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DEVELOPMENT OF MELATIK: INTERACTIVE LEARNING MULTIMEDIA TO ENHANCE STUDENTS' MOTIVATION AND LEARNING OUTCOMES IN INFORMATICS EDUCATION

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Abstract

This research aims to (1) develop ICT learning multimedia for class X Senior High School/Madrasah Aliyah students, (2) assess its feasibility and practicality, and (3) examine its effectiveness in enhancing students' motivation and learning outcomes. The study employed a Research and Development (R&D) approach using the ADDIE model (Analyze, Design, Develop, Implement, Evaluate) and the MDLC approach (Multimedia Development Life Cycle). The research was conducted at Madrasah Aliyah Ma'arif Cilacap Tengah, involving class X-1 as the experimental group and class X-2 as the control group. Data collection methods included interviews, observations, questionnaires, and learning outcome tests, analyzed using qualitative and quantitative descriptive techniques. The results showed that: (1) ICT learning multimedia is highly feasible based on media expert validation (3.72, "very feasible") and material expert validation (3.79, "very feasible"); (2) its practicality was rated "very practical" with average scores of 3.50 in the initial trial and 3.41 in the field test; and (3) its effectiveness is demonstrated by an increase in student motivation (n-gain = 0.53, "medium") and improved learning outcomes in the experimental class (n-gain = 0.81, "high"). Thus, this multimedia has proven effective in enhancing motivation and learning outcomes among students at Madrasah Aliyah Ma'arif Cilacap Tengah.

Keywords: Learning Outcomes; Learning Motivation; ICT Learning Multimedia

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INTRODUCTION

In the digital era, it is imperative that students develop a comprehensive understanding of information and communication technology (ICT) as a fundamental skill. ICT, a foundational element in the domain of Informatics, provides students with a robust foundation to navigate a digitally interconnected world (Fuadah et al., 2023). The ICT element equips learners with the skills to navigate the challenges posed by modern technology. This is achieved not only through the introduction of various software but also through understanding the process, utilization as a tool, manipulation, and effective management of information (Assulamy et al., 2024). Through this learning, students not only learn to increase productivity but also acquire the skills to integrate and present data effectively (Lubis & Nasution, 2024). Furthermore, ICT learning fosters students' capacity for critical examination of information, thereby enhancing their analytical and evaluative abilities (Cobena, 2022).

However, despite the critical role of ICT learning in preparing students to face the digital era, its implementation in various countries still faces challenges. The PISA 2022 report indicates that students' competencies in digital literacy and technology-based problem-solving remain inadequate, particularly in developing countries such as Indonesia (OECD, 2023). A significant factor contributing to this suboptimal mastery of technology is the inadequate involvement of students in the learning process (Melita, 2024), which can be attributed to the employment of less interactive teaching methodologies and the constraints imposed by technology-based learning media (Hayya, 2023).

The issue of inadequate student engagement is also evident at the Central Cilacap Ma'arif Islamic High School. A study conducted with Informatics teachers revealed that many students adopt a passive stance during the learning process, demonstrate minimal responsiveness to the material presented, and encounter difficulty with ICT elements due to their complexity, necessitating additional time to comprehend the material (Salsabilla & Pradana, 2024). Furthermore, the motivation of students in Informatics subjects is identified as a pivotal factor in determining learning success. As Pratiwi & Ridhani (2023) notes that heightened student motivation has been shown to lead to increased effort and higher learning frequency, thereby impacting learning outcomes. In line with this, Pranyoto (2023) reveals that student learning motivation has a positive relationship with student responses and learning outcomes, so high motivation can increase student engagement and tend to make students more enthusiastic about learning.

Addressing this challenge necessitates the implementation of a learning strategy that is more interactive and readily accessible to students. One such strategy that has been employed is the use of interactive multimedia learning materials (Ndraha & Harefa, 2023; Sitepu, 2021). The integration of multimedia elements, such as text, images, audio, and video, has been demonstrated to enhance the presentation of learning material, thereby facilitating students' comprehension of complex concepts and enhancing their engagement in the learning process (Simanjuntak, 2020). According to Mayer & Moreno (2005) The integration of multimedia in learning can enhance students' cognitive engagement and improve conceptual understanding by delivering information more effectively, thereby simplifying complex concepts and providing a more contextual learning experience (Rahmadonna & Suyatiningsih, 2020).

The integration of multimedia learning has become increasingly pertinent with the ubiquity of Android technology, which has become an inextricable facet of students' daily lives. The substantial number of Android users signifies a considerable opportunity to develop Android-based learning multimedia as an innovative solution to enhance learning quality (Rahman et al., 2021). Research conducted by Hartana & Anjani, (2022) has demonstrated the efficacy of Android-based learning media in enhancing student motivation and learning outcomes for the subject of the human digestive system. The feasibility of incorporating this technology into the learning process has also been validated.

In light of these findings, there is a compelling need for the development of an Android-based learning application that is not only interactive but also tailored to the specific needs of various subjects, including the field of Informatics. In contrast to conventional learning media, ICT Learning Multimedia (MelaTIK) is a learning application specifically designed for Informatics subjects with ICT elements. This application is designed to be easily accessible to students and is equipped with evaluation features and drag-and-drop quiz games. This approach enables students to adapt the material to their understanding and fosters greater engagement in completing the available quizzes.

The present study was thus initiated with the objective of developing an Android-based MelaTIK as an interactive learning medium, with the underlying hypothesis being that it will enhance students' motivation and learning outcomes in Informatics subjects. It is hypothesized that this application will render the learning process more engaging, accessible, and aligned with the characteristics and needs of learners in the digital era.

METHODS

This study is of a Research and Development nature. Okpatrioka (2023) delineates R&D as an efficacious research methodology for enhancing educational practices. The development model employed in this study aligns with the ADDIE model, as proposed by Branch (2009), which comprises five distinct stages: analysis, design, development, implementation, and evaluation. The present study employs a distinctive approach to media development, utilizing the Multimedia Development Life Cycle (MDLC) approach in the development stage, as proposed by Sutopo et al. (2019);

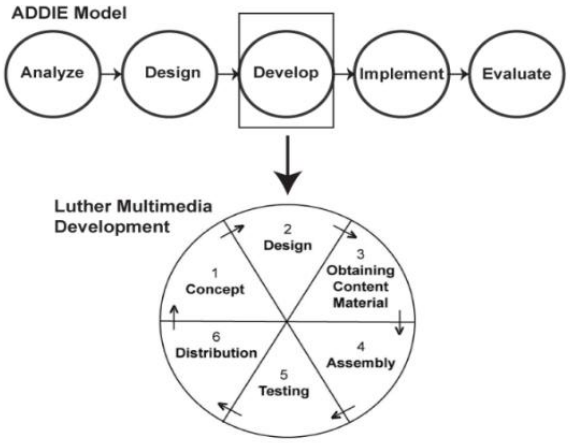

Figure 1.
The ADDIE model with an MDLC approach

The present study was conducted at the Ma'arif Cilacap Tengah Islamic High School, with class X-1 serving as the experimental class and class X-2 serving as the control class. The data collection techniques employed included interviews, observations, questionnaires, and learning outcome tests. The collected data underwent a dual approach of qualitative and quantitative descriptive analysis. The results of the product feasibility and practicality tests use quantitative data in the form of media assessment questionnaires, which then receive input and suggestions from media and material expert validators. The rating index was calculated using a Likert scale, as presented in the following table:

Table 1.
Likert Scale Feasibility/Practicality

Category	Score
Very Feasible/Practical	4
Feasible/Practical	3
Less Feasible/Practical	2
Not Feasible/Practical	1

Calculate the percentage with the following formula:

$$\text{Interval} = \frac{Skor\ Tertinggi - Skor\ Terendah}{Jumlah\ skor} = \frac{4-1}{4} = 0{,}75$$

According to the results of the interval determination, the classification of the average multimedia score is presented in the subsequent table:

Table 2.
Classification of Average Score

Category	Score
Very Feasible/Practical	3,25 - 4
Feasible/Practical	2,50 - 3,24
Less Feasible/Practical	1,75 - 2,49
Not Feasible/Practical	1 - 1,74

The employed methodology involves utilizing the formula proposed by Hake (1999) to enhance motivation and learning outcomes. This involves processing pretest and posttest data through the implementation of the gain score technique. The gain score technique is a statistical method that quantifies the differences in samples that have undergone two distinct treatments, namely before and after.

RESULTS & DISCUSSION

Results

The process of developing multimedia for instructional technology (ICT) employs the ADDIE development model, integrating the MDLC approach. The following stages are involved in this process:

1. Analysis

   In the analysis stage, the researchers conducted a needs analysis, a student characteristic analysis, and a curriculum analysis. This stage was carried out through observation, interviews with computer science teachers, and the completion of a needs analysis questionnaire by students. The analysis of the teachers' perspectives indicated that student motivation and learning outcomes remained relatively low. This finding aligns with the results of the needs analysis questionnaire, in which 57.5% of students indicated experiencing difficulty in comprehending the material. However, the availability of school network facilities and the ownership of smartphones among students elicited a favorable response to the development of multimedia learning materials. A significant proportion of students, amounting to 65%, expressed their belief that the integration of interactive multimedia learning materials would play a pivotal role in enhancing the efficacy of the educational process, underscoring its potential as a strategy for elevating the quality of learning outcomes.
2. Design

   The conceptual design of multimedia products entails the creation of a flowchart that systematically maps the interaction between users and applications, commencing from the home page and content and culminating in the evaluation page. Subsequent to this, a storyboard is formulated as a visual blueprint, thereby providing an overview of the manner in which the content will be presented.

3. Development

This stage employs the Multimedia Development Life Cycle (MDLC) approach, which consists of the following phases: (a) Concept, wherein the primary objective of multimedia development is to enhance student engagement and, consequently, improve their learning motivation; (b) Design, involving the development of flowcharts and storyboards, which are then refined into a user interface while considering the aesthetics of visual elements; (c) Obtaining Content Material, which involves collecting relevant media, such as images and videos, that align with the instructional content; and (d) Assembly, where all media components are integrated into the design using the Articulate Storyline 3 application. The following is the ICT learning multimedia display after the assembly phase:

Figure 2.
Initial Interface Views of MelaTIK

Figure 3.
Views of the Learning Content in MelaTIK

Figure 4.
Display Assessment Instructions

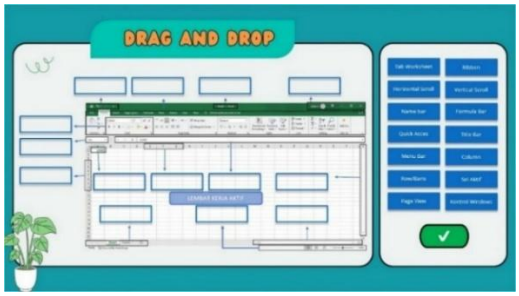

Figure 5.
Drag and Drop Quiz Display

Figure 6.
Views of Correct and Incorrect Quiz Response Pages

The subsequent phase involves a series of tests, which will be conducted by two subject matter experts and two media experts. The results of these tests are as follows:

1) Media Expert Validation

The validation of the media was carried out by two lecturers in learning technology at Yogyakarta State University. The following are the results of the assessment from media experts:

Table 3.
Media Expert Validation Results

No	Aspects of validator assessment	Validator Score 1	Validator Score 2	Average	Criterion
1	Auxiliary information	4	3,75	3,88	Highly Worthy
2	Interface	3,6	3,5	3,55	Highly Worthy
3	Navigation	3,6	3,8	3,70	Highly Worthy
4	Robustness	4	3,5	3,75	Highly Worthy
	Average amount	**3,80**	**3,64**	**3,72**	**Highly Worthy**

Source: Data Processed by the Researcher (2025)

The validation results indicate that the multimedia learning module obtained an average score of 3.72, categorized as "Highly Worthy" in terms of auxiliary information, interface, navigation, and robustness. Consequently, its utilization for educational purposes is deemed feasible.

2) Subject Matter Expert Validation

The material was validated by a lecturer in educational technology at Yogyakarta State University and a computer science teacher from Muhamadiyah 01 Muntilan High School. The following is the material expert assessment data:

Table 4.
Material Expert Validation Results

No	Aspects of validator assessment	Validator Score 1	Validator Score 2	Average	Criterion
1	Learning	4	4	4,00	Highly Worthy
2	Material	3,64	3,91	3,77	Highly Worthy
3	Supporting Materials	3,5	3,5	3,50	Highly Worthy
4	Learning Evaluation	4	3,75	3,88	Highly Worthy
	Average amount	**3,78**	**3,79**	**3,79**	**Highly Worthy**

Source: Data Processed by the Researcher (2025)

The validation process encompassed the assessment of the learning aspects, materials, supporting materials, and evaluation. The results indicated an average score of 3.79, categorizing the learning multimedia as "Highly Worthy" and affirming its substantial feasibility for implementation.

Subsequent to the declaration of feasibility, the learning media underwent revisions based on the recommendations provided by the validator. Subsequently, a small-group trial was conducted, involving one computer science teacher and six students. The ensuing section will delineate the outcomes of the aforementioned trial.

Table 5.
Results of Small Group Trial

Amount	Total Score	Maximum Score	Average score	Criterion
7	294	336	3.5	Very practical

Source: Data Processed by the Researcher (2025)

The results of the preliminary trial, which involved the administration of practicality questionnaires, indicated that the learning media received an average score of 3.5. According to the established assessment criteria, these results imply that the learning media is regarded as highly practical.

The final step in the MDLC stage is distribution. In this step, the assessed and revised media is disseminated to students via a Google Drive link, ensuring that no student encounters impediments during the installation process.

4. Implementation

In the implementation stage, the media that has been tested for feasibility and practicality is used in the learning process in an experimental class with 23 students of grade X-1 MA Ma'arif Cilacap Tengah. The ensuing section delineates the outcomes of a large-scale practicality test (Field Trial):

Table 6.
Results of Field Trial

Amount	Total Score	Maximum Score	Average score	Criterion
23	941	1104	3.41	Very practical

Source: Data Processed by the Researcher (2025)

The findings of the empirical investigation, which entailed a large-scale evaluation of media utilization involving 23 respondents, revealed that the learning media attained an average score of 3.41. According to the established assessment criteria, these results suggest that the learning media are highly practical for educational purposes.

Furthermore, an effectiveness test was conducted by comparing the motivation and learning outcomes of students in the experimental class, who used interactive multimedia, with the control class, who used conventional methods. The results of the analysis indicated that the average post-test score of the experimental class increased significantly compared to the control class. The independent t-test yielded a sig. Value of <0.05, thereby indicating a significant difference between the two classes. Additionally, the N-gain calculation revealed that the enhancement in motivation observed in the experimental class falls within the moderate range, while in the control class, it is classified as low.

Table 7.
N-gain Score Learning Motivation

No	Variable	Control Class (Score)		Experimental Class (Score)	
		Pretest	**Postest**	**Pretest**	**Postest**
1	Lowest Score	67	73	68	85
2	Highest Score	89	91	88	102
3	Average	80,36	84,41	78,52	94,6
	Gain Score	0,14 (Low)		0,53 (Medium)	

Source: Data Processed by the Researcher (2025)

The experimental class demonstrated a substantial enhancement in learning outcomes, categorizing it within the high range. Conversely, the control class exhibited a moderate improvement, placing it within the medium category.

Table 8.
N-Gain Score Learning Outcomes

No	Variable	Control Class (Score)		Experimental Class (Score)	
		Pretest	**Postest**	**Pretest**	**Postest**
1	Lowest Score	30	55	25	75
2	Highest Score	80	100	75	100
3	Average	46,14	73,86	45,87	88,7
	Gain Score	0,54 (Medium)		0,81 (High)	

Source: Data Processed by the Researcher (2025)

The results of the N-Gain Score calculation in both the experimental and control classes demonstrate that the implementation of ICT learning multimedia (MelaTIK) has the potential to significantly enhance student motivation and learning outcomes at MA Ma'arif Cilacap Tengah.

5. Evaluation

The evaluation stage is carried out continuously at each stage of multimedia product development. The evaluation process commences with an analysis of the student's learning needs, which serves as the foundation for the design of the multimedia application. Subsequent to the application's design and development, a feasibility assessment is conducted by two experts: a media expert and a subject matter expert. The media expert provides input regarding improvements to the application's identity, font type, color, and image layout to make it more suitable. Concurrently, the subject matter expert assesses the congruence between the content and the established learning objectives. After these reviews, a small-group test is administered to ascertain the application's potential for enhancement. The subsequent stage involves a field test, which is conducted with an experimental class. The evaluation results from this test demonstrate the application's high feasibility for use in learning. The overarching objective of this evaluation is to ensure that the learning multimedia developed meets the standards of quality, practicality, and effectiveness in supporting the student learning process.

Discussion

Informatics education in schools still faces several challenges, particularly in terms of low student motivation and the complexity of the subject matter. Students often have

difficulty grasping abstract concepts related to information and communication technology. This problem is exacerbated by the limited use of interactive learning media, which ideally should help students to better understand the material. Multimedia-based learning innovations offer a relevant solution to address these challenges. Mayer (2009) principles of multimedia learning and Sweller (1994) cognitive load theory both emphasize that structured visual and verbal content can significantly improve student comprehension compared to traditional methods.

In this study, the development of the interactive learning multimedia "MelaTIK" was based on these theoretical foundations. MelaTIK was created using Articulate Storyline 3, which allows for the integration of visual, textual, and interactive elements to support a more engaging learning experience. Validation by media and subject matter experts confirmed the quality of the multimedia product, with results falling into the "highly feasible" category. In addition, usability testing with students showed an average practicality score of 3.41, indicating that MelaTIK is considered "Very Practical" for use in the classroom.

In addition, the effectiveness of MelaTIK was evaluated using an independent t-test and N-Gain Score analysis to measure improvements in student motivation and learning outcomes. Statistical results indicated a significant difference between the control and experimental groups, with students using MelaTIK showing improved performance. The experimental group's motivation levels improved from low to moderate, while their learning outcomes improved from moderate to high. These findings are consistent with previous research (Hayya, 2023; Rahman et al., 2021; Habibah et al., 2022), which has also shown that interactive multimedia improves student engagement and academic performance.

Overall, the MelaTIK multimedia product has proven to be feasible, practical, and effective for use in computer science education. In addition to meeting quality standards for design and content, MelaTIK has a positive impact on student motivation and learning outcomes. These findings reinforce the principle that integrating technology into education can create a more engaging and accessible learning experience (Aisyah et al., 2025). It is hoped that such multimedia tools can be an innovative learning solution that not only helps teachers to deliver material more effectively but also makes it easier for students to understand learning concepts.

CONCLUSION

The results of the ICT learning multimedia development study indicate the following conclusions: Firstly, the assessment of media and ICT learning multimedia material experts is deemed highly feasible for the learning of Informatics subjects in the ICT element material in grade X. Secondly, user responses indicate that learning multimedia is very practical for educational purposes. The initial trial (small group trial) obtained a score of 3.50, while the field trial obtained a score of 3.41, with an overall average of 3.45, all of which fall into the 'Very Practical' category. 3) The effectiveness test results demonstrate that ICT learning multimedia (MelaTIK) is effective in increasing student motivation and learning outcomes. This finding is corroborated by the independent t-test results, which obtained a sig. Value of <0.05, indicating a significant difference between the two classes. The N Gain Score in the experimental class demonstrated an enhancement in learning motivation with a score of 0.53 (moderate category) and an augmentation in learning outcomes with a score of 0.81 (high category). In contrast, the control class demonstrated a score of 0.14 (low category) for motivation and 0.54 (moderate category) for learning

outcomes. These findings suggest that the incorporation of MelaTIK learning multimedia has the potential to enhance learning effectiveness to a significant extent.

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