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Development of an Interactive Flipbook Oriented Towards TPACK and the Philosophy of KH. Ahmad Dahlan

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Abstrak

Media pembelajaran flipbook interaktif berbasis TPACK dan falsafah KH. Ahmad Dahlan merupakan buku digital yang memanfaatkan teknologi dengan mengintegrasikan berbagai modalitas pembelajaran seperti teks, gambar, audio, video/YouTube, dan tautan internet. Penelitian ini bertujuan untuk mengevaluasi efektivitas penggunaan flipbook interaktif yang berorientasi pada TPACK dan falsafah KH. Ahmad Dahlan dalam meningkatkan proses serta hasil belajar, terutama yang terkait dengan keterampilan berpikir kritis dalam matematika dan nilai-nilai yang terkandung dalam filsafah tersebut. Penelitian ini menggunakan metode pengembangan dengan menerapkan model ASSURE yang mencakup analisis peserta didik, penetapan tujuan, pemilihan media dan materi, penggunaan materi, partisipasi aktif peserta didik, serta evaluasi dan revisi. Instrumen yang digunakan meliputi lembar observasi proses pembelajaran dan tes hasil belajar yang berfokus pada keterampilan berpikir kritis, dengan subjek penelitian terdiri dari 15 mahasiswa semester VI program studi matematika. Data yang diperoleh dianalisis secara deskriptif dan menggunakan metode N-Gain. Hasil menunjukkan bahwa penggunaan flipbook yang dikembangkan ini secara signifikan meningkatkan proses dan hasil belajar serta nilai-nilai yang dianalisis. Dengan demikian, flipbook interaktif berbasis TPACK dan falsafah KH. Ahmad Dahlan terbukti efektif dalam meningkatkan keterampilan berpikir kritis mahasiswa dan layak digunakan dalam pembelajaran.
Kata Kunci: Flipbook; Falsafah K.H Ahmad Dahlan; TPACK.

Abstract

The interactive flipbook learning media based on TPACK and the philosophy of KH. Ahmad Dahlan is a digital book that leverages technology by integrating various learning modalities such as text, images, audio, video/YouTube, and internet links. The purpose of this study is to evaluate the effectiveness of using an interactive flipbook oriented towards TPACK and the philosophy of KH. Ahmad Dahlan in enhancing the learning process and outcomes, particularly in relation to critical mathematical thinking skills and the values embedded in philosophy. The study employs a development research method using the ASSURE model, which includes analyzing learners, setting goals, selecting media and materials, utilizing materials, active learner participation, and evaluation and revision. The instruments used include observation sheets for the learning process and a critical thinking skills test, with the research subjects consisting of 15 sixth-semester mathematics students. The data obtained were analyzed descriptively and using the N-Gain method. The results show that the use of the developed flipbook significantly improves the learning process and outcomes, as well as the values analyzed. Therefore, the interactive flipbook is based on TPACK and the philosophy of KH. Ahmad Dahlan is proven to be effective in enhancing students' critical thinking skills and is suitable for use in learning.
Keywords: Flipbook; Philosophy of K.H Ahmad Dahlan; TPACK.

I. INTRODUCTION

A TPACK-oriented interactive flipbook is a digital learning medium that contains educational materials aligned with interactive learning objectives. The advancement of technology is inseparable from the educational philosophy proposed by KH. Ahmad Dahlan. According to KH. Ahmad Dahlan, education should equip students with the necessary skills and knowledge to achieve success both in this world and the hereafter. Therefore, students require education that aligns with technological advancements in the society they live in (Nevrita, Asikin, & Amelia, 2020; Fauzi, Yaniawati, & Sari, 2024).

A flipbook is a classical animation that resembles a thick book, with pages displaying a process that can move. A TPACK-oriented interactive flipbook is a digital learning medium that integrates images, animations, audio, video, and text into a single platform (Arsyad et al., 2022; Nasrulloh et al., 2024). The interactive flipbook significantly contributes to shifting learning paradigms. Learning through interactive media enables self-directed learning (Burdam et al., 2023; Mulyono & Trisnawati, 2024). The development of technology remains closely related to the educational philosophy of KH. Ahmad Dahlan, which emphasizes that education should prepare students for success by integrating technological advancements with societal needs (Fidri, Tahir, & Nurhayati, 2022; Putri, Uchtiawati, & Fauziyah, 2020).

Education is a crucial aspect of human life. The rapid development of technology influences students' learning interests (Trisnawati et al., 2023; Fathurrahman et al., 2024). However, education should not solely focus on technological advancements but must also incorporate moral and ethical values (Trisnawati & Sundari, 2021; Agam et al., 2013). Integrating moral and ethical values into mathematics education can enhance students' learning motivation (Kusmaryono et al., 2024). The moral and ethical principles in KH. Ahmad Dahlan's philosophy emphasize that ethics and morality are fundamental and inseparable aspects of daily life. His seven philosophical teachings in Islamic education in Indonesia include: (1) Life is only once; therefore, individuals must prepare for the afterlife, (2) Many people are arrogant and make decisions independently; however, good individuals make decisions through deliberation, as humans are social beings, (3) Repeated actions make it difficult to change habits, (4) Humans use reason to understand religion and seek truth, (5) Many people live without wisdom and fail to follow principles of truth, (6) Many leaders abuse their power to manipulate the weak, (7) Seeking knowledge, especially religious knowledge, should be accompanied by its practical application to benefit society. KH. Ahmad Dahlan advocated for an Islamic education system that fosters individuals with good character, global knowledge, and an understanding of both religious and worldly sciences, enabling them to collaborate and contribute to societal well-being (Ruslan, 2020; Mauli, Bustam, Dahlan, No, & Uad, 2021).

The formulation of Islamic educational objectives proposed by KH. Ahmad Dahlan can be integrated with TPACK-based digital

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learning. TPACK is a framework that connects the complexity of three primary components of knowledge: technology, pedagogy, and content (Setyo et al., 2023; Arwadi et al., 2024). Integrating these three aspects in designing instructional models requires a deep and interconnected understanding, along with proper contextual application (Heru, Nery, & Kesumawati, 2021; Hidayati, Setyosari, & Soepriyanto, n.d.). High-quality learning enhances motivation and leads to better learning outcomes (Setyo et al., 2022; Musa'ad et al., 2023; Arnisya & Afriansyah, 2024). Learning objectives include improving academic performance, facilitating material comprehension, and creating effective learning environments (Setyo et al., 2024). Furthermore, KH. Ahmad Dahlan's teachings ensure that technological advancements in education remain aligned with religious values, fostering generations capable of developing knowledge while upholding moral principles (Khasanah, Prasasti, Amita, & Kusumawati, 2022; Rahayu, Pramadi, Maspupah, & Agustina, 2021; Nugroho, 2022).

Observations and interviews with students in the mathematics education program at Universitas Muhammadiyah Sorong reveal a lack of teaching materials developed by lecturers that align with both student characteristics and TPACK-oriented learning integrated with KH. Ahmad Dahlan's philosophy. Currently, most lecturers use teaching materials in PDF format downloaded from the internet, with very few developing their own resources. This situation leads to suboptimal learning processes, particularly in Analytic Geometry courses, as well as low student motivation, where learning is perceived merely as knowledge acquisition rather than a means to cultivate life values. Consequently, students lack discipline, feel no guilt for missing classes, and attend without genuine engagement, resulting in ineffective learning processes and poor academic outcomes.

Several studies have explored the implementation of interactive flipbooks and TPACK in education. Syarifah & Yanuarto (2023) conducted a systematic literature review of six articles (2021–2023) and found that TPACK-based learning can be applied through various approaches, such as Blended Learning for Systems of Linear Equations, TPACK e-modules for triangles and quadrilaterals, Geogebra applications for geometry, Ecoprint teaching materials for transformations, Creative Problem Solving in geometry, and Inquiry Learning instructional design. These variations provide innovative references for developing more creative and student-oriented mathematics learning. Mahrani et al. (2023) successfully developed TPACK-based teaching materials using Google Sites for sixth-grade science learning at UPTD SD Negeri 5 Parepare with the ADDIE model. Their findings indicate that the developed teaching materials were valid, practical, and effective, resulting in an average student score of 89 and positive feedback from both students and teachers. Budiarti et al. (2021) developed a valid and practical TPACK-based e-module using the ADDIE development model. The trial subjects were first-semester students of the Ship

Engineering program at the Sorong Maritime Polytechnic. Results showed that the developed e-module met validity criteria with an average score of 3.09 and practicality based on lecturer (83%) and student (89%) responses. Similarly, Imas Tesia Putri et al. (2022) developed and validated an interactive TPACK-based e-module to facilitate junior high school students' mathematical problem-solving skills in algebra. Using the ADDIE model, the validation results indicated high feasibility, with scores of 91.6% (media evaluation), 88.3% (mathematics education evaluation), and 95% (mathematics expert evaluation). Students responded positively, finding the module engaging, easy to understand, and helpful in problem-solving.

This study shares similarities with previous research that utilized digital technology, particularly interactive flipbooks or TPACK-based e-modules, to support learning. Like prior studies, this research also aims to enhance a specific skill—critical thinking. However, there are key differences that distinguish this study. First, it integrates KH. Ahmad Dahlan's educational philosophy into TPACK-based learning media, an aspect not previously explored. This approach incorporates values and character development into education, alongside fostering critical thinking skills. Second, the study focuses on university students, whereas prior research primarily targeted elementary, secondary, and vocational students. Third, the medium used in this study is an interactive flipbook, which has unique characteristics compared to the more commonly used e-modules. Lastly, this study specifically aims to develop university students' critical thinking skills, whereas previous studies have mostly focused on problem-solving skills or general learning outcomes. Thus, this research contributes to the development of TPACK-based learning media that integrates character education, particularly KH. Ahmad Dahlan's philosophy, to support higher education learning.

II. METHOD

The research was conducted in the Mathematics Education Study Program with second-semester students at Universitas Muhammadiyah Sorong. This study employed the Research and Development (R&D) method, using the ASSURE model as the primary framework to develop an interactive Flipbook as a learning medium for Analytical Geometry. The development process began with an in-depth analysis of student characteristics, learning objectives formulated based on the SMART concept, and the selection of an interactive Flipbook as the main medium. The Flipbook was developed using the BookCreator platform, which allows for the integration of various content formats such as text, images, audio, and video. The learning materials were designed in alignment with the curriculum and enriched with illustrations and moral values based on the philosophy of KH. Ahmad Dahlan.

The Flipbook was implemented over six sessions, actively involving students in a problem-based learning process where they played an active role in exploring concepts and engaging in discussions. Following the implementation, evaluations were conducted through pretest and

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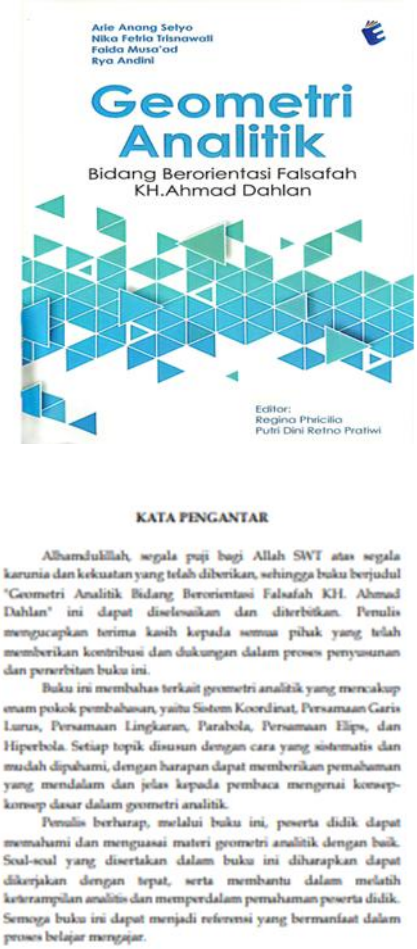
posttest analyses, observations of student activities, and student response questionnaires. These evaluations aimed to measure the effectiveness of the Flipbook in enhancing students' critical thinking skills. The results indicated an improvement in critical thinking abilities, as measured using the gain test, along with positive student responses toward the use of the Flipbook. Additionally, feedback from subject matter experts, media specialists, and educators was incorporated to revise and refine the Flipbook, ensuring its more effective use in future learning. This approach resulted in a well-structured, interactive learning medium that meets students' needs while integrating moral values into the learning process.

III. RESULT AND DISCUSSION

A. Development Results Using the ASSURE Model

1) Analyze Learners:
In the analysis stage, the researcher examined student characteristics by administering questions oriented toward assessing critical thinking skills. The results indicated that students exhibited low levels of critical thinking. Additionally, the researcher found that students were still using conventional learning models, as observed in the learning process, where students primarily followed instructor-centered lessons with minimal active engagement.
2) State Objectives:
This study aims to develop a learning medium in the form of an interactive Flipbook based on the ASSURE model, oriented toward the TPACK framework and the philosophy of KH. Ahmad Dahlan.
3) Select Methods, Media, and Materials:
In this stage, the researcher designed the Flipbook learning media by integrating TPACK principles and the values of KH. Ahmad Dahlan's philosophy. The learning media was structured by first designing a cover. The Flipbook media is presented in Figure 1.



KATA PENGANTAR

Alhamdulillah, segala puji bagi Allah SWT atas segala karunia dan kekuatan yang telah diberikan, sehingga buku berjudul "Geometri Analitik Bidang Berorientasi Falsafah KH. Ahmad Dahlan" ini dapat diselesaikan dan diterbitkan. Penulis mengucapkan terima kasih kepada semua pihak yang telah memberikan kontribusi dan dukungan dalam proses penyusunan dan penerbitan buku ini.

Buku ini membahas terkait geometri analitik yang mencakup enam pokok pembahasan, yaitu Sistem Koordinat, Persamaan Garis Lurus, Persamaan Lingkaran, Parabola, Persamaan Elips, dan Hiperbola. Setiap topik disusun dengan cara yang sistematis dan mudah dipahami, dengan harapan dapat memberikan pemahaman yang mendalam dan jelas kepada pembaca mengenai konsep-konsep dasar dalam geometri analitik.

Penulis berharap, melalui buku ini, peserta didik dapat memahami dan menguasai materi geometri analitik dengan baik. Soal-soal yang disertakan dalam buku ini diharapkan dapat dikerjakan dengan tepat, serta membantu dalam melatih keterampilan analitis dan memperdalam pemahaman peserta didik. Semoga buku ini dapat menjadi referensi yang bermanfaat dalam proses belajar mengajar.

Figure 1. Flipbook Oriented to TPACK

4) Require Learner Participation

At this stage, the researcher conducted a trial of the interactive Flipbook oriented toward TPACK and the philosophy of KH. Ahmad Dahlan.

The trial was carried out following the Require Learner Participation stage over six meetings. The first meeting included a pretest and an explanation of how to use the developed Flipbook. From the second to the fifth meeting, learning activities were conducted using the interactive Flipbook. The sixth meeting was dedicated to the posttest and the completion of student response questionnaires.

The students' learning activities were aligned with critical thinking skills, including:

1. Observation and problem identification skills – The ability to conduct careful and systematic observations and identify existing issues or challenges.
2. Analysis of strategies and alternative techniques for problem-solving – The ability to evaluate and assess various available strategies and methods as options to address a problem.
3. Evaluation and problem-solving skills – The ability to assess the effectiveness of proposed solutions and apply them to resolve existing issues.

The results of the student activity analysis are presented in Table 1.

Table 1.
Analysis Results of Student Activities

Activity Score	The Average Results of Activity Observation for Each Indicator			Category
	1	2	3	
0-20	3	3	3	Not Active
21-40	2	1	3	Less Active
42-60	3	1	2	Moderately Active
61-80	4	4	3	Active
81-100	4	4	5	Very Active
Total	12	12	12	

From the table, it can be analyzed that during the implementation of learning activities oriented toward critical thinking skills:

- For Indicator 1, five students were categorized as inactive or less active, while the rest were at least minimally active.
- For Indicators 2 and 3, three students fell into the inactive category, while one student was categorized as less active. Additionally, three other students were also categorized as less active.

The analysis of student learning activities also shows that more than 62% of students were classified as moderately active to highly active in each indicator.

A similar finding was reported by Desryanto (2023), who stated that the use of a TPACK-based e-module effectively optimized student engagement in learning.

Based on the student activity data analysis, it can be concluded that more than 62% of students actively participated in the learning process of Analytic Geometry using a multimodal interactive Flipbook oriented toward TPACK and the philosophy of KH. Ahmad Dahlan across all three observed indicators.

5) Evaluate and Revise

At this stage, the researcher evaluated the developed Flipbook based on student feedback and expert reviews from media and subject matter specialists.

B. Analysis of the Effectiveness of the TPACK-Oriented Interactive Flipbook and the Philosophy of KH. Ahmad Dahlan in Improving Student Learning Outcomes

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Student learning outcomes are presented in Table 2.

Table 2.
Student Learning Outcomes

Student Learning Outcomes (%)	Pretest frequency	Percentage	Posttest frequency	Percentage	Category
81-100	0	0	5	31,25	Highly Critical
61-80	0	0	3	18,75	Critical
41-60	0	0	6	37,50	Moderately Critical
21-40	2	12,5	1	6,25	Less Critical
0-20	14	87,5	1	6,25	Very Less Critical
Total	16	1	16	1	

Based on Table 2, the pretest results show that 14 students were categorized as very low in critical thinking skills, while 2 students were categorized as low in critical thinking skills. This indicates that students were still untrained in solving problems that integrate critical thinking skills.

The development of students' critical thinking skills after using the interactive Flipbook is presented in Table 3.

Table 3.
Comparison of Students' Critical Thinking Skills

Interval Score	Pretest		Posttest		Category
	Frequency	Percentage (%)	Frequency	Percentage (%)	
81-100		0.00	4	26.67	Highly Critical
61-80		0.00	7	46.67	Critical
41-60		0.00	3	20.00	Quite Critical
21-40	2	13.33	1	6.67	Less Critical
0-20	13	86.67		0	Poorly Critical
Total	15	100.00	15	100	

Based on Table 3, the comparison of students' critical thinking skills shows a significant improvement after the learning process.

- Pretest results:
  - 86.67% (13 students) scored between 0-20, categorized as Poorly Critical (Kurang Kritis).
  - 13.33% (2 students) scored between 21-40, categorized as Less Critical (Kurang Kritis).
- Posttest results:
  - 46.67% (7 students) scored between 61-80, categorized as Critical (Kritis).
  - 26.67% (4 students) scored between 81-100, categorized as Highly Critical (Sangat Kritis).
  - 20% (3 students) scored between 41-60, categorized as Moderately Critical (Cukup Kritis).
  - Only 6.67% (1 student) remained in the Less Critical category (21-40 score range), showing a decrease in the number of students categorized as Less Critical.
  - No students remained in the Poorly Critical category after the learning process.

The findings from Table 3 indicate that students' critical thinking skills improved both in terms of quality and quantity. Initially, 100% of students were classified as Poorly Critical or Less Critical, but after the intervention, this number dropped to only

12.5%, with 6.25% categorized as Less Critical and 6.25% as Poorly Critical. Meanwhile, students categorized as Moderately Critical, Critical, and Highly Critical increased from 0% to 87.5%.

These results are consistent with the study by Arie Anang Setyo et al. (2023), which found that the implementation of interactive Flipbooks based on TPACK significantly improved students' critical thinking skills.

Furthermore, the gain score analysis was conducted using SPSS 22, with the results presented in Table 4.

Table 4.
Descriptive Statistics Gain

		Minimum	Maximum	Mean	Std. Deviation
gain	6	9.00	61.81	42.2994	13.51220
Valid N (listwise)	6				

Table 4 shows that the average gain score is 42.299, indicating that the data falls into the "highly effective" category.

C. Student Responses

The student responses, collected through a questionnaire, can be analyzed in Table 5.

Table 5.
Analysis of Student Response Data

Aspects Responded to by Students	Mean	Percentage	Category
Able Motivate	3.23	80.73	Responded Very Well
Interest	3.40	85.00	Responded Very Well
Material and Presentation	3.26	81.50	Responded Very Well
Language Usage	3.37	84.25	Responded Very Well
Multimodal	3.45	86.25	Responded Very Well
TPACK	3.28	82.00	Responded Very Well
The Philosophy of KH. Ahmad Dahlan	3.25	81.25	Responded Very Well
Total Mean	3.32	83.00	

Based on Table 5, the average student response score across seven indicators is 3.32 or 85%, which falls into the "very good" category. This indicates that students responded very positively to the development of the TPACK-oriented multimodal interactive flipbook based on KH. Ahmad Dahlan's philosophy.

This finding aligns with the study conducted by Imas Tesia Putri et al. (2022), which also concluded that learning with a TPACK-based e-module received positive responses in terms of content, design, language, and illustrations.

IV. Conclusion

The development process of the interactive flipbook using the ASSURE model has successfully produced a TPACK-based learning media integrated with KH. Ahmad Dahlan's philosophy. This flipbook has proven effective in enhancing students' critical thinking skills in Analytic Geometry courses. The effectiveness is evident from the decline in the percentage of students categorized as "very poorly critical" and "less critical" from 100% to just 12.5%. Conversely, the percentage of students in the "moderately critical," "critical," and "highly critical" categories increased to 87.5%.

Additionally, students' responses to the interactive flipbook were highly positive, with an average score of 3.32 (85%) across all indicators, indicating that this learning media was well-received. This research contributes to the development of TPACK-

based learning media, which not only focuses on enhancing critical thinking skills but also integrates character values from KH. Ahmad Dahlan's philosophy.

This study enriches the references for implementing the ASSURE model in developing interactive learning media in higher education, particularly in mathematics. As a recommendation, this interactive flipbook can be expanded for use in other relevant courses, further developed for various educational levels, and evaluated for its long-term impact on learning. Additionally, new technological innovations or additional features could be integrated to enhance both learning effectiveness and student engagement.

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