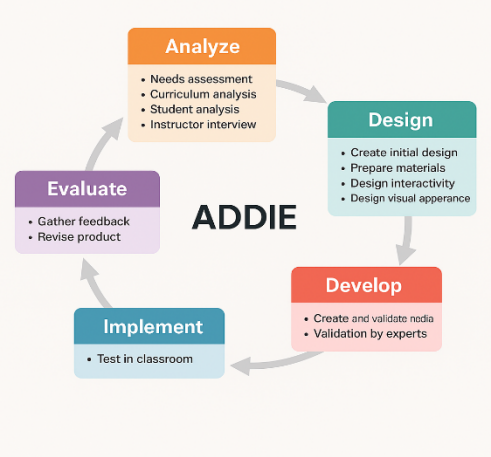


Figure 1. ADDIE stages

This research was conducted in the Mathematics Education Study Program, FMIPA UNJ. The study involved two validators, namely one material expert (a mathematics education lecturer) and one media expert. The selection of validators was carried out using a purposive sampling technique, based on their academic competence and experience in instructional design and interactive media development (Sari et al., 2023). The research was conducted over one semester during the 2024/2025 academic year.

The research procedure followed the ADDIE model adjusted to the study's scope, which included three main stages: analysis (analyze), design (design), and development (develop). The first stage, analysis, aimed to identify the needs for developing ClassPoint-based interactive learning media. Activities in this stage included syllabus and Semester Learning Plan (RPS) analysis to determine

competencies and main topics, analysis of the characteristics of prospective student users, and interviews with the Linear Algebra course lecturer to identify students' learning difficulties.

The second stage, design, focused on creating the initial design of the learning media. This stage included preparing materials based on the RPS, designing the flow of presentation and interactivity (such as quizzes, polls, and live annotations), and designing the visual appearance and navigation of the media. The result of this stage was a prototype of the ClassPoint-based presentation media.

The third stage, development, included the creation of the media and validation by experts. Validation was conducted to ensure that the media met the feasibility criteria in terms of content, presentation, language, and graphical design. The content/material aspect includes alignment with learning objectives, depth, completeness, and suitability to students' level of understanding. The presentation aspect evaluates conceptual clarity, accuracy of data and facts, diversity of difficulty levels, and the presence of examples, guidance, and exercises that support students' comprehension. The language aspect focuses on readability, engagement, and adherence to standard spelling and punctuation (PUEBI). Meanwhile, the graphic design aspect assesses consistency in layout and symbols, visual appeal, relevance of images, and the media's capacity to facilitate interaction and enhance student activity through ClassPoint's interactive features. These four aspects are designed to ensure that the developed instructional media are not only valid in substance but also pedagogically effective and communicative.

The validated aspects are presented in Table 1. The validation process followed the principles used in media development research by Kasmawati et al. (2023), Laksana (2024), and Sari et al. (2023), where validation is carried out by experts to assess the suitability of content, presentation, language, and design before the implementation stage.

Table 1. Validation Aspects

No.	Aspect	Data Collection Method	Instrument
1.	Content/Material	Providing validation sheets to mathematics and media experts	Validation sheet
2.	Presentation		
3.	Language		
4.	Graphic Design		

The main instruments in this study consisted of validation sheets and interview guidelines. The validation sheet was used to assess the feasibility of the media based on four aspects—content, presentation, language, and graphics—as suggested by Alfi, Paidi, and Pratama (2023) to ensure the empirical validity of instructional media. The interview guidelines were used to obtain qualitative responses from validators regarding the strengths and weaknesses of the product. Before being used, both instruments were validated by an instrument expert to ensure content validity (Laksana, 2024).

The validation data were analyzed using quantitative and qualitative descriptive analyses. Quantitative analysis was conducted by calculating the validity value based on the scores given by validators using a four-point Likert scale, as shown in Table 2.

Table 2. Skala Likert Lembar Validasi

Simbol	Keterangan	Bobot
SA	Strongly Agree	4
A	Agree	3
D	Disagree	2
SD	Strongly Disagree	1

The validity value was calculated using the formula (Sugiyono, 2019):

$$V = \frac{\sum f}{N} \times 100\%$$

where V is the validity value, f is the total obtained score, and N is the maximum score. The category of instructional media validity was determined based on Table 3 below

Table 3. Category of Media Validity

Nilai (%)	Category
$80 < V \leq 100$	Highly Valid
$60 < V \leq 80$	Valid
$40 < V \leq 60$	Fairly Valid
$20 < V \leq 40$	Less Valid
$V \leq 20$	invalid

Qualitative analysis was carried out by describing the comments, suggestions, and input from validators to improve the developed media. The results of both analyses were used as the basis for product revision until the media was considered feasible for use in the subsequent trial phase of the research.

This study was limited only to the development and validation stages of the product, without involving implementation testing or evaluation of media effectiveness in classroom learning. The main focus of this research was to produce ClassPoint-based instructional media that are valid in terms of content, language, presentation, and graphical design. The validated product is expected to serve as a foundation for future studies that will examine its practicality and effectiveness.

RESEARCH RESULTS AND DISCUSSION

This study aimed to develop interactive learning media based on ClassPoint for the Linear Algebra course, which was expected to enhance student engagement and facilitate conceptual understanding. The development process employed the ADDIE model up to the validation stage, covering the phases of analysis, design, and development. The results of each phase are described in an integrated manner below.

During the analysis stage, a curriculum (RPS) review, needs assessment, and student characteristic analysis were conducted, along with interviews with the course instructor. Based on the results, the Linear Algebra course consisted of eight main topics: *Systems of Linear Equations (SPL), Matrices, Determinants, Vectors in two- and three-dimensional space, General Vector Spaces, Row and Column Spaces, Inner Product Spaces,* and *Eigenvalues and Eigenvectors.* All materials were organized into 14 sessions, each supported by an interactive PowerPoint presentation utilizing ClassPoint.

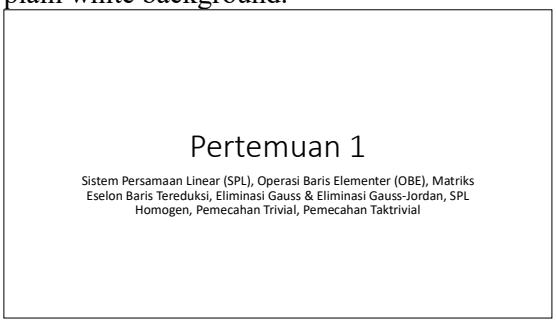
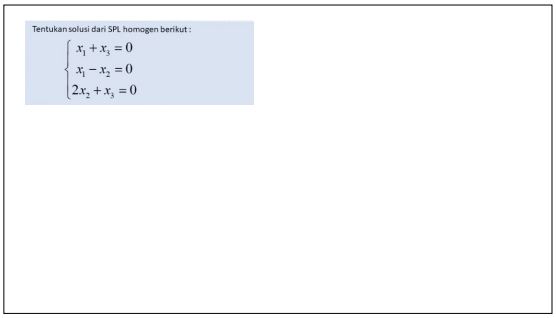
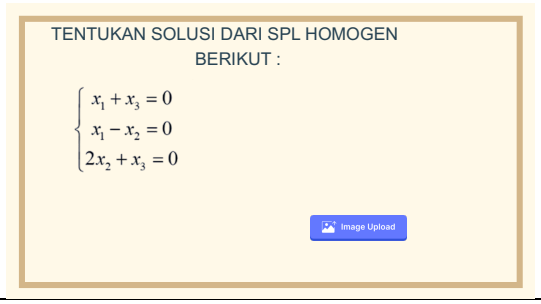
The interview results revealed that although the learning process had been student-centered, students' learning outcomes remained suboptimal. Many students tended to present materials without deep understanding, often copying from online sources or textbooks. Meanwhile, the lecturer's use of conventional PowerPoint slides helped explain concepts but failed to motivate students to participate actively. This finding highlighted the need for more interactive learning media that would allow students to engage actively in the thinking and knowledge-construction process, rather than passively receiving information.

The use of ClassPoint was chosen because it offers interactive features such as quizzes, polls, gamification, and real-time annotations within PowerPoint. Through these tools, lecturers can assess students' comprehension instantly and foster greater engagement. This finding aligns with Connectivism Theory (Siemens, 2023), which emphasizes the importance of collaboration and interaction in digital learning, and with Cognitive Theory of Multimedia Learning (Mayer, 2024), which asserts that the integration of visuals, text, and interactive activities strengthens students' cognitive processes. These analytical results also support the perspectives of Engelbrecht and Borba (2023) and Cevikbaş et al. (2023), who argue that pedagogically designed digital technologies can effectively enhance the quality of mathematics learning through interactive approaches.

The next stage was the design phase, which focused on redesigning the PowerPoint media to make it more engaging and interactive. The redesign process involved improving the visual layout, clarifying the content structure, and integrating ClassPoint features. The primary goal of this stage was to create instructional media that not only presented

material systematically but also stimulated students' active participation.

Table 4. Media Before and After Redesign and ClassPoint Integration

Before Redesign	After Redesign
Simple design dominated by lengthy text and plain white background. 	More attractive design using contrasting colors, visual icons, and neat layout. 
Focused only on content delivery	Equipped with example problems, interactive exercises, and reflections
No interactive activities included. 	Quizzes, polls, and annotation features added via ClassPoint. 

These changes were made based on the Cognitive Load Theory, which emphasizes the importance of balancing visual and textual information to avoid overloading students' working memory (Sweller, 2019). A more dynamic design combined with gamification elements was expected to enhance students' learning motivation. As evidenced by Ní Shé et al. (2023), student engagement increases significantly when instructional media incorporate interactive features.

The third phase was the development stage, which involved the creation and validation of the media by experts. Two validators were involved: a mathematics education lecturer and an instructional media expert. They assessed four key aspects: content/material, presentation, language, and graphic design. The assessment indicators were adapted from Alfi et al. (2023), Laksana (2024), and Sari et al. (2023), considering the relevance of content to learning objectives, linguistic clarity, and the visual as well as interactive quality of the media.

Table 5. Validation Sheet Items

No	Aspect	Main Indicators
1	Content/Material	Relevance of content to learning objectives, depth, completeness, and accuracy.
2	Presentation	Coherence of concepts, logical sequencing, and diversity of examples and exercises.
3	Language	Readability, clarity of sentences, and linguistic appeal.
4	Graphic Design	Consistency of design, colors, symbols, layout, and relevance of images to content.

The initial validation results showed that the content and presentation aspects were in the valid category, while the language and graphic aspects required improvement.

Table 6. Initial Validation Results

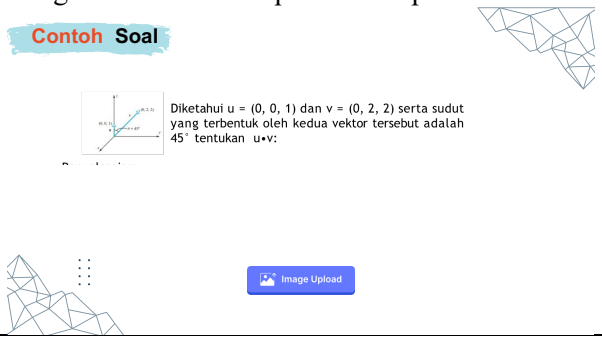
Validation Aspect	Score (%)	Category
Content/Material	81.5	Highly Valid
Presentation	78.0	Valid
Language	58.3	Fairly Valid
Graphic Design	46.4	Fairly Valid

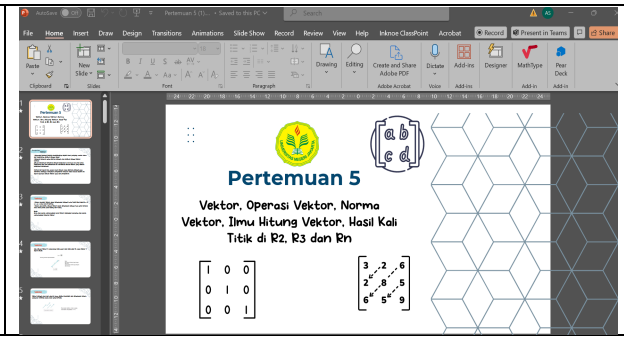
The validators provided several constructive suggestions to enhance the effectiveness of the learning media. One commonly noted aspect was the visual presentation, validators pointed out that the slides were too monotonous in color and lacked elements that attract student attention, which could reduce engagement. They recommended the use of more contrasting and varied colors to improve visual appeal. This aligns with multimedia learning principles, which emphasize the importance of visual design in maintaining cognitive interest (Mayer, 2021).

Additionally, some ClassPoint features, such as real-time quizzes and slide drawing tools, were underutilized. Validators suggested incorporating these features more consistently to support student interaction and formative assessment. This is supported by research indicating that interactive tools like live polls and embedded questions can significantly enhance student motivation and participation (Caldwell, 2007; Muliani, 2023).

Validators also noted the need for more examples and practice exercises, particularly in abstract topics like matrix operations. These revisions were implemented accordingly, and the updated media now includes more examples and exercises at the end of each session, in line with active learning strategies (Prince, 2004). Based on this feedback, revisions were made to the visual design, learning content, and interactive elements of the medi

Table 7. Examples of Media Design Improvements

Type of Improvement	Description
Visual Design	Changed dark backgrounds to neutral colors and added educational icons. 
Interactivity	Integrated ClassPoint quizzes and polls into each meeting. 
Content and Exercises	Added explanations and exercises to previously incomplete sessions.



After revisions, the media were revalidated by both experts. The second validation results indicated a significant improvement across all aspects.

Table 8. Final Validation Results

Validation Aspect	Score (%)	Category
Content/Material	93.8	Highly Valid
Presentation	90.6	Highly Valid
Language	83.3	Highly Valid
Graphic Design	71.4	Valid

The improvement in validation results indicates that the media fulfilled the quality criteria in terms of content, design, and pedagogy. The language and graphical aspects, which were initially lower, increased substantially after revision, demonstrating that the media had become more communicative and visually appealing. These results are consistent with the findings of Kasmawati et al. (2023) and Laksana (2024), who emphasized that improvements in visual design and linguistic structure contribute significantly to the validity of digital instructional media.

Moreover, the integration of interactive features in ClassPoint reinforces the technology-mediated learning principle, which asserts that the effectiveness of digital instructional media depends not merely on the technology itself but on how it is utilized to foster interaction among students, instructors, and learning materials (St Omer et al., 2025). The inclusion of quizzes and gamification elements also enhanced students' motivation to learn, aligning with the conclusions of Syarif et al. (2025) and Suhery et al. (2022), who found that technology-based learning incorporating game-like features encourages active participation and strengthens emotional engagement.

In conclusion, the results of this study demonstrate that the ClassPoint-based interactive learning media developed in this research are highly valid in terms of both substance and appearance. The media are therefore feasible for implementation in subsequent stages to test their effectiveness in improving students' learning outcomes and motivation. These findings reinforce the arguments of Mayer (2024) and Engelbrecht & Borba (2023) that combining multimedia design with interactive, technology-based strategies can create more meaningful learning experiences, particularly in the context of mathematics education in the digital era.

CONCLUSION

This study produced ClassPoint-based interactive learning media for the Linear Algebra course, which was found to be highly valid based on evaluations by both content and media experts. A key finding indicates that the integration of ClassPoint features—such as quizzes, polls, gamification, and real-time annotations—directly enhances student engagement and motivation, supporting a more active and meaningful learning process. The strengths of this media lie in its visually appealing design, systematic content structure, and interactivity that facilitates formative assessment. However, limitations of ClassPoint include its dependence on Windows-based PowerPoint and the lack of integration with LMS platforms or advanced learning analytics features. Despite these constraints, the media is considered feasible for implementation in future studies to evaluate its effectiveness in improving student learning outcomes and fostering 21st-century skills.

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