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Development of Interactive Audio-Visual Multimedia to Enhance Students' Qur'anic Recitation Fluency and Tajwid Accuracy at SMP Unismuh Makassar

Fitriani Nurdin[1*], Hamsu Abdul Gani [2], Abdul Hakim[3], Nurhikmah Hasyim[4]

[1,2,3,4]Universitas Negeri Makassar
Sulawesi Selatan, Indonesia
✉ fitrianinurdin04@gmail.com*

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Abstract

Background: Qur'anic learning in schools still faces obstacles in improving students' recitation fluency and tajwid accuracy. Observations at SMP Unismuh Makassar showed that 52.6% of students had difficulty understanding BTQ *(Baca Tulis Qur'an)* material when learning relied only on textbooks and teacher explanations, while 80% struggled to study independently. Most students, however, supported the use of interactive multimedia, indicating the need for more engaging and accessible learning media.
Aims: This study aimed to develop interactive audio-visual multimedia to enhance students' Qur'anic recitation fluency and tajwid accuracy and to assess its validity, practicality, and effectiveness.
Methods: A Research and Development (R&D) approach was employed using the ADDIE model. Data were collected through observations, questionnaires, tests, and documentation, with using valid and reliable instruments.
Result: The multimedia achieved high validity (98% material; 78% media), strong practicality (99% teacher; 89.6% students), and indicating strong effectiveness with an N-Gain score of 76.38%.
Conclusion: This study offers an effective interactive multimedia model for improving Qur'anic recitation skills and supports student-centered learning.

A. Introduction

The Qur'an, revealed by Allah through the angel Jibril to the Prophet Muhammad (peace be upon him), serves as the primary guide for human life and contains divine laws and moral principles that lead to success in this world and the hereafter (Fauji et al., 2020). Surah Al-Muzzammil verse 4 instructs believers to "*Recite the Qur'an in a measured tone,"* emphasizing the importance of accurate and reflective recitation. Ibn Kathir explains that *tartil* refers to reading the Qur'an slowly, clearly, and correctly in accordance with the rules of *tajwid* (Fitriani & Hayati, 2020). Thus, mastering *tajwid* is essential to preserving proper pronunciation and avoiding errors in recitation.

In Qur'anic education contexts, students are expected to recite the Qur'an fluently and accurately by observing *makhārij al-ḥurūf* (the points of articulation) and applying correct *tajwid* principles. *Tajwid* derived from the Arabic word jawwada, meaning "to improve or beautify" is the science of pronouncing each letter according to its characteristics and articulation (Alagrami & Eljazzar, 2020). Common *tajwid* rules include *izhar*, *idgham bi ghunnah*, *idgham bila ghunnah*, *ikhfa*, and *iqlab* (Premana, 2024). Despite its importance, many students continue to struggle with pronunciation accuracy and correct application of *tajwid*, making it a persistent challenge for educators (Fauji et al., 2020; Zahroh, 2022).

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From a theoretical perspective, Qur'anic reading instruction aligns with cognitive, behaviorist, and constructivist learning theories. The cognitive approach emphasizes guided practice to help students identify and apply *tajwid* rules (Hossain, 2023). The behaviorist approach highlights repetition and imitation through teacher modeling and student practice, while the constructivist approach promotes active engagement, encouraging students to build understanding through interactive learning experiences (Untari et al., 2020). These theories collectively imply that effective learning media should be structured, interactive, and engaging to support mastery of Qur'anic reading.

Advancements in information and communication technology have transformed educational practices, offering innovative tools to enhance engagement and learning outcomes. Interactive multimedia, integrating text, audio, images, animation, and video has been shown to improve comprehension, motivation, and retention (Hossain, 2023). In Qur'anic instruction, multimedia enables students to listen to accurate pronunciations, observe articulation points, and practice recitation independently. It also allows teachers to explain abstract phonetic concepts more effectively (Yusnanto et al., 2023).

Empirical studies support the effectiveness of multimedia-based learning in religious education. Flash-based Qur'anic learning media have helped teachers deliver *tajwid* material, though some lack Android compatibility (Yusnanto et al., 2023). Augmented Reality (AR)–based *tajwid* applications have demonstrated improvements in student understanding (Premana, 2024). Other studies in other subject areas similarly found that interactive multimedia supports student engagement, motivation, and achievement (Alam et al., 2022; Nurhikmah et al., 2021).

Despite these developments, most previous studies have focused on general Qur'anic education rather than *tajwid*-specific recitation fluency at the secondary school level. Additionally, few multimedia models have been designed to meet the contextual needs of Indonesian Islamic school students.

At SMP Unismuh Makassar, a school emphasizing Qur'anic literacy, challenges remain in achieving optimal learning outcomes. Observations during the 2022/2023 academic year revealed that many students mispronounce letters, overlook *tajwid* rules, and lack fluency. Limited class time for BTQ *(Baca Tulis Qur'an)* restricts teachers' ability to provide individualized guidance. Students also struggle during independent study due to limited learning materials and minimal parental support. Survey data further showed that 52.6% of students found it difficult to understand *tajwid* when relying solely on textbooks, while 94.7% expressed interest in interactive multimedia and 89.5% believed smartphone-based applications would support independent learning.

These challenges align with the Indonesian National Education Standards (Government Regulation No. 57 of 2021), which state that learning should be interactive, enjoyable, and student-centered. The integration of educational technology in Qur'anic instruction supports these principles by enhancing engagement, independence, and accessibility (Hurwitz & Vanacore, 2023; Miasari et al., 2022).

In response to these issues, this study aims to develop interactive audio–visual multimedia—built using Android and Construct 2, to enhance students' Qur'anic recitation fluency and *tajwid* accuracy at SMP Unismuh Makassar. The study seeks to produce a valid, practical, and effective learning medium tailored to students' needs, offering strong interactivity, contextual relevance, and robust pedagogical validation. The multimedia integrates synchronized audio-visual features and kinesthetic interaction to accommodate diverse learning styles and promote independent practice.

B. Research Methods

This study employed a Research and Development (R&D) approach. According to Sugiyono (2019), research and development aim to produce a specific product and to test its validity and effectiveness in practical use. In this study, the product developed was an interactive multimedia application designed to improve students' Qur'anic reading skills. The development process adopted the ADDIE model, which consists of five systematic stages: Analysis, Design, Development, Implementation, and Evaluation. As stated by Gagné (as cited in Yu et al., 2021), the ADDIE model provides a structured sequence of stages that facilitates the systematic process of instructional product development.

The subjects of this study consisted of two validators, one content expert and one media expert, along with one BTQ teacher and 20 eighth-grade female students. The sampling technique used was purposive sampling, which involves selecting participants based on specific characteristics and considerations. The selection of the female class was based on the school's policy that female students are specifically guided by a *ustazah* (female instructor), while male students are guided by a *ustaz* (male instructor), particularly

in matters related to Qur'anic reading proficiency. The relatively small sample size of twenty students was determined to allow for focused observation and intensive monitoring during the product testing stage. Although the limited number of participants restricts the generalizability of the findings, the sample was considered adequate for preliminary product validation and feasibility testing within the R&D framework.

This research was conducted during the odd semester of the 2023–2024 academic year at SMP Unismuh Makassar. The school was selected as the research site because it places a strong emphasis on Qur'anic learning as part of its Islamic education curriculum. As a Muhammadiyah-affiliated institution, SMP Unismuh Makassar integrates Qur'anic literacy as a core component of students' spiritual and character development. The school's policy requires all students to demonstrate fluency, accuracy, and proper pronunciation in Qur'anic recitation in accordance with the rules of *tajwid*. This emphasis is reflected in the inclusion of BTQ as a compulsory subject and in the school's structured program for Qur'anic proficiency assessment each semester (Fauji et al., 2020; Miasari et al., 2022).

The development procedure in this study employed the ADDIE model, which consists of five systematic stages: Analysis, Design, Development, Implementation, and Evaluation. This model was used to guide the creation of a comprehensive instructional product. To facilitate clarity and ease of understanding for readers, the ADDIE process is also presented in the form of a flowchart (Figure 1).

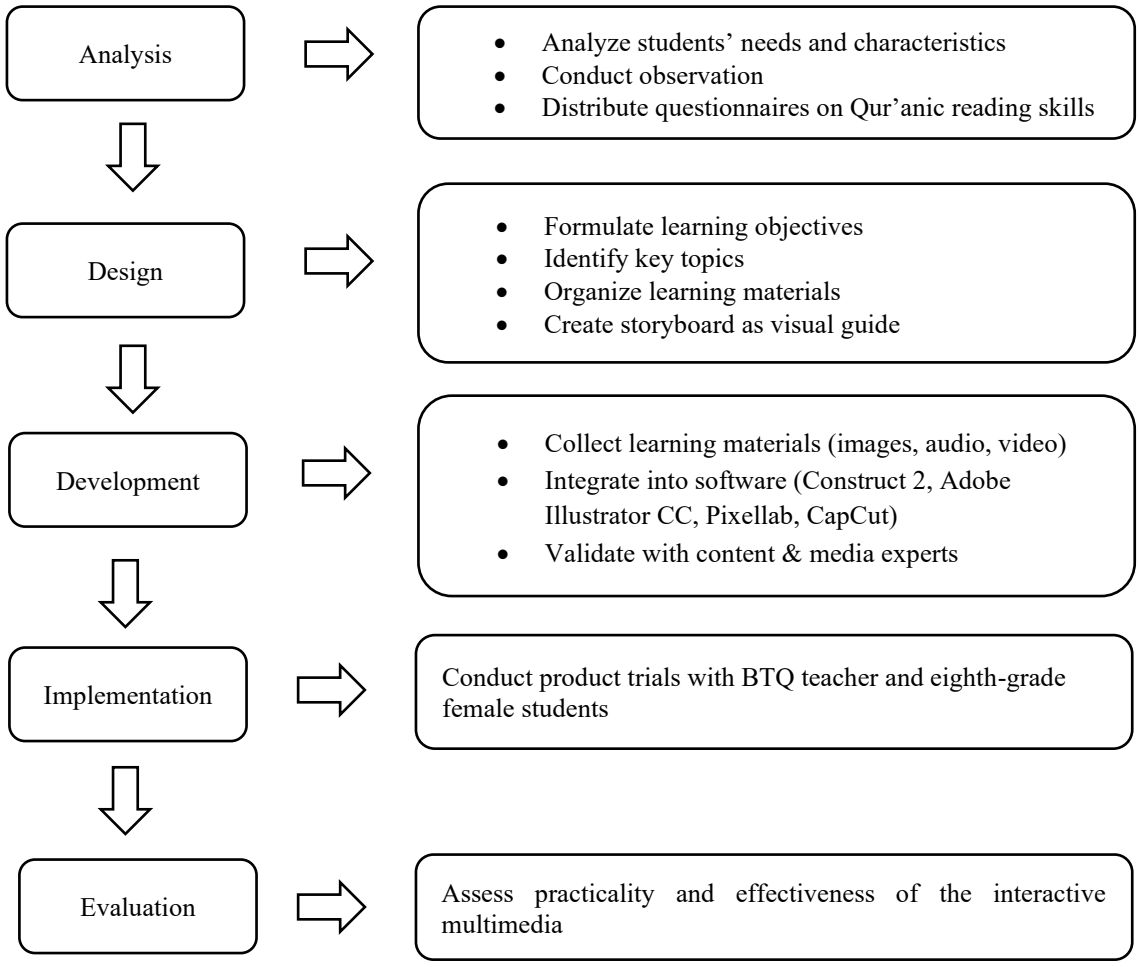

Figure 1. ADDIE Model Flowchart

a) Analysis: This stage involved examining students' needs and characteristics regarding their Qur'anic reading skills at SMP Unismuh Makassar. Data were collected through observations and questionnaires focusing on students' reading abilities and learning preferences.

b) Design: At this stage, learning objectives were formulated, key topics were identified, learning materials were systematically organized, and a storyboard was created. The storyboard served as a visual guide

for planning the program's flow, navigation, interactivity, and integration of multimedia elements, ensuring that the content is logically structured and user-friendly.

c) Development: In this phase, learning materials such as images, audio, and videos were collected and integrated into software applications, including Construct 2, Adobe Illustrator CC, Pixellab, and CapCut. The product was then validated by both content and media experts to ensure its accuracy, feasibility, and quality.

d) Implementation: This stage involved conducting trials of the interactive multimedia with BTQ teachers and eighth-grade female students at SMP Unismuh Makassar. Both limited and large-scale trials were carried out to collect user feedback and measure practicality.

e) Evaluation: The final stage focused on assessing the practicality and effectiveness of the developed multimedia product in supporting Qur'anic learning. Data from student responses, teacher evaluations, and learning outcome tests were analyzed to determine improvements in reading and application of *tajwid* rules.

The data collection techniques used in this study included observation, questionnaires distribution, and tests. The research instruments consisted of an observation guide, material feasibility questionnaires, media feasibility questionnaires, BTQ teacher evaluation questionnaires, student response questionnaires, and achievement tests. Each questionnaire included specific indicators; for example, the material feasibility questionnaire assessed the clarity, accuracy, and relevance of the content, while the media feasibility questionnaire evaluated visual design, navigation, interactivity, and integration of audio and video. All instruments were validated prior to data collection through expert judgment by content and media specialists, and a pilot test was conducted to ensure clarity and reliability.

The data analysis techniques employed in this development research consisted of two approaches: qualitative descriptive analysis and quantitative descriptive analysis. Qualitative descriptive data were used to process information for improving and refining the product based on feedback and suggestions from experts and users. Quantitative descriptive data were used to analyze the levels of validity, practicality, and effectiveness of the interactive multimedia for Qur'anic learning. Specifically, the material and media feasibility questionnaires assessed the practicality of the learning media, while the student response questionnaire and BTQ teacher evaluation questionnaire provided additional input on usability and engagement. The learning outcome test was designed to assess students' mastery of Qur'anic reading and writing skills, including accuracy of recitation, application of *tajwid* rules, and ability to memorize selected surahs. These instruments allowed for a comprehensive evaluation of both the practicality and effectiveness of the developed interactive multimedia.

The developed product was validated by material experts and media experts, and subsequently tested with students based on the results of the needs analysis. The validation process conducted by experts aimed to determine the degree of product validity, while limited trials and field tests were carried out to measure the product's practicality and effectiveness. The obtained data were analyzed using the following formula:

$$Percentage = \frac{\sum(Score\ x\ the\ weight\ of\ each\ option)}{\text{n x Highest weight}} \text{ x } 100\%$$

where n is the number of respondents, and the highest weight represents the maximum score assigned to an item.

To determine the level of validity and practicality of the developed learning media, the qualification criteria presented in Table 1 and Table 2 were used.

Table 1. Category of Product Validation Based on Percentage Analysis (adapted from Arikunto, 2013)

No.	Achievement Level	Qualification	Description
1	81 – 100%	Excellent	Very valid – no revision needed
2	61 – 80%	Good	Valid – no revision needed
3	41– 60%	Fair	Fairly valid – minor revision required
4	21– 40%	Poor	Invalid – major revision required
5	<20%	Very Poor	Highly invalid – revision strongly required

Table 2. Category and Criteria of Product Percentage (adapted from Sugiyono, 2019)

No.	Achievement Level	Qualification
1	81.00% – 100.00%	Very Practical
2	61.00 – 80.00%	Practical
3	41.00% – 60.00%	Fairly Practical
4	21.00% – 40.00%	Less Practical
5	00.00% – 20.00%	Impractical

The interactive multimedia product is considered effective if students' learning outcomes improve based on their test results. The level of effectiveness can also be determined by calculating the N-Gain score, which measures the normalized improvement between pre-test and post-test scores. The formula for calculating N-Gain is as follows:

$$N - Gain = \frac{Posttest\ Score - Pretest\ Score}{Maximum\ Score - Pretest\ Score} \text{ x } 100\%$$

This formula provides a standardized measure of learning improvement, allowing comparisons across students and ensuring that the effectiveness of the learning media is assessed consistently.

The categories of effectiveness level based on the N-Gain Score test according to Suharsimi can be seen in Table 3.

Table 3. Categories of N-Gain Score Effectiveness (Suharsimi, 2013)

No.	Achievement Level	Criteria
1	>76%	Effective
2	56%–75%	Moderately Effective
3	40%–55%	Less Effective
4	<40%	Ineffective

C. Results and Discussion

1. Results

This research and development produced an interactive multimedia product for Qur'an learning at SMP Unismuh Makassar by adapting the ADDIE development model, which includes five stages: analysis, design, development, implementation, and evaluation.

1.1. Analysis

The interactive multimedia product was developed based on a needs analysis of Qur'an learning at SMP Unismuh Makassar, as outlined in the initial stage of the ADDIE development model. The needs analysis was conducted to determine the readiness and necessity for interactive multimedia. This process involved analyzing the curriculum, identifying students' needs and characteristics through observations and questionnaires in Qur'an learning, particularly focusing on Qur'an reading skills at SMP Unismuh Makassar.

The observations conducted at SMP Unismuh Makassar indicated that the learning media were limited to textbooks and the Qur'an itself, causing students to experience difficulties in reading the Qur'an fluently and studying independently. To assess students' responses, a questionnaire was distributed to 20 students during the data collection period. The responses were analyzed using percentage scoring, and the results are presented in Table 4. Overall, most students rated the learning media as practical or very practical, indicating a positive perception and highlighting the need for interactive multimedia to support Qur'an reading skills.

Table 4. Student Needs and Characteristics Questionnaire (n=20)

No.	Question	Yes (n %)	No (n %)
1.	Do you have difficulty understanding BTQ material when learning only with textbooks and teacher explanations?	11 (52.6%)	9 (47.4%)
2.	Do you enjoy learning the material using only textbooks?	9 (45.00%)	11 (55.00%)
3.	Do you experience difficulties when studying Qur'an at home?	16 (80.00%)	4 (20.00%)

No.	Question	Yes (n %)	No (n %)
4.	Does using a smartphone facilitate your independent learning?	18 (89.05%)	2 (10.05%)
5.	Do you agree that Qur'an learning media should be accessible anytime and anywhere?	20 (100.00%)	0 (0.00%)
6.	Is learning through videos, images, and audio more interesting and enjoyable for you?	17 (84.02%)	3 (15.08%)
7.	Do you agree that Qur'an learning media should be developed as interactive multimedia?	19 (94.07%)	1 (5.03%)
8.	Do you agree that interactive multimedia should include navigation buttons and menu options?	18 (89.05%)	2 (10.05%)
9.	Do you think images and animations are necessary in interactive multimedia development?	20 (100.00%)	0 (0.00%)
10.	Do you think audio is necessary in interactive multimedia development?	20 (100.00%)	0 (0.00%)

Notes:

n = 20 students.

Percentages are rounded to one decimal place.

Yes + No totals = 100% (except for rounding differences)

Based on the results of the observations and questionnaire, the researcher concluded that there is a need for a learning media that is engaging, easy to use, and accessible anytime and anywhere. These findings form the basis for developing interactive multimedia for Qur'an learning, which combines text, images, animations, audio, and video. The use of interactive multimedia can support learning by presenting material in an engaging way (Octavia et al., 2023) and provide in-depth illustrations to reinforce understanding after the learning process (Iswara et al., 2020).

1.2. Design

The second stage involves designing the interactive multimedia. This begins with formulating the learning objectives, such as enabling students to read the Qur'an fluently, apply *tajwid* rules correctly, and improve memorization skills. The main topics were identified based on students' needs, including reading short surahs, understanding pronunciation rules, and practicing proper articulation.

Lesson materials were prepared and organized systematically, and evaluation instruments such as quizzes and interactive exercises were designed to be incorporated into the multimedia. These design decisions directly respond to the needs identified in the analysis stage, ensuring that the product supports effective and engaging learning. This is followed by creating a storyboard.

A storyboard is a flow diagram that outlines the design of the media to be developed. Its purpose is to plan the product design, layout, colors, buttons, menus, and navigation flow, as well as to integrate interactive elements such as audio, video, and quizzes (Nurhikmah et al., 2021). Creating a storyboard helps ensure that the content is structured logically and supports effective interactivity, facilitating a smoother development process.

Figure 2. Home Page Layout

Figure 3. Learning Objectives Page Layout

Figure 4. Lesson Material Menu Layout

Figure 5. Discussion Menu Layout

Figure 6. Quiz Menu Layout

1.3. Development

The third stage focused on the development of the learning media. Instructional videos based on the prepared materials were successfully produced, edited using CapCut, and uploaded to YouTube. These videos were then integrated into the interactive multimedia program, which was compiled into a functional product using the Construct 2 application. The final multimedia product is fully operational and can be accessed independently on both smartphones and laptops via the following link: https://tajwid-interaktif-spuma.netlify.app/. This development resulted in a ready-to-use interactive learning media that integrates instructional videos, text, images, audio, animations, and navigation features to support effective and independent student learning.

Figure 7. Discussion Video Layout

Validation of Interactive Multimedia Product for Qur'an Reading Skills

During the development stage, product validation is necessary to produce an interactive multimedia product that has been tested for feasibility, following revisions based on the assessments, suggestions, and feedback from experts in their respective fields. The validation conducted includes both content validation and media validation.

Content validation was conducted to determine the relevance and feasibility of the learning material for development into interactive multimedia. In this study, the material was validated by Dr. KH. Abbas Baco Miro, Lc., MA, an expert in Qur'an education who serves as the Director of Education at Ulamah Tarjih Muhammadiyah (PUTM) Unismuh Makassar, a lecturer at Unismuh Makassar, and the Chairperson of Rumah Tahfidz Al Qur'an Ibnu Abbas. He was selected as the content expert due to his extensive competence in Qur'an studies, including mastery of *tajwid* rules.

To ensure clarity and coherence, the results of content and media validation are presented together with the corresponding revisions. This approach allows readers to directly see how expert feedback was implemented in the learning media.

Table 5. Content Validation and Revision by a Content Expert

No.	Assessment Item	Score	Feedback/Revision
Learning Aspect			
1.	Relevance of the material to the learning objectives	5	-
2.	Accuracy of the title with the content of the material	5	-
3.	Attractiveness of the material content	5	-
4.	Suitability of the material with students' characteristics	5	-
5.	Encourages students' independent learning	5	-
Material Aspect			
1.	Material is presented clearly and concisely	5	-
2.	Uses simple and easily understood language	5	-
3.	Completeness of the material	5	-
4.	Systematic presentation of the material	5	-
5.	Consistency between images and the material	4	Image alignment has been adjusted to ensure

No.	Assessment Item	Score	Feedback/Revision
			consistency with the accompanying text.
6.	Sequence of examples presented	5	-
7.	Appropriateness of examples provided	5	-
8.	Clarity and correctness of language usage	4	Refined some Arabic text for clarity
9.	Clarity of audio in explaining the material	5	-
10.	Includes images, videos, audio, and animations that help users understand the material clearly	5	-
Accuracy and Meaningfulness Aspect			
1.	Assists in the learning process	5	
2.	Facilitates students' understanding	5	
3.	Supports the learning process	5	
4.	Images, videos, and animations correspond to the content of the material	5	
5.	Stimulates students in understanding the material	5	
	Total Score	98	
	Percentage	98%	

Media validation was conducted to assess the feasibility of the learning media. The validation was carried out by Dr. Pattaufi, S.Pd., M.Si, a lecturer in Educational Technology at Universitas Negeri Makassar. The results of the validation and the corresponding revisions based on his feedback are presented in Tables 6.

Table 6. Product Validation Results by Media Expert

No.	Assessment Item	Score	Feedback/Revision
Visual Aspect			
1.	Accuracy of font selection for readability	2	Font size increased; text color contrasted with background
2.	Accuracy of font size for readability	3	Font size increased
3.	Accuracy of text color for readability	2	Adjusted for better contrast
4.	Appropriateness of color proportion usage	3	-
5.	Clarity of contrast between text and background	2	Adjusted for better readability
6.	Consistency and clarity of color proportions	3	
7.	Image composition	3	
8.	Image quality	4	
9.	Attractiveness of animations	4	
10.	Video quality	4	
11.	Clarity of material presentation in the video	4	
12.	Language used is easy to understand	4	
13.	Appropriateness of background music selection with the material	3	
14.	Clarity of audio in explaining the material	4	
15.	Clarity of program identity	3	Home button replaced with Main Menu
16.	Clarity of navigation and buttons used	3	Added navigation buttons "Back" and "Next"
Programming Aspect			
1.	Ease of operation	3	
2.	Accuracy of button and navigation functions	3	
3.	Ease of interaction with the program	3	
4.	Flexibility (can be used independently or with guidance)	3	
5.	Presents clear success criteria	3	
6.	Clarity of learning objectives	3	
7.	Alignment of media usage with learning objectives	3	

No.	Assessment Item	Score	Feedback/Revision
8.	Alignment of media usage with lesson content	3	
9.	Alignment of media usage with students' characteristics	3	
	Total Score	78	
	Percentage	78%	

Both content and media validation were carried out by experts in their respective fields. The validation results guided the necessary revisions to improve clarity, readability, navigation, and alignment with learning objectives. Presenting validation and revision results together allows readers to clearly understand how expert feedback was implemented to enhance the learning media.

1.4. Implementation

Practicality of the Interactive Multimedia Product for Qur'an Reading Skills

The fourth stage is the implementation phase, which begins with a limited trial involving three students, followed by a large-scale field test to examine the practicality of the interactive multimedia. The limited trial participants were three students selected from Class VIII, while the large-scale trial involved twenty different students from another class, ensuring that no participants took part in both trials. This separation of participants was intended to maintain objectivity and avoid potential bias that might occur if students with prior exposure to the media were included in the subsequent trial. The trials were conducted with both students and the Qur'an subject teacher to gather practical feedback and evaluate the usability and effectiveness of the developed interactive multimedia.

Table 7. Analysis of Student Responses in the Limited Trial

No.	Assessment Item	Respondents		
Visual Aspect				
1.	Interesting and not boring	4	5	4
2.	Clarity of contrast between text and background	5	4	4
3.	Font size and type are easy to read	5	5	4
4.	Appropriateness of color usage	4	4	4
5.	Attractiveness of images and animations	5	5	5
6.	Quality of image and video display	5	5	5
7.	Composition of images, audio, and video	4	5	4
8.	Appropriateness of animations with the material	4	5	4
Material Aspect				
9.	Clarity of material presentation in the video	5	4	4
10.	Language used is easy to understand	5	5	5
11.	Examples provided facilitate understanding of the material	5	5	4
12.	Games presented are engaging	5	5	5
13.	Quiz provided is aligned with the material	4	5	5
Programming Aspect				
14.	Ease of interaction with the program	5	5	4
15.	Clarity of learning objectives and material	5	5	5
16.	Clarity and accuracy of navigation and buttons	4	4	4
17.	Can be used independently or with guidance	4	5	4
18.	Helps students to learn actively	4	5	5
19.	Helps students learn independently	5	5	4
20.	Increases students' learning motivation	4	5	5
	Total Score	91	96	88
	Average Score		91.67	

The limited trial produced total scores ranging from 88 to 96, with an average of 91.67, classified as very practical. Students found the media engaging, visually clear, and easy to navigate. The material was understandable, and the games, quizzes, and examples effectively supported learning. Programming features encouraged active and independent learning.

Table 8. Analysis of Student Responses in the Large-Scale Trial

Metric	Result
Number of Respondents	20
Average Total Score	90.1
Very Practical	16 respondents
Practical	4 respondents

In the large-scale trial, scores ranged from 79 to 98. Most students (16/20) rated the media as very practical, while 4 rated it as practical. These results confirm that the media is consistently effective and user-friendly across a larger group.

Both trials demonstrate that the learning media is practical and effective. The limited trial identified initial usability and engagement, while the large-scale trial validated these findings at a broader scale. Presenting the results together allows readers to easily compare outcomes, confirming that the media consistently supports active and independent learning.

Table 9. Teacher Responses to the Interactive Multimedia

No.	Assessment Items	Score
Visual Aspect		
1.	Interesting and not boring	5
2.	Clarity of contrast between text and background	5
3.	Font size and type are easy to read	5
4.	Appropriateness of color usage	5
5.	Attractiveness of images and animations	4
6.	Quality of image and video display	5
7.	Composition of images, audio, and video	5
8.	Appropriateness of animations with the material	5
Material Aspect		
9.	Clarity of material presentation in the video	5
10.	Material is presented systematically	5
11.	Language used is easy to understand	5
12.	Examples provided are relevant to the material	5
13.	Games presented are engaging	5
14.	Quiz provided is aligned with the material	5
Programming Aspect		
15.	Clarity and accuracy of button functions and navigation	5
16.	Alignment of media usage with students' characteristics	5
17.	Alignment of media usage with learning objectives and material	5
18.	Presents clear success criteria	5
Benefit Aspect		
19.	Ease of interaction with the program	5
20.	Facilitates teacher instruction	5
21.	Helps students learn actively	5
22.	Can be used independently or with guidance	5
23.	Can improve students' academic achievement	5
24.	Increases students' learning motivation	5
	Total Score	119

The results of the teacher's evaluation of the interactive multimedia, as presented in Table 9, show a total score of 119 out of 120, which falls into the "very practical" category based on the practicality criteria used in this study. This indicates that the multimedia is highly feasible for classroom use in terms of visual quality, material presentation, navigation functions, as well as its benefits for both teachers and students. The highest ratings were given to aspects related to ease of interaction, clarity of material presentation, and alignment with learning objectives, demonstrating that the multimedia effectively supports the instructional process.

When it is compared with students' responses, which also indicated a high level of practicality, the teacher's evaluation further strengthens the conclusion that the multimedia is both usable and pedagogically supportive. While students emphasized the media's attractiveness and its role in increasing engagement,

the teacher highlighted its instructional value, particularly in facilitating lesson delivery and supporting active learning. The consistency between student and teacher evaluations shows that the interactive multimedia is not only visually appealing but also functions effectively as a learning tool that can enhance the Qur'an reading learning process.

1.5. Evaluation

The evaluation stage in the ADDIE development model is the final phase, serving to assess the quality and feasibility of the developed product. In this study, both formative and summative evaluations were conducted. Formative evaluation was carried out at each stage of development, starting from analysis, design, development, and implementation, through expert validation of materials and media as well as limited trials, which allowed for continuous refinement of the product. Summative evaluation was conducted after the interactive multimedia had been fully implemented to determine its overall effectiveness and practicality in actual classroom use.

To measure learning outcomes, a 20-item multiple-choice test was used, designed to assess students' accuracy and understanding in Qur'an reading. The test instrument was reviewed and validated by experts in Qur'anic education and instructional media to ensure content validity. The same set of items was used for both the pre-test and post-test to maintain consistency in measuring students' mastery levels. This procedure strengthens the validity and reliability of the data used to evaluate the effectiveness of the developed interactive multimedia.

Effectiveness of the Interactive Multimedia Product

The effectiveness of the interactive multimedia was measured through students' learning outcomes. The learning outcome instrument consisted of a 20-item multiple-choice test that assessed students' Qur'an reading comprehension and accuracy. The instrument was reviewed by two experts in Qur'anic education and instructional media to ensure content validity. Its reliability was confirmed through internal consistency analysis, indicating that the test was sufficiently reliable for measuring students' mastery levels. A pre-test was administered prior to the implementation of the interactive multimedia, followed by a post-test after its use in the learning process. The results of the pre-test and post-test for 20 students at SMP Unismuh Makassar are presented in Table 10.

Table 10. Student Learning Outcomes at SMP Unismuh Makassar

Respondent	Pre-Test Score	Post-Test Score	Post-Pre Test	Ideal Score	N-Gain Score	N-Gain%
1.	65.00	75.00	10.00	35.00	0.29	28.57
2.	40.00	80.00	40.00	60.00	0.67	66.67
3.	85.00	100.00	15.00	15.00	1.00	100.00
4.	85.00	100.00	15.00	15.00	1.00	100.00
5.	60.00	90.00	30.00	40.00	0.75	75.00
6.	75.00	95.00	20.00	25.00	0.80	80.00
7.	55.00	75.00	20.00	45.00	0.44	44.44
8.	80.00	100.00	20.00	20.00	1.00	100.00
9.	45.00	80.00	35.00	55.00	0.63	63.63
10.	70.00	90.00	20.00	30.00	0.67	66.67
11.	70.00	90.00	20.00	30.00	0.67	66.67
12.	90.00	100.00	10.00	10.00	1.00	100.00
13.	55.00	90.00	35.00	45.00	0.78	77.78
14.	80.00	95.00	15.00	20.00	0.75	75.00
15.	50.00	80.00	30.00	50.00	0.60	60.00
16.	75.00	95.00	20.00	25.00	0.80	80.00
17.	70.00	90.00	20.00	30.00	0.67	66.67
18.	60.00	95.00	35.00	40.00	0.88	87.50
19.	55.00	95.00	40.00	45.00	0.89	88.89
20.	65.00	100.00	35.00	35.00	1.00	100.00
Average	66.50	90.75	24.25	33.50	0.77	76.38

The normalized gain (N-Gain) was calculated using the formula:

g = (post-test score − pre-test score) / (maximum score − pre-test score) (Hake, 1999).

Based on the results presented in Table 10, the N-Gain score obtained was 0.76 (76.38%). According to the normalized gain classification formulated by Hake (1999), this value falls into the "high effectiveness" category ($g \geq 0.70$). This interpretation is supported by empirical studies establishing normalized gain as a reliable criterion for measuring instructional effectiveness in technology-enhanced learning environments (Daeng et al., 2025; Putri et al., 2022).

This finding indicates that the developed interactive multimedia produces substantial conceptual and procedural gains in Qur'anic learning and aligns with effective instructional design principles in modern Islamic education. Therefore, the multimedia can be considered pedagogically effective and appropriate for improving students' Qur'anic reading achievement in the context of secondary Islamic education.

2. Discussion

The findings show that the developed multimedia significantly improves students' Qur'anic recitation accuracy and fluency. High validity and practicality results indicate alignment with multimedia learning principles, particularly dual-channel processing and active cognitive engagement (Mayer, 2024). The integration of audio exemplars and color-coded *tajwid* cues minimizes cognitive load and supports efficient recognition of articulation rules.

Furthermore, the high N-Gain score confirms that interactive *tajwid* media accelerate procedural mastery through immediate feedback and multimodal reinforcement, consistent with constructivist principles (Nurliadin et al., 2024).

Increased motivation and autonomy also indicate that interactive Qur'an-learning technology fosters engagement and self-regulated learning, while repetitive audio-visual cues strengthen automatization in line with behaviorist theory (Muslim, 2024; Suwarno et al., 2024). These findings confirm that technology-enhanced *tajwid* instruction is pedagogically effective and developmentally appropriate for junior secondary learners.

2.1. Implications

Pedagogically, this study demonstrates that interactive multimedia can be integrated into Qur'anic learning to support differentiated instruction and reduce teachers' workload through guided digital practice (Djainudin et al., 2025; Ferdiansyah et al., 2021; Hasyim et al., 2020). It can also strengthen engagement and learner autonomy in Islamic education through visually and auditorily enriched *tajwid* instruction (Mujib & Marhamah, 2020; Mustafa et al., 2021; Vivianingsih et al., 2023).

Practically, the validated media product provides a scalable and teacher-friendly solution for schools in integrating technology while maintaining Qur'anic pedagogical authenticity. Consequently, interactive multimedia serves not only as an instructional aid but also as a model for future innovation in digital Islamic education (Muslim, 2024; Siregar et al., 2025).

2.2. Research contribution

This study provides insights from theoretical, practical, methodological, and socio-educational perspectives. Theoretically, it shows that cognitive, behavioral, and constructivist learning theories can be integrated in interactive multimedia, as evidenced by students actively constructing knowledge, receiving immediate feedback, and engaging with multimedia-supported learning. Practically, the validated multimedia product helps teachers overcome limitations of conventional Qur'an teaching, making lessons more engaging and accessible. Methodologically, the study demonstrates the R&D approach using the ADDIE model, with clearly defined phases that can be replicated or adapted in similar educational contexts. Socio-educationally, integrating technology in Qur'an learning promotes literacy and aligns with the needs of 21st-century learners.

2.3. Limitations

This study has several limitations. First, it was conducted in only one school, SMP Unismuh Makassar, with a small sample of 20 female students, which may introduce gender-related bias and limit the generalizability of the findings to other school contexts or to male students. Second, the development of the interactive multimedia focused solely on Qur'an reading skills, and did not address other aspects such as understanding tafsir, memorization, or the application of Qur'anic values in daily life. Third, the effectiveness of the media was measured over a relatively short period, leaving the long-term impact of using interactive multimedia uncertain. Fourth, the validation process involved only two validators, and the reliability of the instruments was not tested, which may limit the strength of conclusions regarding content and media validity. Future research could address these limitations by including larger and more diverse

samples, conducting instrument reliability testing, involving more validators, extending the duration of the study, and exploring additional Qur'anic competencies.

2.4. Suggestions

Future research should involve larger and more diverse samples across multiple schools to enhance generalizability. Interactive multimedia development could be expanded to include understanding, memorization, and application of Qur'anic values, and its long-term effectiveness should be examined. Exploring additional technological approaches, such as adaptive learning or gamification, and testing at different educational levels could further improve its applicability. These findings can benefit teachers, media developers, and educational institutions in enhancing Qur'an learning.

D. Conclusion

This study concludes that the development of interactive multimedia for Qur'an reading skills at SMP Unismuh Makassar has met the criteria of being valid, practical, and effective. The interactive multimedia was rated valid, with validation percentages of 98% for content (very valid) and 62.4% for media (valid). Its practicality was classified as very practical, with percentages of 99% from teachers and 89.6% from students. The effectiveness was assessed as effective, with an N-Gain score of 76.38%. These results indicate that the developed interactive multimedia meets the criteria of validity, practicality, and effectiveness for use in Qur'an learning. This multimedia product may serve as a context-specific, innovative alternative learning medium for enhancing Qur'an education at SMP Unismuh Makassar. However, given the limited sample size and single-school setting, further research is needed to confirm its effectiveness and applicability in other secondary school contexts.

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F. Author Contribution Statement

FN served as the lead author, responsible for designing the study, collecting and analyzing data, and drafting the initial manuscript. HG provided guidance on research methodology and academic supervision in the study design and data analysis. AH contributed to the development of research instruments, critically reviewing and revising the manuscript. NH supported data processing, and reference compilation.

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