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DEVELOPMENT OF WEBSITE-BASED TAJWIDIAN LEARNING MEDIA ON TAJWID MATERIALS TO IMPROVE THE UNDERSTANDING AND ABILITY OF GRADE V ELEMENTARY SCHOOL STUDENTS

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Abstract

Tajwid instruction in elementary schools often relies on monotonous conventional drill methods, resulting in low motivation and a gap between theoretical understanding and recitation accuracy. Furthermore, existing digital tajwid media typically require Android app installation, creating technical access barriers for schools with limited devices. This study develops TajwidIAN, a web-based gamified learning media using Unity WebGL that offers zero-installation access, and examines its feasibility and effectiveness. The research employs a Research and Development (R&D) approach with the ADDIE model. The subjects were 84 fifth-grade students from three elementary schools in Bandar Lampung. Data were collected through expert validation, practicality questionnaires, and cognitive-psychomotor pretest-posttest instruments. Statistical analysis used paired sample t-test and Wilcoxon signed-rank test. Results show very high feasibility (content expert 92.04%; media expert 94.42%) and very high practicality (teachers 96.25%; students 92.81%). Effectiveness tests proved significant improvement in cognitive understanding (N-gain 0.6581; $p<0.001$) and recitation ability (N-gain 0.7020; $p<0.001$). It is concluded that TajwidIAN effectively minimizes technical infrastructure barriers while strengthening students' tajwid competence through the integration of gamification and audio-visual feedback.

Keywords: Tajwid Learning, Gamification, Unity WebGL, Elementary School

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INTRODUCTION

Reciting the Qur'an with correct tajweed is a fundamental obligation for every Muslim, in line with Allah's commands in QS. Al-Muzzammil verse 4 to read tartil. The meaning of tartil requires that the recitation be done slowly, clearly, and in accordance with the rules of tajweed, so that the worship of reciting the Qur'an is not only about reciting sounds, but also maintaining the accuracy of its meaning.[1] In the national education ecosystem, this is a top priority. The Merdeka Curriculum specifically targets students in grades V and VI of Elementary School (Phase C) to be able to read the Qur'an with tartil, which includes mastery of reading laws such as nun mati/tanwin, mim mati, mad, qalqalah, and waqaf in accordance with the latest learning achievement standards.[2]

However, the reality on the ground shows conditions that are not fully in line with these expectations. Data from the National Qur'an Literacy Index released by the Ministry of Religion of the Republic of Indonesia notes that the reading competence of the community still needs to be improved, where the percentage of Muslims who are able to read fluently and be educated is still below 50 percent.[3] Similar problems are specifically portrayed in a preliminary study in three elementary schools in Bandar Lampung City at the end of 2024, which shows that the average tajweed score of grade V students only reaches 55.1 with a low level of classical completeness. Based on the search through in-depth interviews with educators, this low achievement is rooted in learning methods that are still dominated by repetitive lectures and exercises that tend to be monotonous, as well as the lack of availability of interactive learning media that can attract students' interest.

From a psychological point of view, elementary school children (7–11 years old) are in the concrete operational stage, a phase where they more easily absorb information through things that are real, visual, and manipulative.[4] In fact, the science of tajweed contains abstract rules that are quite difficult to understand without visual aids. On the other hand, a learning approach that involves social interaction and peer collaboration is needed to support student understanding within the framework of constructivist learning.[5] Responding to these conditions in this digital era, the gamification approach or the strategy of inserting game elements into the learning process is present

[1] M. Quraish Shihab dan Muhammad Quraish Shihab, *Surah Fâthir, Surah Yâsîn, Surah ash-Shâffât, Surah Shâd, Surah az-Zumar, Surah Ghâfir*, Cetakan V, Tafsîr Al-Mishbâḥ : Pesan, Kesan, dan Keserasian al-Qurʾan / M. Quraish Shihab 11 (Jakarta: Lentera Haiti, 2012).

[2] Kementerian Pendidikan, Kebudayaan, Riset, Dan Teknologi, *Keputusan Kepala BSKAP Nomor 032/H/KR/2024 tentang Capaian Pembelajaran pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Menengah pada Kurikulum Merdeka*, (Jakarta), 2024.

[3] Al Afghani Moch Mardiansyah, "Kemampuan baca tulis Al Quran masyarakat Indonesia tinggi pada 2023," Antara News, 11 Oktober 2023, https://www.antaranews.com/berita/3768246/kemampuan-baca-tulis-al-quran-masyarakat-indonesia-tinggi-pada-2023.

[4] John W. Santrock, *Educational psychology*, 4th ed (Boston: McGraw-Hill, 2009).

[5] Lev Semenovič Vygotskij dan Michael Cole, *Mind in Society: The Development of Higher Psychological Processes*, Nachdr. (Cambridge, Mass.: Harvard Univ. Press, 1981).

as a promising solution. Various current scientific literature shows that this method has been shown to be able to significantly improve intrinsic motivation and student learning outcomes.[6]

An in-depth analysis of previous research trends reveals several gaps in the development of tajweed learning media. Some developers have created digital card media (*flashcards*), but this type of media is still considered one-way and less interactive so that it is not optimal in spurring student involvement.[7] Meanwhile, there are also Android-based application development that unfortunately often only focuses on the cognitive aspect without touching the psychomotor aspect in depth, and is constrained by installation obligations that cannot be accessed by all student device specifications.[8] Other studies use an interactive multimedia approach, but have not integrated complete game mechanics to boost students' motivation to learn sustainably.[9]

Furthermore, previous studies that adopted the concept of board games were generally still limited to physical forms or simply moving the physical board to a digital screen without fundamentally changing the dynamics of learning.[10] From these various studies, several key gaps were identified. First, there is no tajweed learning media that comprehensively integrates gamification with web-based accessibility. Second, there is still a lack of learning media that can be accessed across *platforms* without requiring an installation process. Third, there is a lack of research that utilizes the monopoly approach in PAI learning with a *looping* mechanism that supports *the principle of tikrār* (repetition). Finally, there is no website-based tajweed media that is specially developed according to the characteristics of elementary school students in Indonesia with the integration of *a corrective feedback* system in *real-time*.

In order to answer these challenges, this research developed a learning media entitled "TajwidIAN" (Tajwid Iqbal Ahmad Najib). This media is developed website-based using Unity WebGL technology, so it can be accessed directly through a *browser* without the hassle of installing applications. The decision to choose Unity WebGL as the foundation for development was based

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[6] Jonna Koivisto dan Juho Hamari, "The Rise of Motivational Information Systems: A Review of Gamification Research," *International Journal of Information Management* 45 (April 2019), https://doi.org/10.1016/j.ijinfomgt.2018.10.013; Karl M. Kapp, *The gamification of learning and instruction: game-based methods and strategies for training and education* (San Francisco, CA: Pfeiffer, 2012).

[7] Hamdina Lestari, Amri Rahman, dan Wahyu Kurniati Asri, "Efektivitas Media Flash Card terhadap Penguasaan Kosakata Bahasa Arab Siswa Kelas XI Madrasah Aliyah Awaluddin Kuo Kabupaten Mamuju Tengah," *Al-Fashahah: Journal of Arabic Education, Linguistics, and Literature* 3, no. 1 (Juni 2023), https://doi.org/10.59562/al-fashahah.v3i1.46700.

[8] Sofia Zaini Kulbi, "Mobile Learning Berbasis Android Sebagai Media Pembelajaran Pendidikan Agama Islam," *Nazhruna: Jurnal Pendidikan Islam* 2, no. 3 (November 2019), https://doi.org/10.31538/nzh.v2i3.1110.

[9] Anisa Nanindra Mahastrajaya, "Pengembangan Multimedia Pembelajaran Interaktif Mata Pelajaran Pendidikan Agama Islam Materi Melaksanakan Sholat Untuk Siswa Kelas IV SDN Lempuyangwangi Yogyakarta" (Universitas Negeri Yogyakarta, 2015).

[10] Irwan Muhamad Faizal, Nisa Nurhasanah, dan Elita Rahmawati, "Digitalisasi permainan tradisional galah melalui media game," *INTEGRATED (Journal of Information Technology and Vocational Education)* 5, no. 1 (April 2023), https://doi.org/10.17509/integrated.v1i1.16705.

on a number of comparative advantages over other alternatives. The first advantage lies in the engine's ability to produce high-quality 2D/3D graphics with stable performance, which is crucial for creating a smooth gaming experience.[11] The second advantage is the *zero-installation aspect* which is a solution to the limitations of administrative access rights on school laboratory computers, so that the media can be run directly without burdening the storage of the device.[12] A third advantage is the flexibility of accessibility that bridges learning at school and at home (*ubiquitous learning*), allowing students to continue their learning progress from various devices on an ongoing basis.

TajwidIAN is designed with the concept of board games that facilitate students to learn tajweed material repeatedly (*tikrār*) in a fun atmosphere. The selection of monopoly mechanics is based on the characteristics of the *looping game mechanic* which is in line with the pedagogical principle of tajwid, namely repetition (*drilling*). Unlike linear adventure games that have static endpoints, TajwidIAN allows students to go around the board many times, so that they are exposed to the same tajweed legal material intensively but through a variety of different questions. This approach allows the process of internalizing the law of tajweed to occur naturally, while minimizing the boredom that often arises in conventional training methods.

To support flexible learning both independently and collaboratively, this media is equipped with a comprehensive set of gamification features. This system includes awarding points for each correct answer, as well as the embedding of digital badges as a form of appreciation for certain achievements, such as a special badge after students have successfully answered a series of questions related to the law of death correctly. In addition, there is a *leaderboard* feature that displays student rankings based on accumulated points, as well as the application of tiered levels ranging from beginner to advanced to accommodate progressive difficulty levels. Last but not least, this media also includes an *immediate feedback feature*, where the system automatically provides notifications, explanations of tajweed laws, and audio demonstrations of proper reading every time students answer questions.[13]

[11] Prasetyo Budi, "Perancangan Teknologi Augmented Reality Sebagai Media Pemasaran Pada Brosur Perumahan Pt. Bumi Berkah Madani Menggunakan Metode Mdlc" (UIN Raden Intan Lampung, 2025).

[12] Antti Syvanen dkk., "Supporting pervasive learning environments: adaptability and context awareness in mobile learning," *IEEE International workshop on wireless and mobile technologies in education (WMTE'05)*, 2005.

[13] John Hattie dan Helen Timperley, "The Power of Feedback," *Review of Educational Research* 77, no. 1 (Maret 2007), https://doi.org/10.3102/003465430298487.

RESEARCH METHODS

This research was carried out by applying the *Research and Development* (R&D) approach, a scientific research method focused on producing a specific educational product and then empirically testing the effectiveness of the product. In its implementation, this study adopts an ADDIE development model that is known to be systematic and comprehensive. This model consists of five main stages that are interrelated, namely analysis, design, development, implementation, and evaluation.[14] The selection of the ADDIE model is based on its structured yet flexible workflow, allowing researchers to make continuous improvements at each phase. This is considered very relevant to the research completion target scheduled for eight months, to ensure that the resulting learning media products are truly mature and tested.

The research location took place in three elementary schools that represented the diverse educational characteristics of Bandar Lampung City, namely SD Negeri 2 Rajabasa, SD Al-Kautsar, and SDN 4 Talang. This series of research activities will be carried out from November 2024 to June 2025. The test subjects involved a total of 84 students in class V, with details of the distribution of samples of 30 students from SD Negeri 2 Rajabasa, 30 students from SD Al-Kautsar, and 24 students from SDN 4 Talang. The determination of grade V students as research subjects was carried out using *purposive sampling techniques* with curriculum considerations. Students at this level are in Phase C of the Independent Curriculum, a crucial phase where mastery of tajweed and the ability to read the Qur'an tartly are mandatory competencies that must be achieved before they proceed to the secondary education level.

The data collection process is carried out through four stages of complementary techniques to ensure the validity of the data. First, in the preliminary study stage, the researcher used in-depth interview techniques with teachers and participatory observation in the classroom to map the *needs assessment* and identify real learning obstacles in the field. Second, the quality of the product's feasibility is assessed through validity tests by experts, which involve subject matter experts to review the veracity of tajweed content and media experts to assess aspects of software engineering as well as visual design. Third, the practicality aspect of the media was measured using a user response questionnaire distributed to teachers and students after they used the product in learning. Fourth, to measure the effectiveness of the product, a learning outcome test instrument was used with *a One-Group Pretest-Posttest design* which included cognitive questions to measure theoretical understanding and performance tests to measure psychomotor reading skills.

[14] Robert Maribe Branch, *Instructional Design: The ADDIE Approach*, 1st ed., SpringerLink Bücher (Boston, MA: Springer-Verlag US, 2009), https://doi.org/10.1007/978-0-387-09506-6.

The data analysis techniques used in this study are grouped into two main categories. First, feasibility data from experts and practicality data from the questionnaire were analyzed using percentage descriptive techniques. The results of this calculation are then converted into a table of eligibility criteria to determine whether the product falls into the category of very feasible, feasible, adequate, or lacking. Second, the data on the effectiveness of learning outcomes were analyzed statistically inferentially using the help of SPSS software version 27. As a first step, a data normality test was carried out using *the Shapiro-Wilk method* considering that the number of samples was less than 100. If the data is distributed normally, hypothesis testing is carried out with *the Paired Sample T-test*. Conversely, if the data is not normally distributed, the analysis is continued using the non-parametric *Wilcoxon Signed-Rank Test*. In addition to the significance test, this study also calculates the amount of improvement in student competence using the *Normalized Gain* (N-Gain) formula to classify the increase into high, medium, or low categories.

RESULTS AND DISCUSSION

In the process of developing TajwidIAN learning media, the researcher uses the ADDIE development model with the following stages:

1. Analysis Stage

   The analysis stage is a fundamental step in this study which aims to map the gap *(gap analysis*) between the expected ideal learning conditions and the empirical reality that occurs in the field. Referring to the competency standards in the Independent Curriculum Phase C, grade V elementary school students ideally have the ability to read the Qur'an tartilly. This indicator of achievement is not only limited to reading fluency, but also includes the ability to apply the laws of tajweed precisely, including the laws of nun mati/tanwin, mim mati, mad, to qalqalah. This mastery is very crucial because in this phase, students are expected to start moving from just knowing letters to understanding the reading rules that affect the meaning of the sentence.

   However, data obtained from the preliminary study from September to October 2024 at three research locations, namely SD Al-Kautsar, SDN 4 Talang, and SDN 2 Rajabasa, showed a significant discrepancy. Based on the results of a diagnostic test involving 84 students, it was found that the average tajweed competency score of students only reached 55.1. Even more concerning, the classical completeness rate was recorded at only 43%, far below the minimum standard expected. The analysis of question items shows a consistent pattern of errors: students tend to be able to memorize the definition or name of the law of tajweed theoretically (cognitive), but fail to implement it when practicing reading (psychomotor). The most dominant errors are found in the inconsistency of the length of the madness of the recitation and the inaccuracy in disguising the sound in the law of ikhfa' or fusing the sound in idgham.

To explore the root of this problem, the researcher conducted in-depth interviews with PAI teachers and participatory observations in the classroom. The results revealed that the learning method applied was still very conventional, dominated by one-way lecture methods and manual drills that were repetitive but monotonous. This approach has proven to be less effective in retaining students' attention. In fact, viewed from the aspect of developmental psychology, elementary school-age students are at a concrete operational stage that urgently needs visual and interactive stimulus to understand abstract concepts such as tajweed rules.

In addition to pedagogical challenges, technical constraints of infrastructure are also in the spotlight. Although the digital literacy of alpha generation students is quite qualified, schools often face obstacles in technology integration. School computer labs generally have system access restrictions, so teachers have difficulty installing new learning applications on each device. Responding to the complexity of these pedagogical and technical problems, the researcher decided to develop "TajwidIAN". This media is designed website-based using *Unity WebGL* technology. The choice of this technology is a strategic solution because it offers a *zero-installation* feature, where media can be accessed directly through a *browser* on various devices (laptops, tablets, or smartphones) without overloading storage memory. This solution is expected to be able to transform boring practice methods into immersive gaming experiences, combining visual and audio elements to strengthen student retention of comprehension.

2. Design Stage

The design stage is a crucial phase to translate the results of the needs analysis into a concrete technical design of learning systems and architectures in TajwidIAN media. This design process began with the preparation of a *content map* that was strictly aligned with the Learning Outcomes (CP) Phase C of the Independent Curriculum. Tajweed materials that include nun mati/tanwin, mim mati, mad, qalqalah, and waqaf are not simply transferred to digital format, but are reconstructed into units of game challenges. This is done to ensure constructive *alignment*, where every element of the game from board tiles to question cards has measurable learning objectives, both in the domain of knowledge and reading skills.

In designing the gameplay mechanics, the learning materials are broken down into micro-segments that are integrated into the TajwidIAN game board tiles. The researcher applied *color coding* and visual icons specifically for each category of tajweed law to help students' memory association. The game scenario is built on the principle *of tikrār* (repetition) which is packaged in a *loop game* format, so that students will learn the same material over and over again without feeling bored. In addition, *a dual-coding theory* approach is applied by combining visual text and audio narration simultaneously.[15] The goal is to minimize the cognitive load and

[15] Allan Paivio, *Mental representations: A dual coding approach* (Oxford university press, 1990).

make it easier for students to visualize abstract tajweed rules into more concrete. The immediate *feedback feature* is also carefully designed; When students answer incorrectly or mispronounce it, the system will provide automatic correction instantly, allowing for real-time improvement of comprehension.

Technically, this design stage resulted in three main guidance documents that became the blueprint for development. First, a *flowchart* (flowchart) of the system is compiled that maps the programming logic comprehensively, starting from the user login mechanism, the dice randomization algorithm, the branching of logic when answering questions, to the point calculation system and level increase. Second, *a storyboard* is created that visualizes the layout of each scene, the navigation flow between menus, and the scenario of the system's response to user interaction. Third, a *child-centered* design is designed to be a child-centered design of the User Interface (UI) and User Experience (UX). This design prioritizes the use of bright colors, easy-to-read typography, and intuitive navigation buttons to minimize extraneal cognitive load, so students can focus fully on the learning content.

Along with designing the media architecture, the researcher also compiled a comprehensive assessment instrument. This instrument includes validation sheets for subject matter experts and media experts, practical response questionnaires for teachers and students, and test question packages (*pretest* and *posttest*). The preparation of the instrument at this stage aims to ensure the validity of the content, ensuring that the features designed are truly relevant to the indicators of learning success to be achieved. Thus, this design stage does not only focus on visual aesthetics, but rather on maturing pedagogical architecture and game mechanics so that TajwidIAN media can function effectively, reliably, and educatively when implemented in an elementary school environment.

3. Development Stage

The development stage is a realization phase where the conceptual design that has been prepared at the design stage is realized into a real product in the form of TajwidIAN learning media. At this stage, researchers transformed *flowcharts* and *storyboards* into a website-based digital board game that can be accessed directly through a browser without the need for installation. This production process involves integrating hardware, such as laptops for development and *smartphones* for testing, with the main software that is *the Unity Game Engine*. Unity is used to build game mechanics and programming logic, while other supporting applications are used to process interface graphics assets and edit audio recitations to produce an interactive and engaging learning experience for students.

The development step begins with the creation of visual assets such as game boards, pawn characters, and kid-friendly navigation icons. Next, the researchers developed programming logic for TajwidIAN mechanics, such as dice randomization systems and pawn movements. At the heart of this development is the integration of tajweed material into the game system, where each tile represents a specific category of reading laws equipped with a question bank and automatic feedback. Once all components are integrated, the *build* process is carried out to WebGL format to ensure that the media can run smoothly on various devices with an internet connection.

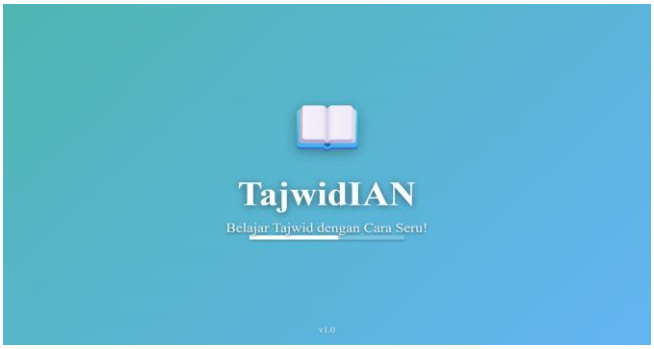


Figure 1. TajwidIAN Home Screen Display

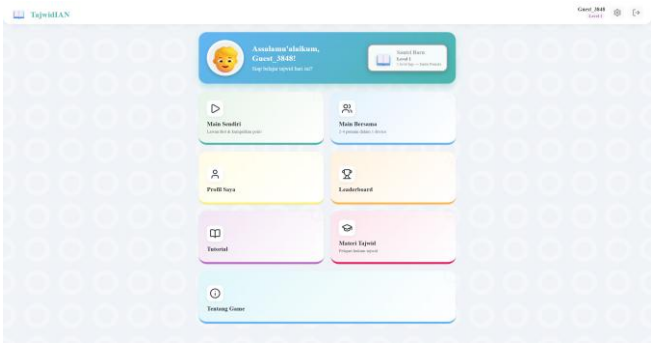


Figure 2. TajwidIAN Main Menu Display



Figure 3. TajwidIAN Interface Display

After the prototype of TajwidIAN media is developed, the product must go through a validation process by a number of experts before being tested in the field. This validation aims to test the feasibility of the product in terms of technical and substance, as well as to obtain constructive input for media improvement. This process involves an in-depth assessment by media experts who focus on technology and design aspects, as well as material experts who ensure the correctness of the tajweed content presented. The following are the results of the recapitulation of the assessment from the experts:

Table 1. Media Expert Validation Results

No	Aspects assessed	Score generation
1	Software Engineering	90.00
2	Visual Design (UI/UX)	95.00
3	Audio Quality	96.67
4	Gamification and Interactivity Implementation	96.00
Total Score		**94.42**
Maximum Score		**100**
Percentage		**94.42%**
Category		**Highly Valid**

The first validation was conducted by media experts to assess aspects of software engineering, visual design, audio quality, and gamification interactivity. Based on the assessment carried out, TajwidIAN media obtained an average score of 94.42%. This number puts the media in the "Very Valid" category. This indicates that technically, this medium is stable, easy to operate, and has an attractive and responsive interface to support the student learning process.

Table 2. Material Expert Validation Results

No	Aspects assessed	Score generation
1	Quality of Material	91.11
2	Learning Quality	91.67
3	Evaluation Suitability	93.33
Total Score		**92.04**
Maximum Score		**100**
Persentase		**92.04%**
Category		**Highly Valid**

Furthermore, the validation of the material is carried out by Islamic Religious Education experts to ensure the accuracy of tajweed law, pedagogical quality, and the suitability of the evaluation with the curriculum. The results of the material validation showed an average score of 92.04% with the category "Very Valid". This achievement confirms that the content of the material in TajwidIAN has been accurate in terms of tajweed science and presented in the right method for elementary school students, so that it is safe and effective to be used as a learning resource.

In addition to providing quantitative assessments, experts also provide suggestions and comments to improve the quality of the products being developed. The input is followed up by the researcher through a revision process to improve the visual and functional aspects of the media. This revision is carried out to ensure that the media is not only valid in theory, but also optimal when used by students. A comparison of the interface before and after the revision shows an improvement in the quality of the final draft that is ready for implementation.



Figure 4. Views before revision

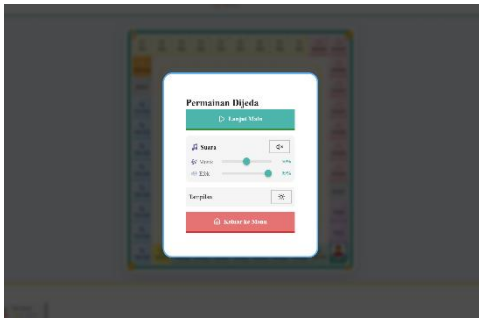


Figure 5. Post-revision view

Implementation Stage

At the implementation stage, the Unity WebGL-based TajwidIAN learning media that has been developed was tested on educators and students in three elementary schools in Bandar Lampung City. This trial aims to assess the practicality and effectiveness of media in improving the understanding and ability of tajweed students in class V. Practicality assessment is carried out after students and educators use media in learning, by filling out user response questionnaires to measure the ease of use, efficiency, and usefulness of media. The following are the results of the questionnaire response from educators in the field trial.

Table 3. Results of Educator Response Questionnaire

No	Aspects assessed	Score generation
1	Learning Efficiency	96.67
2	Ease of Use	95.00
3	Material Suitability	95.00
4	Impact on Students	98.33
	Total Score	**96.25**
	Total Score	**100**
	Persentase	**96.25%**
	Category	**Highly Worth It**

Based on these results, it can be concluded that TajwidIAN media obtained an average score of 96.25 from educators, which is included in the very practical category. This shows that the zero-installation feature is very helpful for teachers in the efficiency of class preparation time. In addition to educators, assessments are also carried out by students to see the user experience side. The following are the results of the student response questionnaire:

Table 4. Results of the Student Response Questionnaire

No	Aspects assessed	Perolehan skor
1	Interface Design	92.02
2	Ease of Use	91.51
3	Clarity of Material	93.50
4	Benefits	94.20
	Total Score	**92.81**
	Maximum Score	**100**
	Persentase	**92.81 %**
	Category	**Highly Worth It**

Student responses showed an average of 92.81% in the category of very practical, which indicates that TajwidIAN's interface is easy to understand and fun for students. In addition to the practicality test, an effectiveness Score generation test was also carried out using *the One Group Pretest Posttest design* on 84 students. This test aims to measure the improvement of competence in two aspects, namely conceptual understanding (cognitive) and reading practice ability (psychomotor). The pretest was carried out before the use of media to measure initial

ability, followed by a learning intervention using TajwidIAN, and ended with a Posttest. The test result data was then analyzed through normality tests, hypothesis tests, and N-Gain tests. The following are the results of statistical analysis for the concept understanding aspect (cognitive).

Table 5. Normality Test Results (Concept Understanding)

Your	Statistic	df	.Sig	Remarks
Pretest	.980	84	.203	Normally Distributed
Posttest	.976	84	.126	Normally Distributed

The results of the normality test in table 5 show a significance value of > 0.05, which means that the data is normally distributed. Therefore, the hypothesis test was carried out using *the Paired Sample T-Test.*

Table 6. Paired Sample T-Test Test Results (Concept Understanding)

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest - Posttest	-33.107	8.830	.963	-35.023	-31.191	-34.362	83	.000

The results of the hypothesis test showed a significance value of 0.000, which means that there was a significant difference in students' understanding before and after using TajwidIAN. To measure the magnitude of the increase, the N-Gain calculation is carried out.

Table 7. Average N-Gain (Concept Comprehension)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
GAIN	84	.23	1.00	.6581	.16341
Valid N (listwise)	84				

The results of the N-Gain test in terms of comprehension showed a moderate category increase. In addition to the aspect of understanding, this study also measures the improvement of students' practice (psychomotor) ability in reciting the law of tajweed. The first step in

processing practical ability data is to conduct a normality test to determine the right type of hypothesis test. The following are the results of the normality test for practical ability data.

Table 8. Normality Test Results (Practical Ability)

Tes	Statistic	df	.Sig	Keterangan
Pretest	.932	84	.000	Tidak Berdistribusi Normal
Posttest	.947	84	.002	Tidak Berdistribusi Normal

The results of the normality test in table 8 show a significance value of < 0.05, which means that the practice ability data is not normally distributed. Therefore, the hypothesis test cannot use the T-Test, but rather is carried out using the non-parametric *Wilcoxon Signed Rank Test.*

Table 9. Wilcoxon Signed Ranks Test Results)

Test Statistics[a]	
	Posttest - Pretest
Z	-7.980[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

The results of the Wilcoxon test showed a significance value of 0.000, indicating a significant improvement in students' practice ability before and after treatment. The amount of improvement in practicability was then further analyzed using the N-Gain test.

Table 10. Average N-Gain (Practical Ability)

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
GAIN	84	.34	1.00	.7020	.17393
Valid N (listwise)	84				

The results of the N-Gain test in table 10 show that the improvement of students' practice ability is in the high category. This proves that TajwidIAN is very effective in practicing Qur'an reading skills, supported by audio and repetition features in the game. These findings are in line

with the principles *of drill and practice* packaged in gamification, where fun repetition can strengthen students' muscle memory and pronunciation skills.[16]

4. Evaluation Stage

The results of the study comprehensively show that TajwidIAN learning media has a level of feasibility in the very valid category. This is evidenced through a series of rigorous validation by subject matter experts and media experts, which is reinforced by positive user responses stating that this medium is very practical to apply in the classroom. The success of the implementation of this media is also evident from the results *of the students' pretest* and *posttest*, where there was a significant spike in scores after the use of TajwidIAN. Specifically, interesting findings emerged where the improvement of reading practice ability (psychomotor) was proven to be higher than the improvement of conceptual comprehension (cognitive). This phenomenon is in line with the findings of Sailer and Homner, who stated that gamification elements that demand repetitive actions such as challenges to be solved in games are very effective in strengthening students' procedural memory and technical skills.[17]

The main attraction of TajwidIAN lies in its attractive visual appearance by adopting board game mechanics that are already very familiar to children. In the context of tajweed learning which is often considered abstract and complicated, this media plays an important role in concretizing the material through the visualization of color codes on the game board and the support of clear pronunciation audio. This approach simultaneously supports visual and auditory learning styles. Referring to *Mayer's Dual-Coding* theory , the combination of visual and audio inputs presented synchronously will significantly strengthen students' memory retention.[18] This theory was confirmed valid by the data from the research results which showed *that the N-Gain* score of practical ability reached 0.7020 (high category). This figure indicates that students have an easier time improving the quality of their reading through the live audio feedback mechanism available in the game.

In addition to the pedagogical aspect, the presence of web-based media (*Unity WebGL)* such as TajwidIAN has proven to be a powerful solution for educators in overcoming technical obstacles to infrastructure in schools. The *zero-installation feature* allows for flexible access across multiple devices without putting a strain on memory, making learning time much more efficient because it doesn't take up complicated technical preparation. Qualitative analysis also revealed psychological changes in students, where they felt more enthusiastic and did not feel

[16] Kapp, *The gamification of learning and instruction*.

[17] Michael Sailer dan Lisa Homner, "The Gamification of Learning: A Meta-Analysis," *Educational Psychology Review* 32, no. 1 (Maret 2020), https://doi.org/10.1007/s10648-019-09498-w.

[18] Richard E. Mayer, *Multimedia learning*, 2nd ed (Cambridge ; New York: Cambridge University Press, 2009).

like they were carrying the burden of "hard study" thanks to the fun competition atmosphere. Therefore, TajwidIAN is considered very suitable and effective as an innovative learning medium that not only improves theoretical understanding, but most importantly, is able to hone the ability to practice tajweed for grade V elementary school students optimally.

CONCLUSION

Based on a series of research and development with the ADDIE model, this research succeeded in producing a website-based "TajwidIAN" learning media product using Unity WebGL technology. This media is proven to have a very high level of feasibility, with the validity of the material reaching 92.04% and the validity of the media of 94.42%. In addition, field trials showed an excellent level of practicality, where the response of teachers reached 96.25% and students 92.81%. This confirms that the interface design and presentation of materials in the TajwidIAN format are well accepted, easy to operate, and relevant to the learning needs of the elementary school environment.

In terms of effectiveness, the implementation of TajwidIAN has a significant impact on improving student competence, both in cognitive and psychomotor aspects. Statistical findings show that this medium is effective in improving conceptual comprehension with an N-Gain of 0.6581 (Medium category), and is proven to be superior in improving reading practice skills with an N-Gain of 0.7020 (High category). This excellence in the psychomotor aspect indicates that the integration of audio features of recitation (*corrective feedback*) and repetition mechanisms (*tikrār*) in the gameplay is very effective in training students' technical skills in reading the Qur'an.

This study concludes that technical barriers in the digitization of learning in schools, such as device limitations, can be effectively overcome through *zero-installation* (web-based) technology. On the other hand, student motivation barriers can be solved through gamification approaches that transform *conventional drill* methods into immersive and enjoyable learning experiences. Therefore, TajwidIAN is recommended as an effective alternative solution to support the achievement of learning outcomes (CP) of tajweed material in Phase C in elementary schools, bridging the gap between abstract tajweed theory and concrete recitation practice.

BIBLIOGRAPHY

Branch, Robert Maribe. *Instructional Design: The ADDIE Approach*. 1st ed. SpringerLink Bücher. Boston, MA: Springer-Verlag US, 2009. https://doi.org/10.1007/978-0-387-09506-6.

Budi, Prasetyo. “Perancangan Teknologi Augmented Reality Sebagai Media Pemasaran Pada Brosur Perumahan Pt. Bumi Berkah Madani Menggunakan Metode Mdlc.” UIN Raden Intan Lampung, 2025.

Faizal, Irwan Muhamad, Nisa Nurhasanah, dan Elita Rahmawati. “Digitalisasi permainan tradisional galah melalui media game.” *INTEGRATED (Journal of Information Technology*

and Vocational Education) 5, no. 1 (April 2023). https://doi.org/10.17509/integrated.v1i1.16705.

Hattie, John, dan Helen Timperley. "The Power of Feedback." *Review of Educational Research* 77, no. 1 (Maret 2007). https://doi.org/10.3102/003465430298487.

Kapp, Karl M. *The gamification of learning and instruction: game-based methods and strategies for training and education*. San Francisco, CA: Pfeiffer, 2012.

Kementerian Pendidikan, Kebudayaan, Riset, Dan Teknologi. *Keputusan Kepala BSKAP Nomor 032/H/KR/2024 tentang Capaian Pembelajaran pada Pendidikan Anak Usia Dini, Jenjang Pendidikan Dasar, dan Jenjang Pendidikan Menengah pada Kurikulum Merdeka*. (Jakarta), 2024.

Koivisto, Jonna, dan Juho Hamari. "The Rise of Motivational Information Systems: A Review of Gamification Research." *International Journal of Information Management* 45 (April 2019). https://doi.org/10.1016/j.ijinfomgt.2018.10.013.

Kulbi, Sofia Zaini. "Mobile Learning Berbasis Android Sebagai Media Pembelajaran Pendidikan Agama Islam." *Nazhruna: Jurnal Pendidikan Islam* 2, no. 3 (November 2019). https://doi.org/10.31538/nzh.v2i3.1110.

Lestari, Hamdina, Amri Rahman, dan Wahyu Kurniati Asri. "Efektivitas Media Flash Card terhadap Penguasaan Kosakata Bahasa Arab Siswa Kelas XI Madrasah Aliyah Awaluddin Kuo Kabupaten Mamuju Tengah." *Al-Fashahah: Journal of Arabic Education, Linguistics, and Literature* 3, no. 1 (Juni 2023). https://doi.org/10.59562/al-fashahah.v3i1.46700.

Mahastrajaya, Anisa Nanindra. "Pengembangan Multimedia Pembelajaran Interaktif Mata Pelajaran Pendidikan Agama Islam Materi Melaksanakan Sholat Untuk Siswa Kelas IV SDN Lempuyangwangi Yogyakarta." Universitas Negeri Yogyakarta, 2015.

Mayer, Richard E. *Multimedia learning*. 2nd ed. Cambridge ; New York: Cambridge University Press, 2009.

Moch Mardiansyah, Al Afghani. "Kemampuan baca tulis Al Quran masyarakat Indonesia tinggi pada 2023." Antara News, 11 Oktober 2023. https://www.antaranews.com/berita/3768246/kemampuan-baca-tulis-al-quran-masyarakat-indonesia-tinggi-pada-2023.

Paivio, Allan. *Mental representations: A dual coding approach*. Oxford university press, 1990.

Sailer, Michael, dan Lisa Homner. "The Gamification of Learning: A Meta-Analysis." *Educational Psychology Review* 32, no. 1 (Maret 2020). https://doi.org/10.1007/s10648-019-09498-w.

Santrock, John W. *Educational psychology*. 4th ed. Boston: McGraw-Hill, 2009.

Shihab, M. Quraish, dan Muhammad Quraish Shihab. *Surah Fâthir, Surah Yâsîn, Surah ash-Shâffât, Surah Shâd, Surah az-Zumar, Surah Ghâfîr*. Cetakan V. Tafsîr Al-Mishbâḫ : Pesan, Kesan, dan Keserasian al-Qurʾan / M. Quraish Shihab 11. Jakarta: Lentera Haiti, 2012.

Syvanen, Antti, Russell Beale, Mike Sharples, Mikko Ahonen, dan Peter Lonsdale. "Supporting pervasive learning environments: adaptability and context awareness in mobile learning." *IEEE International workshop on wireless and mobile technologies in education (WMTE'05)*, 2005.

Vygotskij, Lev Semenovič, dan Michael Cole. *Mind in Society: The Development of Higher Psychological Processes*. Nachdr. Cambridge, Mass.: Harvard Univ. Press, 1981.