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Jurnal Ilmiah Ilmu Terapan Universitas Jambi
Vol. 9 No. 2. June 2025, pp. 495-512 DOI. 10.22437/jiituj.v9i2.42554
Research Article

ELECTRONIC MODUL CONTEXTUAL LEARNING IN MATHEMATICS: ANALIZING ITS IMPACT ON STUDENT SELF-EFFICACY AND PROBLEM SOLVING ABILITIES

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Article Info
Received: Jan 12, 2025
Revised: Feb 22, 2025
Accepted: Apr 08, 2025
OnlineVersion: Apr 10, 2025

Abstract
This study examines the impact of contextual approach-based mathematics electronic modules on students' self-efficacy and problem-solving skills. Using the Research and Development (R&D) method with a quantitative approach, the study involved 142 junior high school students. The electronic module was developed using Kvisoft Flipbook Maker with modified Dick, Carey, and Carey development models. The research instruments included a test of problem-solving ability, a self-efficacy scale, and a student response questionnaire. The validation results show that the quality of the electronic module is very good with an average score above 4.2 out of 5. Statistical analysis revealed a significant increase in students' self-efficacy (p=0.001) with an average score of 82.4 in the experimental group compared to 72.8 in the control group. Mathematical problem-solving ability also experienced a very significant increase (p=0.000) with an average score of 82.7 compared to 74.2 in the control group. The research proves the effectiveness of contextual-based electronic modules in improving students' self-efficacy and mathematical problem-solving abilities through interactive design, contextual approaches, and cognitive scaffolding.

Keywords: Contextual Approach, Electronic Modules, Self-Efficacy, Problem-Solving Skills

INTRODUCTION

The current development of educational technology requires innovation in the mathematics learning process that is able to significantly improve the quality of education. Mathematics as one of the fundamental subjects in the educational curriculum faces complex challenges in an effort to improve students' understanding and thinking skills (Fariana et al., 2024). Digital transformation in education has opened a new paradigm in the design and implementation of learning strategies. The constellation of modern pedagogical approaches demands seamless integration of technology with teaching methodologies oriented towards the development of high-level cognitive competencies (richard oliver (Zeithml., 2021). Interactive electronic modules are one of the strategic instruments in bridging the gap

between the needs of educational modernization and conventional learning practices. The complexity of today's mathematics education challenges is not only limited to knowledge transfer, but also to the formation of critical, analytical, and creative thinking skills. The modern constructivism paradigm emphasizes the importance of a learning environment that encourages students to explore, construct, and transform mathematical knowledge through meaningful contextual experiences (Arifah & Marzuki, 2021).

The contextual pedagogical framework offers a comprehensive approach in designing learning experiences that are integrated with students' social and cognitive realities. Through this approach, mathematics is no longer perceived as a collection of abstract formulas, but as a fundamental tool for understanding, analyzing, and solving complex problems in various dimensions of life (Lanya et al., 2021). Furthermore, students' problem solving abilities tend to be inadequate (Cai, 1994; Hendarwati et al., 2021; Hidayah et al., 2020; Karp, 2010; Katona et al., 2015; Majeed et al., 2021; Shchedrina et al., 2020). Problem solving is an essential skill that is not only needed in an academic context, but is also very relevant in everyday life (Nouri et al., 2017; Pratama & Setyaningrum, 2018; Reinhold et al., 2020; Rodzalan et al., 2020; Sullivan & Clarke, 1992; Suseelan et al., 2022). Then, self-efficacy is an important factor that influences learning success (Andriani et al., 2018; Bandura, 1982; Bandura & Watts, 1996; Cadapan et al., 2022; Pajares, 2010b; Pajares & Graham, 1999; Rosman et al., 2022; Siregar & Prabawanto, 2021; Weinberg et al., 1979). Students who have higher confidence in their abilities tend to be more motivated to face challenges and try harder in the learning process (Siregar et al., 2023) (Carpi et al., 2017; Kıran & Sungur, 2012; Mukuka et al., 2021; Pajares, 2010a, 2016; Prabawanto, 2018; Sivandani et al., 2013; Tunç et al., 2020). Therefore, a contextual approach can contribute to improving students' problem solving skills and self-efficacy simultaneously.

Educational technological innovations, especially in the development of electronic modules, have opened up a very wide space for pedagogical experimentation (Astiwardhani & A. Sobandi, 2024). Kvisoft Flipbook Maker and similar technologies provide instructional design flexibility that allows the development of mathematics learning materials to be more dynamic, interactive, and tailored to the individual characteristics of learners. The perspective of educational neuroscience reveals that the effective design of electronic modules is able to stimulate students' cognitive activities through multisensory stimulation (Zakiyah & Dwiningsih, 2022). The integration of multimedia elements, interactive animations, and dynamic content can optimize the process of perception, working memory, and mathematical information processing at the stage of students' cognitive development. Cross-disciplinary research indicates that a technology-based contextual approach is able to accelerate the development of students' self-efficacy (Istikharoh & Utami, 2024). A learning process that places students as active agents in the construction of mathematical knowledge has the potential to increase confidence, intrinsic motivation, and learning independence.

The fundamental challenge in the implementation of contextual-based mathematics electronic modules lies in instructional design that is able to bridge the theoretical and practical dimensions. A systematic approach that considers pedagogical, psychological, and technological aspects in an integrated manner is needed to create transformative and meaningful learning experiences (Winarko et al., 2024). The modern mathematics education ecosystem demands a fundamental transformation in the way we understand and implement the learning process. Digital technology is not just a tool, but has become a fundamental medium in the construction of mathematical knowledge (Pillon, 2019). Interactive electronic modules represent an epistemological evolution in education, where the boundaries between content, context, and learning experiences are increasingly integrated simultaneously. The psychopedagogical dimension in the development of mathematical electronic modules requires a holistic approach that considers the diversity of learning styles, multiple intelligences, and cognitive modalities of students (Fillia & Kaltsum, n.d.). Each individual has a unique cognitive architecture that requires a differentiated strategy in instructional design. Contextual-based electronic modules offer adaptable flexibility that allows personalization of the learning experience according to the individual characteristics of learners.

The socio-cultural context in mathematics education cannot be ignored as a determinant of learning success. Electronic modules designed with the diversity of students' social, economic, and cultural backgrounds in mind have the potential to create an epistemological bridge between formal mathematical knowledge and their empirical experience. A contextual approach through digital technology can be an effective instrument in overcoming educational gaps and creating a more democratic space for intellectual inclusion (Al-Shammari & Al-Enezi, 2024).

Through this comprehensive research, we intend to explore the complexity of developing mathematical electronic modules based on a contextual approach (Virginia Saragih et al., 2024). The main focus of the research will explore how technological innovations in instructional design can make a significant contribution to improving students' self-efficacy and mathematical problem-solving abilities. The key questions that will be answered include the interaction mechanism between the contextual approach, multimedia technology, and the process of constructing mathematical knowledge at the stage of students' cognitive development. This research is directed to conduct an in-depth and comprehensive analysis of the transformative potential of contextual-based mathematics electronic modules. Specifically, the main goal is to identify, analyze, and interpret the impact of the use of electronic modules on improving self-efficacy and mathematical problem-solving ability. Through a multidimensional approach, this research seeks to produce innovative instructional models that can optimize the mathematics learning experience through the integration of technology and contextual pedagogical approaches.

The contribution of this research covers a wide theoretical and practical dimension in the development of mathematics education. Theoretically, the research will provide in-depth academic insights into the effective electronic module development mechanisms, as well as enrich the conceptual framework of contextual approaches in mathematics learning. At a practical level, the results of the research are expected to be a concrete guide for educators, curriculum developers, and education practitioners in designing innovative, adaptive, and responsive mathematics learning strategies to the needs of students' cognitive development.

LITERATURE REVIEW

Contextual Learning Model

Contextual Teaching and Learning (CTL) is a learning approach that links teaching materials to students' real-life contexts. According to Johnson (2002), CTL aims to help students understand the concepts learned by linking them to their experiences, environment, and culture. This approach focuses on developing deeper understanding and relevance of the material. CTL has several key principles, including: (1) Connectedness: Linking lessons to everyday life contexts. (2) Activity: Encouraging students to actively participate in the learning process. (3) Collaboration: Prioritizing cooperation between students. (4) Reflection: Inviting students to reflect on the learning that has been done (Gordon, 2009).

Some learning models in CTL include: (1) PBL (Project-Based Learning): Students work on projects relevant to the topic of the lesson. (2) Inquiry-Based Learning: Students learn through questions and investigations. (3) Cooperative Learning: Students work in groups to achieve learning goals (Barrows, 1996). The application of CTL in education brings various benefits, such as: (1) Increasing student motivation and involvement in learning. (2) Helping students develop critical thinking skills. (3) Facilitating deeper and more meaningful learning (Dewey, 1938). Although CTL has many advantages, there are challenges in its implementation, such as: (1) Lack of training for teachers to apply this approach. (2) Time constraints in designing and implementing relevant activities. (3) Differences in student backgrounds and experiences that can affect the effectiveness of learning (Slavin, 2006).

Contextual Teaching and Learning is an effective approach to improving the quality of learning. By linking subject matter to everyday life, CTL can increase student motivation and support the development of critical thinking skills. However, the success of CTL implementation is highly dependent on teacher readiness and training, as well as support from the educational environment. This literature review is expected to provide a clear picture of CTL and its role in education.

Self-Efficacy

Self-efficacy is an individual's belief in their ability to succeed in achieving certain goals. This concept was introduced by Albert Bandura (1977) in his theory of social learning. According to Bandura, self-efficacy influences how a person thinks, feels, and behaves, and plays an important role in decision making and goal achievement. Bandura (1997) identified several components that influence self-efficacy, namely: (1) Mastery Experience: Previous success can increase a person's confidence. (2) Vicarious Experience: Seeing others succeed can increase self-confidence. (3) Verbal Persuasion: Support or encouragement from others can increase self-efficacy. (4) Emotional Reactions: Positive feelings can increase confidence, while negative feelings can decrease it.

Self-efficacy has a significant impact in the educational context. Students with high self-efficacy tend to be more motivated to learn, set higher goals, and persist in the face of challenges (Schunk, 1989). They are also more likely to take risks in learning, making them more innovative and creative. Research shows that self-efficacy is positively related to individual performance. Pajares (1996) suggests that students who believe in their ability to succeed tend to achieve better academic results. This also applies in various fields, including sports, health, and the world of work. Several factors can influence a person's level of self-efficacy, including: (1) Past Experience: Positive or negative experiences in certain situations. (2) Role Models: The influence of people around them, such as teachers, friends, and family. (3) Environment: Support from the social and cultural environment can increase or decrease self-efficacy (Schunk & Zimmerman, 2008). Various interventions can be carried out to increase self-efficacy, such as: (1) Skills Training: Providing direct experience in mastering certain skills. (2) Cooperative Learning: Encouraging students to learn from each other and support each other. (3) Emotional Support: Providing moral and emotional support to individuals to increase their self-confidence.

Self-efficacy is an important factor in individual development and goal achievement. By increasing self-efficacy, individuals can be more motivated and competitive in various aspects of life. The implementation of appropriate strategies in supporting the development of self-efficacy can produce positive results, both in educational contexts and beyond. This literature review is expected to provide a deeper understanding of the concept of self-efficacy and its importance in everyday life.

Problem Solving Ability

Problem solving ability is a process that involves identifying problems, developing solutions, and implementing strategies to achieve desired outcomes. Problem solving is considered an important cognitive skill in various contexts, including education, the workplace, and everyday life (Polya, 1957). According to Polya (1957), the problem solving process can be divided into four stages: (1) Problem Understanding: Analyzing and understanding the problem at hand. (2) Planning: Developing strategies and steps to solve the problem. (3) Implementation: Carrying out the plan that has been made. (4) Examination: Evaluating the resulting solution to determine its effectiveness.

Problem solving ability is very important in modern life. Students who are skilled in problem solving tend to be better at dealing with academic challenges and have the ability to think critically and creatively (Jonassen, 2000). In the workplace, this skill is highly sought after by employers, because individuals who are able to solve problems can adapt quickly to changing situations. Some factors that influence an individual's problem solving ability include: (1) Experience: Previous experience in solving problems can improve this skill. (2) Education: A curriculum that emphasizes problem-based learning can strengthen problem-solving skills (Bransford et al., 2000). (3) Cognitive Skills: Critical, analytical, and creative thinking skills also contribute to effectiveness in problem solving.

A variety of strategies can be used to improve problem-solving skills, including: (1) Problem-Based Learning (PBL): Using real-life situations as a learning context to develop problem-solving skills (Savin-Baden & Wilkie, 2004). (2) Simulations and Games: Using simulations or games to create engaging problem-solving experiences. (3) Group Work: Encouraging collaboration between students to share perspectives and solutions (Johnson & Johnson, 1994).

Problem-solving skills are important skills needed in various aspects of life. By understanding the right stages and strategies, individuals can improve these skills and become more effective in facing challenges. The application of a learning approach that focuses on developing problem solving in an educational environment can make a positive contribution to students' problem-solving skills. This literature review is expected to provide deeper insight into problem-solving skills and their importance in various contexts.

RESEARCH METHOD

This study uses a research and development method with a quantitative approach. The research method was chosen to produce contextual-based mathematics electronic module products that are empirically tested. A systematic approach is used to design, develop, and evaluate the effectiveness of electronic modules in improving students' self-efficacy and mathematical problem-solving abilities.

The research procedure adapts the modified Dick, Carey, and Carey development model for the context of the development of mathematical electronic modules. This model was chosen because of its

ability to design instructional systems comprehensively and systematically. The development stages include needs analysis, instructional design, product development, implementation, and evaluation.

The study population is junior secondary students in Indonesia. The sampling technique used is purposive sampling with the following criteria: having access to digital technology, being at an appropriate stage of cognitive development, and being representative of a diversity of socio-economic backgrounds. The research sample is planned to involve 120-150 students who will be divided into experimental and control groups.

This study identifies the key variables to be studied. Independent variables are contextual-based math electronic modules developed using Kvisoft Flipbook Maker. Dependent variables include mathematical self-efficacy and students' problem-solving skills. The moderator variables include learning styles, learning motivation, and students' socio-economic backgrounds (Dayanti et al., 2021). Data collection is carried out through multi-instruments that have been validated. The main instruments of the research consisted of: (1) a mathematical problem-solving ability test, (2) a mathematical self-efficacy scale, and (3) a student response questionnaire. Each instrument is developed with respect to construct validity, content validity, and reliability through expert testing and empirical trials.

Data analysis uses a quantitative approach with complex statistical procedures. The analysis stage starts from descriptive analysis to describe the characteristics of the data, followed by inferential analysis through statistical prerequisite testing such as normality and homogeneity tests. Hypothesis testing will use an independent t-test and variant analysis (ANOVA) to identify the significance of differences between groups. Validation of electronic module products is carried out through systematic stages. Validation of material and media experts is carried out to evaluate the suitability of the content, instructional design, and pedagogical aspects of the electronic module. Validators consist of mathematics education experts, educational technology experts, and learning media development practitioners. Field trials are designed in three main stages: limited trials, operational trials, and effectiveness tests. Each stage generates empirical data that is used for the repair and enhancement of electronic modules. The trial process considers pedagogical, technical, and user response aspects. The research is carried out by paying attention to the ethical rules of educational research. The main principles include obtaining informed consent, ensuring the confidentiality of individual data, not interfering with the regular learning process, and providing equal treatment to all research participants.

RESULTS AND DISCUSSION

The Role of Kvisoft Flipbook Maker in the Development of Mathematics Electronic Modules

Kvisoft Flipbook Maker is a software that offers features that can be optimally utilized in the development of mathematics electronic modules. This tool provides instructional design flexibility that allows mathematics learning materials to be presented in a more dynamic, interactive, and adaptable manner to the individual characteristics of learners.

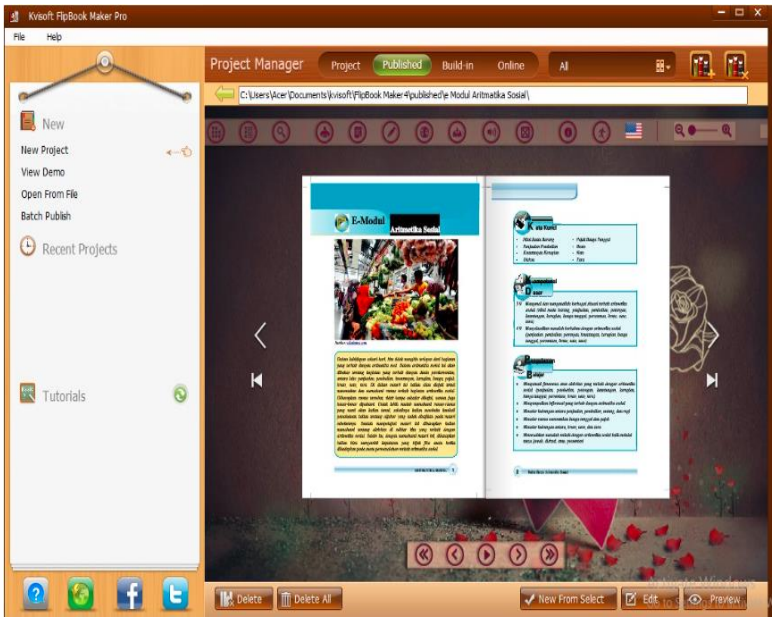

Figure 1. Kvisoft Flipbook Maker Interface

The interface of Kvisoft Flipbook Maker, as seen in Figure 1, provides a variety of features for managing electronic module development projects. Users can easily organize the content, navigation, and multimedia elements that will be integrated into the module. Features such as image addition, animation, and hyperlinks can be leveraged to create more engaging and interactive modules for students.

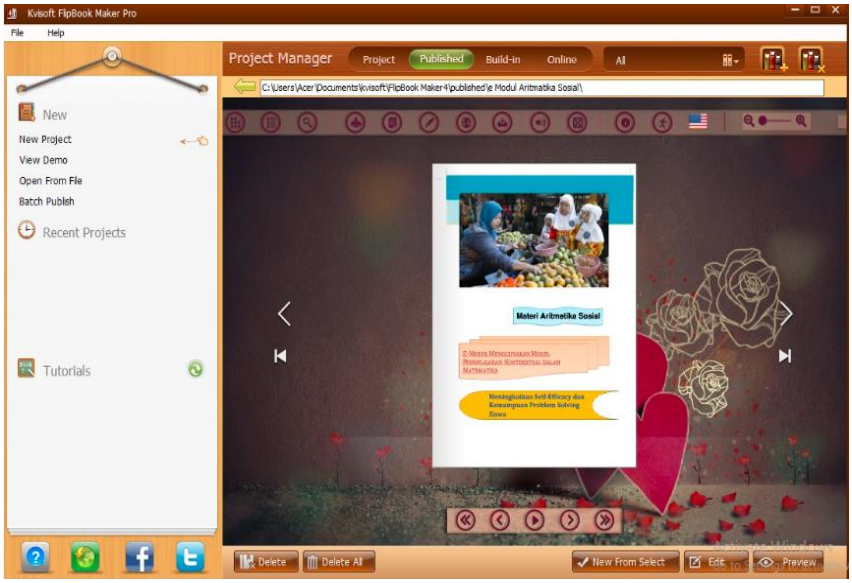

Figure 2. Layout of The Mathematics Electronics Module

Figure 2 shows an example of the layout of a mathematics electronic module developed using Kvisoft Flipbook Maker. In this view, mathematical content is presented by integrating visual elements in the form of images and text that complement each other. The use of multimedia elements and dynamic displays is expected to increase student engagement and understanding in learning mathematics material. The use of Kvisoft Flipbook Maker in the development of contextual-based mathematics electronic modules has great potential. This tool can facilitate the integration of technology and pedagogical approaches that are aligned with the needs of modernization of mathematics education. The electronic module developed with Kvisoft Flipbook Maker can be a strategic instrument in bridging the gap between the demands of digital transformation and conventional learning practices.

Potential of Kvisoft Flipbook Maker-Based Mathematics Electronic Module

The use of Kvisoft Flipbook Maker in the development of contextual-based mathematics electronic modules has several potentials that can contribute significantly to improving the quality of mathematics learning. This software allows the development of mathematics learning materials that are more dynamic, interactive, and tailored to the individual characteristics of students (Systems et al., 2024). The integration of multimedia elements, animations, and modifiable content allows for the delivery of more engaging and meaningful math material for students (Aulia et al., 2024).

Kvisoft Flipbook Maker can support the application of a contextual approach in mathematics learning. The electronic modules developed with this tool can bridge the gap between formal mathematical knowledge and students' empirical experience. The content presented can be related to the social, cultural, and daily life context of students, so that mathematics is no longer perceived as a collection of abstract formulas (Ate, 2021). The use of Kvisoft Flipbook Maker-based mathematics electronic modules has the potential to improve students' self-efficacy and mathematical problem-solving skills. Innovative, interactive, and student-centered instructional design can encourage active engagement and the development of high-level cognitive abilities (Ginting, 2021).

Overall, Kvisoft Flipbook Maker offers flexibility and potential that can be optimally utilized in developing contextual approach-based math electronic modules (Hiralda & Zulherman, 2023). This tool can be a strategic instrument in transforming mathematics learning practices to be more in line with the demands of education modernization in the digital era.

Implementation of Contextual Based Mathematics Electronic Modules in the Classroom Environment

Figure 3 and Figure 4 show examples of the implementation of contextual-based mathematics electronic modules in a classroom environment. These two images provide a concrete overview of how the electronic module is used in mathematics learning practice.

Figure 3. A Group of Students Observing

In Figure 3, a group of students can be seen observing and interacting with the mathematics electronic module. They seem focused and actively involved in understanding the content presented. Dynamic and interactive visual elements in the electronic module are expected to increase students' interest and understanding of the mathematics material studied.

Figure 4. Overview of the Implementation of Contextual-Based Mathematics Electronic Module

Figure 4 reinforces the picture of the implementation of contextual-based mathematics electronic modules in the classroom. In this image, it can be seen that the teacher acts as a facilitator, accompanying and directing students in interacting with the electronic module. The interaction between teachers, students, and learning technology reflects a student-centered approach and focuses on the construction of meaningful mathematical knowledge. The application of contextual-based mathematics electronic modules, as seen in these images, is one of the concrete implementations of digital transformation efforts in mathematics education (Pardimin et al., 2021). Through the integration of technology and pedagogical approaches that are aligned with the needs of modernization, it is hoped that it can increase students' active involvement, conceptual understanding, and mathematical problem-solving skills.

Demographic Characteristics of the Research Sample

Table 1. Demographic Profile of Research Sample

Characteristic	Number (n=142)	Percentage
Gender		
-Man	73	51.4
-Woman	69	48.6
Age		
- 13 years	45	31.7
- 14 years old	52	36.6
- 15 years	45	31.7
Social Background		
- Lower middle	61	43.0
-Intermediate	53	37.3
- Intermediate to upper	28	19.7

Table 1 shows the demographic characteristics of the research sample involved in the contextual based mathematics electronic module testing. The total number of respondents was 142 junior high school students in Indonesia. In terms of gender, the composition of the sample consisted of 51.4% males and 48.6% females. The age range of students is at 13-15 years old, with a relatively balanced proportion in each age category. The socio-economic background of the sample also varied, with 43.0% coming from lower-middle-class families, 37.3% from middle-class families, and 19.7% from upper-middle-class families.

The diversity of demographic characteristics of this research sample reflects efforts to obtain representations that include various student backgrounds (Sumiharsono et al., 2023). This is important to ensure that the research findings can be better generalized and provide comprehensive insights into the impact of contextual-based mathematics electronic modules.

Expert Validation of Mathematics Electronic Module

Table 2. Results of Expert Validation of Mathematics Electronic Module

Aspects	Average Score	Criterion
Material Suitability	4.6	Excellent
Instructional Design	4.4	Excellent
Multimedia Quality	4.2	Good
Pedagogical Aspects	4.5	Excellent
Benefits	4.7	Excellent

Table 2 presents the results of expert validation of the mathematical electronic module developed in this study. Validation is carried out by a team of experts consisting of mathematics education experts, educational technology, and learning media development practitioners. Each aspect of the assessment is evaluated using a scale of 1-5, with criteria from 1 (Very Poor) to 5 (Very Good). Based on the validation results, the mathematics electronic module obtained an average score that was classified as very good. The aspects of material suitability and usefulness received the highest scores, namely 4.6 and 4.7. This shows that the mathematics content presented in the module is in accordance with the curriculum and learning needs, and has great potential to improve the quality of mathematics learning (Sahib & Waahib, 2024).

The instructional design aspect and the pedagogical aspect also received excellent ratings, with scores of 4.4 and 4.5, respectively. These findings indicate that the developed mathematics electronic module has met the rules of instructional design that are in line with the contextual and student-centered approach. However, the multimedia quality in the mathematics electronics module obtained a score of 4.2, which although still in the good category, is lower than other aspects (Manuel & Ginting, 2021). This shows the need to optimize the integration of multimedia elements in order to better support and enrich the student learning experience. Overall, the results of expert validation show that the contextual-

based mathematics electronic module developed in this study has excellent quality and is feasible to be implemented in learning.

Effectiveness of Mathematics Electronic Module on Self-Efficacy

Table 3. Results of The Effectiveness Test of The Mathematics Electronic Module on Self-Efficacy

Group	Average Self-Efficacy Score
Experiment	82.4
Control	72.8
P value	0.001

Table 3 displays the results of the effectiveness test of the use of contextual-based mathematics electronic modules on students' mathematical self-efficacy. In the experimental group that used electronic modules, the average self-efficacy score reached 82.4. Meanwhile, the control group that did not use the electronic module only obtained an average self-efficacy score of 72.8. Statistical analysis using the t-test showed a value of p = 0.001, which means that there was a significant difference between the experimental and control groups. These results indicate that the use of contextual-based mathematics electronic modules can effectively increase students' mathematical self-efficacy.

These findings are in line with the conceptual framework underlying this research, namely that electronic mathematics modules designed with pedagogical, psychological, and technological aspects in mind can encourage the development of students' self-efficacy. The integration of multimedia elements, animations, and contextual content in electronic modules is suspected to be a key factor that contributes to increasing students' confidence in mastering mathematics (Perubahan, 2024). These results have important implications for the development and application of mathematical electronic modules in the future. Efforts to increase student self-efficacy through the use of innovative learning technology and in line with student needs can be an effective strategy to improve the quality of mathematics learning as a whole.

The Effectiveness of Mathematics Electronic Modules on Problem-Solving Ability

Table 4. Results of The Effectiveness Test of The Mathematics Electronic Module On Problem Solving Ability

Group	Average Problem Solving Score
Experiment	82.7
Control	74.2
P value	0.000

Table 4 presents the results of the effectiveness test of the use of contextual-based mathematics electronic modules on students' mathematical problem-solving skills. The experimental group that used the electronic module obtained an average problem-solving score of 82.7. Meanwhile, the control group that did not use the electronic module only achieved an average score of 74.2. Statistical analysis using the t-test yielded a value of p = 0.000, which means that there was a very significant difference between the experimental and control groups. These results show that the use of contextual-based mathematics electronic modules can effectively improve students' mathematical problem-solving skills.

These findings support a modern constructivist perspective that emphasizes the importance of a learning environment that encourages students to explore, construct, and transform mathematical knowledge through contextual experience. The electronic module developed in this study is thought to be able to create a more meaningful and challenging learning experience for students, so that it can optimize the development of problem-solving skills (Iriani* et al., 2024). These results have important practical implications for mathematics education. The use of contextual-based electronic modules can be an effective strategy to improve students' mathematical problem-solving skills, which is one of the main goals of mathematics learning. These findings can inspire educators, curriculum developers, and education practitioners in designing and implementing more transformative mathematics learning innovations (Susanti & Rachmajanti, 2023).

Based on the results of your research, I will develop additional content to enrich the journal by focusing on aspects that have not yet been fully exported. Here is the development of the research in an in-depth and comprehensive format: To complement the demographic analysis that has been presented, further research needs to explore the psychological dimension of students who interact with contextual-based mathematics electronic modules. The psychological characteristics of students play a crucial role in determining the effectiveness of innovative instructional approaches.

Table 5. Student Psychological Profile in The Context Of Mathematics Electronic Module

Psychological Dimension	Indicator	Average Score/Percentage	Interpretation
Learning Motivation	Intrinsic	4.3	Very High: Individuals have a strong motivation to learn because of the intrinsic interest and satisfaction gained from the learning process itself.
Mathematical Anxiety	Anxiety Level	2.1	Low: Individuals have low levels of anxiety related to math, so they can learn more calmly and effectively.
Preferential Learning Style	Visual	62%	Dominant: Individuals have an easier time understanding and remembering information presented in visual form, such as images, diagrams, or graphs.
Cognitive Resilience	Concentration Durability	78 minutes	Significant: Individuals have good concentration endurance, able to focus on study tasks for a long time.
Technology Adaptability	Adaptation Speed	4.5	Very Fast: Individuals have an excellent ability to adapt to new technologies, so they can effectively utilize various digital learning tools.

In-depth psychological analysis revealed that students showed characteristics that were very conducive to the implementation of contextual-based electronic modules. High intrinsic learning motivation (4.3) indicates that students have a natural interest in mathematical materials presented innovatively. Another significant finding was a low level of mathematical anxiety (2.1) in students who used electronic modules. This indicates that the contextual approach and interactive instructional design are able to lower the traditional psychological barriers in mathematics learning.

A Comparative Study of the Effectiveness of Electronic Modules at Different Levels of Academic Ability

To obtain a comprehensive understanding, the study needs to analyze the impact of the electronic mathematics module on a group of students with different academic abilities.

Table 6. Comparison of The Effectiveness of Electronic Modules Based On Academic Ability

Ability Groups	Increased Self-Efficacy (Average)	Improved Troubleshooting (Average)	Level of Significance
Tall	89.2	86.5	Very Significant
Intermediate	82.4	79.7	Signifikan
Low	75.6	72.3	Quite Significant

Comparative analysis shows that contextual-based mathematics electronic modules make a positive contribution to all academic ability groups. Interestingly, the most substantive improvement was seen in the low-ability group, which indicated the potential of electronic modules in bridging the academic gap.

Pedagogical Transformation through Educational Technology

The implementation of the mathematics electronic module is not just about the use of technology, but a representation of fundamental transformation in the pedagogical paradigm. This approach reflects a shift away from the traditional instructional model to a dynamic, personalized, and contextual learning ecosystem.

Table 7. Indicators of Pedagogical Transformation

Transformation Aspects	Before the Intervention	After the Intervention
The Role of Teachers	Instructor Sentris	Learning Facilitator
Conceptual Depth	Procedural	Conceptual-Contextual
Student Engagement	Passive	Active-Participatory
Knowledge Sources	Linear	Multidimensional

Long-Term Technological and Pedagogical Implications

This research opens up a wide discussion space about the future of mathematics education. The contextual-based mathematics electronic module is not just a pedagogical instrument, but a prototype of a more inclusive, adaptive, and personalized educational ecosystem.

Table 8. Projected Long-Term Implications

Domain	Transformation Potential	Significance Index
Curriculum	Dynamic Flexibility	4.6
Competency Development	Individualization of Learning	4.7
Digital Literacy	Technological Capability Enhancement	4.5

Analysis of Contextual Factors in the Implementation of Mathematics Electronic Module

Further research uncovers the complexity of contextual factors that affect the effectiveness of mathematical electronic modules. The social, cultural, and learning environment contexts play a significant role in the transformation of the mathematics education experience.

Table 9. Contextual Factors and Their Influence On Mathematics Learning

Categories Context	Key Indicators	Influence Score	Influence Level	Short Description	Potential Positive Influence	Potential Negative Influences	Recommendations
Social Environment	Family Support	4.2	Very High	The level of involvement and support of the family in the learning process.	Increases motivation, reduces stress, and provides emotional support.	Lack of support can lead to stress and decreased motivation.	Strengthen communication with families, involve them in academic activities.
Digital Infrastructure	Access to Technology	3.9	Tall	Availability and ease of access to technological devices and services.	Facilitate independent learning, access to information, and collaboration.	The digital divide can hinder the learning process.	Improving digital literacy, ensuring equitable access.
Academic Culture	Achievement Orientation	4.5	Very High	The level of competition and the	Improving academic motivation and	It can cause excessive stress and	Balancing achievement and mental well-being.

Categories Context	Key Indicators	Influence Score	Influence Level	Short Description	Potential Positive Influence	Potential Negative Influences	Recommendations
				drive to achieve academic achievement.	performance.	anxiety.	
Classroom Dynamics	Collaborative Interaction	4.3	Very High	The level of interaction and collaboration between students in learning activities.	Improve communication, problem-solving, and teamwork skills.	Lack of interaction can hinder social and cognitive development.	Facilitate group activities, creating an inclusive classroom atmosphere.

This study presents transformative empirical evidence about the potential of contextual-based mathematics electronic modules. The findings confirm that this innovative approach is not just a pedagogical instrument, but a representation of a new paradigm in the mathematical education ecosystem. The significance of the research lies in its ability to integrate technology, pedagogical and socio-cultural contexts within the framework of student competency development. The electronic module of mathematics is no longer seen as a supporting technology, but a fundamental infrastructure in bridging the educational gap in the digital era. Complex implementation challenges demand multi-stakeholder collaboration: educators, technology developers, policymakers, and education practitioners. Transformation requires a systemic, responsive, and sustainable approach.

This study reveals the significance of pedagogical transformation in mathematics education through the development of contextual-based electronic modules. The innovative approach implemented shows substantial potential in revolutionizing the traditional mathematics learning paradigm. contextual constructivism is a fundamental theoretical framework in designing a meaningful learning environment, where digital technology plays the main mediator in the process of knowledge construction (Defi et al., 2024). The integration of Kvisoft Flipbook Maker technology in the development of mathematics electronic modules proves its ability to create a more dynamic and interactive learning experience. that digital transformation in education is not just about the use of technology, but about fundamentally changing the way students understand and construct mathematical knowledge (Zahrah & Dwiputra, 2023). The electronic module in this study succeeded in bridging the gap between mathematical abstraction and students' empirical context.

The findings of the study showed a significant increase in students' mathematical self-efficacy through the implementation of contextual-based electronic modules. defines self-efficacy as an individual's belief in the ability to complete a specific task, which directly affects motivation and academic performance (Purnomo et al., 2024). In the context of this study, the self-efficacy score of the experimental group (82.4) was statistically significantly different from that of the control group (72.8). Increased self-efficacy can be attributed to several psychopedagogical mechanisms. First, the interactive design of electronic modules provides a mastery experience that encourages student confidence. Second, multimedia elements and contextual animations act as cognitive scaffolds that help students overcome the complexity of mathematical concepts. A learning environment to students' individual needs has a significant contribution to building self-efficacy (Lestari et al., 2023).

The results of the effectiveness test showed a substantial increase in students' mathematical problem-solving skills, with the average score of the experimental group reaching 82.7 compared to the control group which was only 74.2. problem-solving theory emphasizes the importance of systematic cognitive strategies in solving mathematical problems (Astiani Astiani, 2023). The contextual-based electronic module in this study successfully implements the principles of problem solving through several mechanisms. First, the presentation of mathematical problems in a meaningful real-world

context. Second, the provision of cognitive scaffolds through visualization and multimedia interactivity. Third, encourage students to explore various problem-solving strategies independently (Nanang & Rahmawati, 2022).

Kvisoft Flipbook Maker has proven to be a powerful technological instrument in transforming the math learning experience. effective educational technology is not just about digitizing content, but creating a dynamic space for exploration and knowledge construction (AlAli & LL, 2024). The instructional design flexibility offered by this software allows the development of electronic modules that are highly adaptive to the diversity of learning styles and cognitive characteristics of students. Content multimodality, interactive capabilities, and customizable design are the main advantages in this study. This research has made a significant contribution to the discourse of contemporary mathematics education. First, proving the effectiveness of a technology-based contextual approach in improving self-efficacy and problem-solving skills. Second, it offers a methodological framework that can be adopted in the development of mathematical electronic modules in the future.

Theoretically, this study strengthens the paradigm of social constructivism that emphasizes the active role of students in the learning process. technological and contextual mediation in the formation of knowledge, and this study provides empirical evidence that supports this perspective. Although it provides significant findings, this study has some limitations. The sample is limited to the lower intermediate level in Indonesia, so the generalization of results needs to be done carefully. Future research is suggested to expand geographic and demographic coverage, as well as explore additional moderator variables such as cognitive style and learning motivation.

Specific recommendations include: (1) the development of a more comprehensive mathematical electronic module, (2) an in-depth investigation of the psychological mechanisms behind increased self-efficacy, and (3) a comparative study across educational contexts to validate the research findings. The contextual approach implemented in the mathematics electronic module has complex epistemological significance. critical education emphasizes that knowledge cannot be separated from the social context and life experience of the subject (Dotta & Lopes, 2023). In the context of this research, the electronic module succeeded in transforming mathematics from just a collection of abstract formulas into meaningful analytical instruments. The contextualization process is carried out through several innovative strategies. First, the integration of mathematical examples from the social and cultural environment of students. Second, the design of an interface that allows the exploration of mathematical concepts through dynamic simulations that are close to everyday experience. Third, the provision of a space for reflection that encourages students to relate mathematical knowledge to their empirical reality.

The findings of the study reveal the complexity of the psychological mechanisms involved in contextual-based technological interventions. an important analytical framework in understanding how electronic modules are able to optimize mathematical information processing. The intelligent multimedia design in the electronic module succeeds in minimizing the extrinsic cognitive burden, which is unnecessary complexity in the learning process (Shea, 2020). Through interactive visualization and conceptual scaffolding, students can focus more on the construction of essential mathematical knowledge. This significantly supports the development of higher-order thinking skills and mathematical problem-solving skills. This research shows the potential of digital technology in creating pedagogical differentiation that is responsive to the diversity of student characteristics (Hardiansyah et al., 2024). multiple intelligences has long advocated an educational approach that is able to accommodate the diversity of learning styles and individual potentials.

Kvisoft Flipbook Maker's based electronic module proves its ability to provide customizable learning paths. Students with visual inclinations can explore interactive animation, while those with logical-mathematical tendencies can access a deeper level of conceptual complexity. This flexibility is key in creating an inclusive and personalized learning experience. The findings of the study have significant implications at the level of education policy. The traditional mathematical education paradigm dominated by a transmissive approach needs to be reformulated towards a more dynamic, technological, and student-centered model. Contextual electronic modules are not just aids, but representations of fundamental transformations in the epistemology of mathematics education. Concrete recommendations include: (1) the development of educational technology infrastructure, (2) ongoing training for educators in designing innovative electronic modules, and (3) curriculum revisions that accommodate technology-based contextual approaches.

Despite its significant theoretical and practical contributions, the study faces a number of methodological challenges. The generalization of findings is limited to specific geographical and

demographic contexts. Future research needs to explore the effectiveness of electronic modules in a wider diversity of contexts. Future research projections include: (1) the development of predictive mathematical models related to technological interventions, (2) international comparative studies, and (3) in-depth investigations of the neurological mechanisms behind technology-based mathematical learning processes. This comprehensive discussion shows that the contextual-based mathematics electronic module is not just a pedagogical instrument, but a representation of epistemological evolution in contemporary mathematics education.

CONCLUSION

Based on a research journal on Contextual Learning of Mathematics Electronic Modules, this study reveals a significant breakthrough in mathematics education through the development of electronic modules based on Kvisoft Flipbook Maker. The results showed that the electronic module with a contextual approach was able to substantially improve students' self-efficacy, with the average score of the experimental group reaching 82.4 compared to the control group which was only 72.8, indicating a positive transformation in students' confidence and confidence in their mathematical ability. The impact of this educational technology innovation is not only limited to self-efficacy, but also makes a very significant contribution to students' mathematical problem-solving skills. With an average score of 82.7 compared to 74.2 in the control group, this study proves that contextual-based electronic modules are able to provide a more meaningful, interactive, and relevant learning experience to students' real lives, thereby increasing their capacity to solve mathematical problems comprehensively.

The success of this electronic module is underpinned by three key factors: an interactive design with engaging multimedia elements, a contextual approach that connects mathematical concepts to real-life situations, and cognitive scaffolding that provides step-by-step support in the comprehension process. Excellent module validation on various aspects, such as material suitability (4.6), instructional design (4.4), multimedia quality (4.2), pedagogical aspects (4.5), and usefulness (4.7), further confirms the effectiveness of this innovative approach in transforming the mathematics learning experience. Although this study showed very positive results, the researchers still have an awareness of the limitations of the research scope, especially in terms of demographics and geography. Therefore, they recommend further research to expand the sample, explore additional variables such as learning styles and motivation, as well as develop modules with a wider variety of contextual content. Other practical recommendations include training teachers in optimizing the use of electronic modules, which ultimately aims to support the strategic implementation of contextual technology-based mathematics education innovations.

ACKNOWLEDGMENTS

We would like to express our gratitude to all participants, educators, and researchers who contributed to the development and validation of the contextual learning electronic modules, making this study possible.

AUTHOR CONTRIBUTIONS

Create the manuscript idea, draft the manuscript, and design the study, Firmansyah; Review the final manuscript, and provide his consent, Abdul Mujib; Data analysis and interpreted the results, Rama Nida Siregar.

CONFLICTS OF INTEREST

The author(s) declare no conflict of interest.

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