

Development of Gamification-Based Interactive Learning Media Through the DILEMA Platform to Improve Learning Outcomes in Islamic Cultural History (SKI) for Sixth-Grade Students at MI Khoirul Huda Bedahan

Damayanti¹, Masitowati Gatot², Ibdalsyah³

^{1 2 3} Program Studi Magister Teknologi Pendidikan, Sekolah Pascasarjana
Universitas Ibn Khaldun Bogor, Indonesia

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ABSTRACT

Digital transformation has encouraged the use of learning media that promotes student engagement. However, learning platforms in madrasahs are still mainly used for administrative purposes rather than instructional activities. This study aimed to develop gamification-based learning media through the DILEMA platform for Islamic Cultural History (SKI) and to examine its validity and effectiveness in improving learning outcomes. The study employed a Research and Development (R&D) approach with mixed methods by integrating the Dick and Carey instructional design model with the Lee and Owens multimedia development model. Data were collected through observations, interviews, questionnaires, documentation, and achievement tests. The results showed that the media were highly valid, with expert validation scores of 91.00%, 97.60%, 94.40%, and 97.33%. The media also effectively improved learning outcomes, increasing the average score from 62 to 90 with an N-Gain of 0.74 (high category), and showed a significant difference between the experimental and control groups (Mann-Whitney U, Sig. = 0.000; $p < 0.05$). The DILEMA-based gamification media is a valid and effective alternative for Islamic Cultural History learning in Madrasah Ibtidaiyah.

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Corresponding Author:

Damayanti

Universitas Ibn Khaldun Bogor

Email: Damayantifauzi5@gmail.com

1. INTRODUCTION

The utilization of digital technology in education provides opportunities for teachers to create more interactive learning experiences that align with students' characteristics. The use of interactive media and game-based learning has been reported to improve students' motivation, participation, and learning outcomes through engaging activities and feedback [1]–[3]. This is in line with Minister of Education, Culture, Research, and Technology Regulation No. 16 of 2022, which emphasizes interactive and enjoyable learning that encourages active student engagement. In this context, educational technology serves not only as a learning aid but also as a means of facilitating the learning process and improving the quality of education [4].

In Islamic Cultural History (SKI) learning, innovative media are needed because historical content and the exemplary values of historical figures are often difficult for students to understand

when delivered solely through lectures and student worksheets [5]. Observations at MI Khoirul Huda Bedahan revealed that SKI instruction was still predominantly lecture-based, with student worksheets serving as the primary learning resource, while the use of digital media remained limited. This situation resulted in suboptimal student engagement, with approximately 61% of sixth-grade students failing to meet the Learning Objective Achievement Criteria (KKTP). Meanwhile, the school already has a computer laboratory, internet access, smart televisions, and the DILEMA platform, which have not been optimally utilized as learning media [6].

Previous studies have shown that Educaplay and game-based learning can support students' learning outcomes and participation [2], [3], [1]. However, these applications are generally used independently, meaning that learning materials, activities, assessments, and collaboration are not yet integrated into a single learning environment [7]. This situation presents an opportunity to develop DILEMA as a gamification-based learning medium through the integration of Educaplay, Flash Quiz, and Interactive Group [8].

Based on these conditions, this study aims to develop gamification-based learning media through the DILEMA platform for Islamic Cultural History (SKI) instruction at the Islamic elementary school level, assess its feasibility, and analyze its effectiveness in improving students' learning outcomes. This development is expected to provide an alternative approach to utilizing the school's digital platform as a more interactive and meaningful learning environment [9].

2. METHOD

This study employed a mixed-methods approach using a Research and Development (R&D) design. This approach combines qualitative and quantitative data to provide an overview of the product development process, feasibility, and effectiveness [10]. Both approaches were selected according to the research needs, including collecting field data and evaluating the developed product [11]. The R&D method was chosen because the study aimed to develop and evaluate gamification-based interactive learning media through the DILEMA platform [12], [13].

The development process primarily adopted the Dick and Carey model, which views learning as an interconnected system whose components are developed systematically, from defining instructional objectives to evaluation [14], [15]. The stages included identifying instructional goals, analyzing instruction and learner characteristics, formulating learning objectives, developing assessment instruments, designing instructional strategies and materials, conducting formative evaluation, revising the product, and performing summative evaluation [16].

Since the product was an interactive multimedia application, the Dick and Carey model was integrated with the Lee and Owens model for media development. This model consists of five stages: analysis, design, development, implementation, and evaluation. The integration supported the technical design and development of the media, including its interface, storyboard, interactive features, and product testing [16].

The media development process also considered the principles of interactive learning media, which enable students to engage with learning materials and receive feedback throughout the learning process [17]. Product feasibility was assessed through evaluation and validation before classroom implementation [18]. The product's effectiveness was subsequently analyzed by comparing pretest and posttest scores and calculating the N-Gain to measure improvements in students' learning outcomes [19]. The integration of the development models used in this study is illustrated in Figure 1:

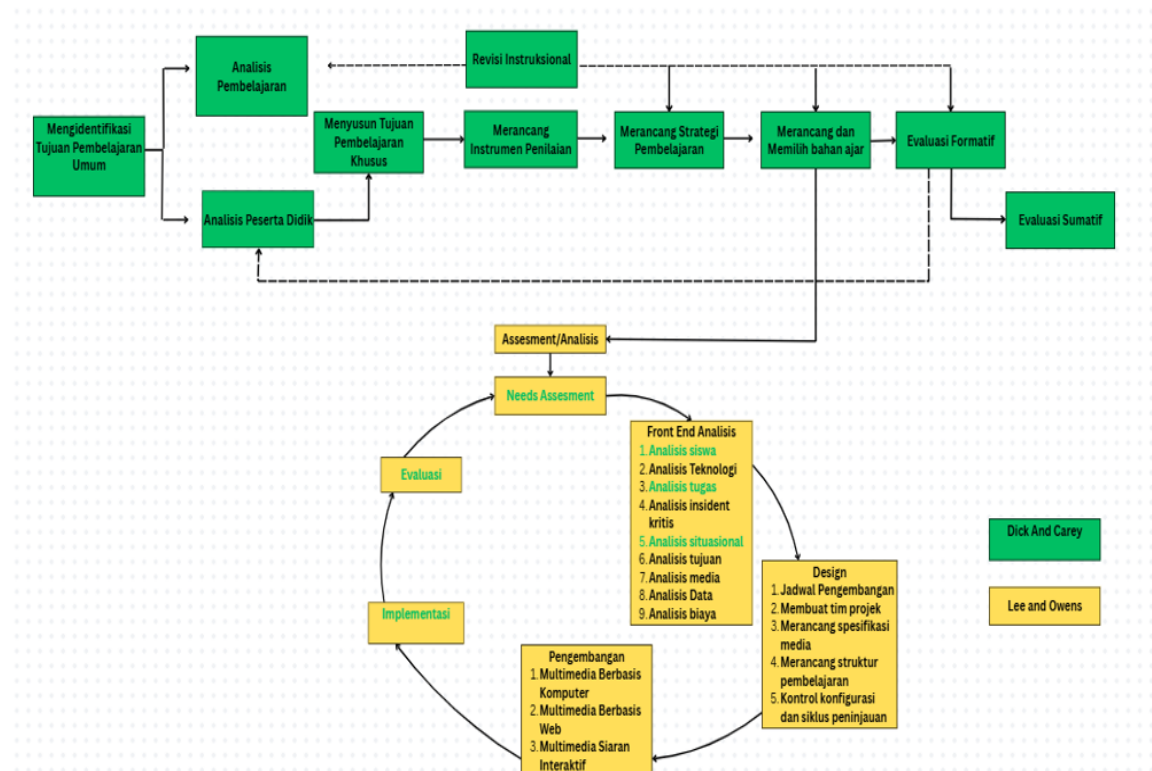


Figure 1. Integration of the Dick and Carey and Lee and Owens Models in the Development of Gamification-Based Learning Media

Based on the integration of the two models, the study began with the identification of instructional goals, needs analysis, instructional analysis, and an examination of students' characteristics and the learning context. These stages followed the systematic approach of Dick and Carey, which considers instructional objectives, learner characteristics, strategies, learning materials, and evaluation as interrelated components [3]. This structured development process also supports the design of interactive learning media, with each stage directed toward achieving the intended learning objectives [15].

The subsequent stages involved formulating specific learning objectives, developing assessment instruments, designing instructional strategies, and selecting learning materials. Once the instructional design had been completed, multimedia development proceeded through storyboard preparation, navigation structure design, interface design, and the development of interactive features. These stages followed the Lee and Owens model, which consists of five phases: analysis, design, development, implementation, and evaluation [4]. During the analysis phase, a needs assessment and front-end analysis were conducted to identify user needs and learning conditions, while the design phase focused on planning the media structure and interface.

The media development process also considered the characteristics of interactive learning media. Fikri and Madona [17] explain that interactive media can integrate text, images, audio, video, animation, and interactive elements into a single learning medium. Meanwhile, Kristanto [20] describes media as a means of conveying instructional messages that can support students' attention and engagement.

The developed product was subsequently evaluated through one-to-one, small-group, and field trials. Each stage included formative evaluation to obtain feedback on the product's weaknesses and provide a basis for revision before summative evaluation. This process is consistent with the Dick and Carey model, which incorporates formative evaluation, revision, and summative evaluation as integral components of instructional development [14].

The study was conducted at MI Khoirul Huda Bedahan, Sawangan District, Depok City, during the second semester of the 2025/2026 academic year. It employed a Research and

Development (R&D) method with a mixed-methods approach, integrating qualitative and quantitative data to examine the development process, feasibility, and effectiveness of the product. In the qualitative stage, informants were selected using purposive sampling based on specific considerations relevant to the research objectives [11].

The effectiveness of the media was tested using a quasi-experimental design with a nonequivalent control group design. This design involves an experimental group and a control group, both of which are administered pretests and posttests to measure changes in learning outcomes following the intervention [21]. The experimental class used gamification-based learning media through the DILEMA platform, while the control class received instruction using the teacher's usual teaching methods. Both groups completed pretests and posttests to measure changes in their learning outcomes.

Data were collected through observation, semi-structured interviews, documentation, questionnaires, and learning outcome tests. Observation, interviews, and documentation were used during the needs analysis stage, while questionnaires were administered to obtain expert evaluations and user responses. Pretests and posttests were used to measure students' learning outcomes in the topic of the Wali Songo's Islamic preaching efforts. The use of interactive media was also intended to provide a more active learning experience through direct interaction with instructional materials and the learning system [22], [23].

Qualitative data were analyzed through data reduction, data presentation, and conclusion drawing, while quantitative data were analyzed using descriptive and inferential statistics [11]. Statistical analyses included tests of normality and homogeneity. Since the data did not meet the assumptions for parametric testing, the Wilcoxon Signed-Rank Test was used to identify changes in learning outcomes, while the Mann-Whitney U Test was used to compare learning outcomes between the two groups. The effectiveness of the media was further analyzed using the Normalized Gain (N-Gain), calculated from the pretest and posttest scores [19].

3. RESULT AND DISCUSSION

This study produced gamification-based interactive learning media through the DILEMA platform for teaching Islamic Cultural History (SKI), specifically the topic of the Wali Songo's Islamic preaching efforts, to sixth-grade students at MI Khoirul Huda Bedahan. The development process employed the Dick and Carey model as the instructional design framework, integrated with Lee and Owens for multimedia development. Dick and Carey emphasizes the interconnectedness of learning objectives, learner characteristics, instructional strategies, materials, and evaluation, while Lee and Owens supports multimedia development through the stages of analysis, design, development, implementation, and evaluation [14], [16].

The needs analysis was conducted through observation, interviews, and document analysis. The findings indicated that SKI instruction was still dominated by lectures and student worksheets, while digital media remained underutilized. Of the 38 students, 23 students (61%) had not met the Learning Objective Achievement Criteria (KKTP), while 15 students (39%) had achieved mastery. Meanwhile, the madrasah was equipped with a computer laboratory, internet access, smart TVs, and the DILEMA platform, which had previously been used primarily for administration and learning outcome reporting. Students demonstrated greater enthusiasm when learning activities involved quizzes, group discussions, and competitive challenges. These conditions reinforced the need to develop learning media that could make more effective use of the madrasah's digital facilities [17].

These findings are consistent with Januszewski and Molenda [24], who explain that educational technology extends beyond the use of devices to include the creation, utilization, and management of technological processes and resources to facilitate learning and improve performance. Arief [25] and Nurhayati [26] also position educational technology as part of the instructional design, development, utilization, and evaluation process. Thus, the use of DILEMA in this study not only transformed the presentation of learning materials but also optimized technology as an integral component of the learning system.

The developed media integrated SKI learning materials with Educaplay, Flash Quiz, Interactive Group, a point system, badges, a leaderboard, challenges, and immediate feedback. The product specifications presented in the thesis indicate that DILEMA functioned as a learning

management system (LMS) incorporating interactive materials, Educaplay activities, Interactive Group, quizzes, assessments, and gamification elements such as points, badges, leaderboards, and challenges. This multimedia integration is consistent with Fikri and Madona [17], who explain that interactive media can combine text, images, audio, video, animation, and interactivity. Kristanto [20] adds that media serve as a means of conveying instructional messages that can attract students' attention and increase engagement.

Regarding interactivity, Watri et al. [27] explain that interactive media allow students to control learning activities and the learning process, while Sinta et al. [22] emphasize two-way communication between students and the system. Mubarrok et al. [28] demonstrate that interactive media can integrate learning materials, activities, technology, and feedback within a single digital environment. These characteristics were reflected in DILEMA, which enabled students to study materials, complete educational games, participate in quizzes, engage in group discussions, and receive feedback on their work within one learning environment [29].

The use of game elements is also supported by previous empirical studies. Kalogiannakis et al. [30] found that gamification can support motivation, engagement, learning experiences, and academic achievement. Najuah et al. [31] explain that game-based activities can develop thinking skills, concentration, and problem-solving abilities, while Wibawa et al. [32] reported that game-based learning can improve motivation, participation, and learning experiences.

These findings are also consistent with Widiani [23], who found that game-based learning can improve learning interest and conceptual understanding, and Manurung et al. [33], who emphasized the potential of interactive multimedia based on game-based learning to provide more communicative and engaging learning experiences. In the context of SKI, Saiful Anwar and Jasiah [34] demonstrated that Educaplay-assisted media can increase student activity and support the understanding of historical concepts. Similarly, Ge'e and Dahlan [2] found that Educaplay can support motivation, conceptual understanding, and student engagement.

The development of DILEMA also aligns with the research of Andista and Rahayu [1], which showed that interactive game-based learning media can create engaging learning environments and support students' understanding of learning materials. Basyar [35] describes digital platforms as tools that can support more interactive and collaborative learning tailored to students' needs. Therefore, the distinctive contribution of this study lies in the integration of various learning activities and gamification elements within the DILEMA platform, rather than the use of separate gaming applications alone [36].

Before classroom implementation, the developed media was validated by subject matter experts, media experts, instructional design experts, and practitioners. The validation results are presented in Table 1.

Table 1. Validation Results of Gamification-Based Learning Media

No	Scoring Aspect	Validator	Percentage (%)	Category
1	Content Feasibility	Content Expert	91,00	Highly Valid
2	Media Feasibility	Media Expert	97,60	Highly Valid
3	Instructional Design	Instructional Design Expert	94,40	Highly Valid
4	Usability	Practitioner	97,33	Highly Valid

The results in Table 1 show that the media was rated highly valid across all assessment aspects. The validation percentages ranged from 91.00% to 97.60%, indicating that the content, media presentation, instructional design, and ease of use met the feasibility criteria. The validators' feedback was then used to guide product refinement, particularly in the presentation of learning materials, user instructions, and gamification features. These revisions resulted in a media product ready for implementation in the field trial.

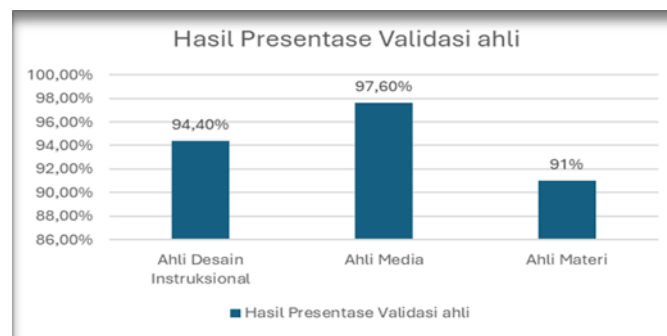
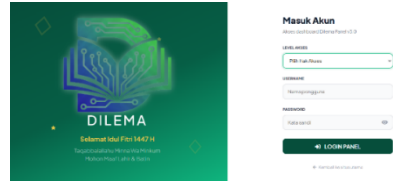
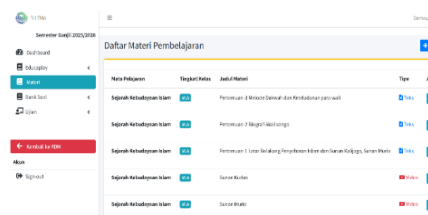


Figure 2. Validation Test Results Diagram

These findings indicate that integrating the Dick and Carey model with the Lee and Owens model can produce learning media that meet both pedagogical and technical multimedia requirements. This is consistent with previous studies suggesting that systematic media development tends to result in products that are more feasible and easier to implement in the learning process.

The validated interactive learning media are presented below:

No	Development
	
1	The login dashboard was designed to be simple and easy to recognize, allowing students to access the system with ease.
	
2	The dashboard menu was organized under the “Gabut” section, with clear navigation to help students access learning materials, games, and assessments systematically.
	

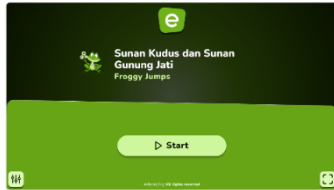
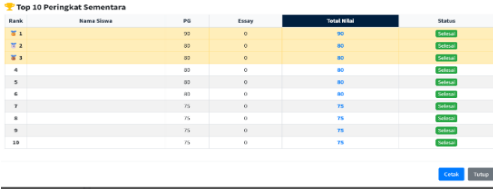
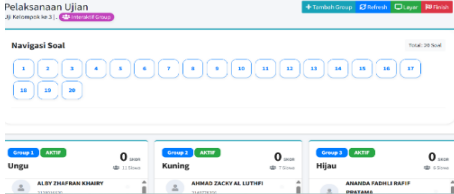
3	The learning materials page was structured to present content interactively through narratives, images, videos, and digital documents.	
		
4	Integrating Educaplay Interactive Games into the DILEMA Platform	
		
5	The feedback page displays scores, rankings, and awards to provide students with feedback on their learning outcomes.	
		
6	The interactive group page was designed to support collaborative learning through group assignments and monitoring of learning activities.	

Table 2 presents the main components developed in the gamification-based learning media through the DILEMA platform. The development included simplifying the interface, organizing interactive learning materials, integrating Educaplay, providing learning outcome feedback, and adding an interactive group feature to support student collaboration. All components were designed to make the learning process more engaging, systematic, and student-centered.

The effectiveness of the learning media was tested using a nonequivalent control group design involving an experimental class and a control class. Pretests and posttests were administered to measure changes in learning outcomes following the instructional process.

The effectiveness test involved 36 sixth-grade students at MI Khoirul Huda Bedahan. Learning outcomes were measured before and after the use of interactive learning media in the SKI subject. To ensure the accuracy of the effectiveness measurement, the test instrument was first subjected to a validity test, with the following results.

Table 3. Test Item Validation Results

No Soal	Person Correlation	NILAI Sig	Kesimpulan	Interpretatio
Soal_1	0,093	0,658	TIDAK VALID	
Soal_2	.688	0,000	VALID	TINGG
Soal_3	.692	0,000	VALID	TINGGI
Soal_4	.543	0,005	VALID	CUKUP
Soal_5	.417	0,038	VALID	CUKUP
Soal_6	.546	0,005	VALID	CUKUP

No Soal	Person Correlation	NILAI Sig	Kesimpulan	Interpretatio
Soal_7	.471	0,018	VALID	CUKUP
Soal_8	.466	0,019	VALID	CUKUP
Soal_9	.591	0,002	VALID	CUKUP
Soal_10	.675	0,000	VALID	TINGGI
Soal_11	.444	0,026	VALID	CUKUP
Soal_12	.721	0,000	VALID	TINGGI
Soal_13	.507	0,010	VALID	CUKUP
Soal_14	.652	0,000	VALID	TINGGI
Soal_15	0,347	0,089	TIDAK VALID	
Soal_16	.765	0,000	VALID	TINGGI
Soal_17	.641	0,001	VALID	TINGGI
Soal_18	.688	0,000	VALID	TINGGI
Soal_19	.641	0,001	VALID	TINGGI
Soal_20	.444	0,026	VALID	CUKUP
Soal_21	.268	0,195	TIDAK VALID	
Soal_22	.753	0.000	VALID	TINGGI
Soal_23	.268	0.195	TIDAK VALID	
Soal_24	.753	0.000	VALID	TINGGI
Soal_25	.268	0.195	TIDAK VALID	

Based on the validity test results for the 25 test items, 20 items were found to be valid, while 5 items—numbers 1, 15, 21, 23, and 25—were deemed invalid because their significance values were greater than 0.05. The remaining 20 items had significance values below 0.05 and were therefore considered valid and suitable for use as research instruments. The reliability test was then conducted, with the following results:

Table 4. Reliability Test Results

Reliability Statistics	
Cronbach's Alpha	
	N of Items
.743	25

The analysis yielded a Cronbach's Alpha value of 0.743, indicating that the instrument falls within the reliable category and is suitable for use as a data collection tool in this study.

Before testing the hypotheses, a normality test was conducted to determine whether the learning outcome data were normally distributed. The normality test was performed using IBM SPSS Statistics.

Table 5. Normality Test Results

Tests of Normality							
		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Class	Statistic	df	Sig.	Statistic	df	Sig.
Study Result	Pre-test C (Control)	.156	36	.026	.881	36	.001
	Post-Test C (Control)	.197	36	.001	.928	36	.022
	Pre-test A (Experiment)	.150	36	.040	.869	36	.001
	Post-test A (Experiment)	.151	36	.037	.933	36	.032

a. Lilliefors Significance Correction

Based on the normality test results, the significance (Sig.) values were 0.026 for the control class pretest, 0.001 for the control class posttest, 0.040 for the experimental class pretest, and 0.037 for the experimental class posttest. All significance values were below 0.05 (Sig. < 0.05), indicating that the pretest and posttest data for both the control and experimental classes were not normally distributed.

According to IHR Ahmadi, nonparametric statistics are used when research data do not meet the assumptions of parametric statistics, such as the assumption of normal data distribution (Ahmadi, 2024, pp. 4–5). Therefore, hypothesis testing in this study proceeded using nonparametric statistical methods.

Although the data were not normally distributed, a homogeneity test was still conducted to determine whether the variances of the experimental and control classes were equal.

Table 6. Homogeneity Test Results

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Study Result	Based on Mean	.214	1	70	.645
	Based on Median	.187	1	70	.667
	Based on Median and with adjusted df	.187	1	64.632	.667
	Based on trimmed mean	.295	1	70	.589

Based on the homogeneity test using Levene's Test, the significance value (Sig.) under "Based on Mean" was 0.645. Since this value was greater than 0.05 (Sig. > 0.05), the learning outcome data variances of the control and experimental classes can be considered homogeneous.

Thus, the two groups had relatively equal variances, and hypothesis testing could proceed using nonparametric statistical tests, in accordance with the earlier normality test results.

The effectiveness of the gamification-based learning media through the DILEMA platform was analyzed by comparing students' learning outcomes before and after instruction in the experimental and control classes. Pretest and posttest assessments were used to measure changes in students' abilities following the learning process.

Based on the pretest results from 36 students, scores in the control class ranged from 15 to 80, while those in the experimental class ranged from 10 to 80. Overall, the pretest results indicated

that students' initial abilities in both classes were within the low-to-moderate range and were relatively comparable before the intervention. Therefore, both classes were considered suitable for comparing learning outcome improvements in the subsequent stage.

Based on the posttest results from 36 students, scores in the control class ranged from 45 to 90, while scores in the experimental class ranged from 70 to 100. Overall, both classes showed improvements in learning outcomes following the instructional process.

Table 7. Mean Pretest and Posttest Scores

Class	Pretest (Mean)	Posttest (Mean)
Experiment	61,53	89,58
Control	63,06	71,81

Based on Table 2, the mean learning outcomes increased in both groups following instruction. In the experimental class, the mean score rose from 61.53 to 89.58, while in the control class it increased from 63.06 to 71.81. Although both groups showed improvements in learning outcomes, the increase was greater in the experimental class than in the control class. These findings indicate that the use of gamification-based learning media through the DILEMA platform was associated with higher learning outcomes than conventional instruction.

A Mann–Whitney U test was then conducted to determine whether there was a difference in learning outcomes between the experimental and control classes after the intervention.

Table 8. Mann–Whitney U Test Results

Statistic	Value
Mann–Whitney U	76,000
Z	-6,496
Asymp. Sig. (2-tailed)	0,000

The significance value of 0.000 ($p < 0.05$) indicates a statistically significant difference in learning outcomes between the experimental and control classes. This finding suggests that the use of gamification-based learning media through the DILEMA platform was associated with better student learning outcomes than instruction without the developed media.

In addition to hypothesis testing, learning outcome improvements were analyzed using the Normalized Gain (N-Gain) to determine the effectiveness of the learning media.

Table 9. N-Gain Analysis Results

Class	Average N-Gain	Category
Experiment	0,74	High
Control	0,22	Low

Based on Table 9, the mean N-Gain score in the experimental class was 0.74 (high category), while that of the control class was 0.22 (low category). In the experimental class, 55.6% of students were in the high category and 44.4% in the moderate category. In contrast, the control class consisted of 77.8% of students in the low category and 22.2% in the moderate category. These results indicate that the gamification-based learning media through the DILEMA platform was more effective in improving learning outcomes than conventional instruction.

The improvement was related not only to content delivery but also to students' learning experiences. The integration of Educaplay, Flash Quiz, and Interactive Group enabled students to

learn interactively, receive immediate feedback, and collaborate, thereby supporting their understanding of the Wali Songo's missionary struggles.

These findings are consistent with Najuah, Sidiq, and Simamora [31], who stated that game-based learning can develop thinking skills, improve concentration, and help students become accustomed to solving problems through direct experience (learning by doing). Widiananda [23] also reported that game-based learning positively affects learning interest and conceptual understanding through engaging instruction that actively involves students. This is further supported by Manurung, Agung, and Suartama [33], who stated that interactive multimedia based on game-based learning can create dynamic, communicative learning experiences that align with students' characteristics.

This study differs in its integration of learning materials, educational games, assessments, and collaborative activities through the DILEMA platform. Thus, the entire learning process takes place within a single digital environment, providing a more comprehensive learning experience while helping teachers manage instruction effectively.

4. CONCLUSION

This study successfully developed gamification-based learning media through the DILEMA platform for Islamic Cultural History (SKI) instruction at the Madrasah Ibtidaiyah level. The development integrated the Dick and Carey model as the primary instructional design framework with the Lee and Owens model for multimedia development. Based on evaluations by content, media, and instructional design experts, as well as a practitioner, the developed media met the "highly valid" criteria and was deemed suitable for use in learning.

The effectiveness test showed that the use of gamification-based learning media through the DILEMA platform significantly improved students' learning outcomes. This improvement was reflected in the changes in learning outcomes following instruction and supported by statistical tests and N-Gain analysis, which indicated that the media had a positive impact on students' mastery of the material compared with conventional instruction.

The findings demonstrate that optimizing the DILEMA platform as gamification-based learning media not only supports content delivery but also facilitates learning activities, assessment, and collaboration within a single digital learning environment. Therefore, the developed media has the potential to serve as an alternative for teachers seeking to create more interactive, engaging, and student-centered Islamic Cultural History instruction. It may also be further developed for other subjects with similar characteristics.

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