International Journal of Modern Education
EISSN: 2637-0905
IJMOE
Volume 7 Issue 24 (March 2025) PP. 991-1003
DOI: 10.35631/IJMOE.724070

INTERNATIONAL JOURNAL OF MODERN EDUCATION (IJMOE)
www.ijmoe.com

GLOBAL ACADEMIC EXCELLENCE

USER PERFORMANCE AND ACCEPTANCE OF DUNIA BELAJAR JAWI: BOOSTING CONNECTIVITY SKILLS IN JAWI SCRIPT VIA GAMIFIED LEARNING

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Article Info:

Article history:
Received date: 19.01.2025
Revised date: 10.02.2025
Accepted date: 13.03.2025
Published date: 26.03.2025

To cite this document:

Malik, M. A., Osman, S., Nawi, H. S. A., Marjudi, S., & Mohd Noor, S. (2025). User Performance And Acceptance Of Dunia Belajar Jawi: Boosting Connectivity Skills In Jawi Script Via Gamified Learning. *International Journal of Modern Education, 7* (24), 991-1003.

Abstract:

The study examined the functionality of the Dunia Belajar Jawi app and analyzed its user acceptance test. This fun learning tool aims to develop young learners' skills in Jawi script. The research included 32 Standard 1, 2, and 3 students in a primary religious institution in Kuala Selangor, Malaysia. The practitioner used the pre-test and post-test methods to measure students' learning outcomes. The pre-test surveyed students' Jawi literacy proficiency, which served as a baseline, while the post-test assessed improvements after the students were introduced to the game. A User Acceptance Testing (UAT) survey was also conducted to measure usability, engagement, and educational benefits. Findings indicate a significant 25% improvement in the post-test scores, which, in this case, demonstrates the game's efficacy in the Jawi letter connectivity reinforcement. Besides that, UAT results show a high level of acceptance of the application among users since students have been quite content with the game's interaction, options (drag-and-drop), feedback (instant), and aesthetics. The study's conclusion showed that the gamified learning method could help improve the efficiency of Jawi literacy classes.

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Keywords:

User Performance, User Acceptance, Gamified Learning, Jawi Script, Interactive Learning

Introduction

Game-based learning (GBL) has become an effective educational method, especially in improving language proficiency and cultural understanding. Specifically regarding Jawi, a script that originates from Arabic and is utilised for writing the Malay language, there is a growing development of GBL applications designed to captivate students and enhance their educational achievements.

The rising embrace of GBL methods signifies a transformation towards more engaging and productive educational settings, bolstered by an expanding collection of studies that underline its advantages and uses.

Game-based learning (GBL) has been popular in educational research and practice since the early 2000s, particularly in physics education. This shift highlights a growing awareness of GBL's ability to improve student engagement and academic success (Nurjanah et al., 2024). As a result, many educational institutions embrace GBL within their curricula, recognising its capacity to enhance cognitive skills and inspire learners (Alduwairej, 2024). In STEM education specifically, GBL is essential, functioning as a motivational resource that draws students' interest towards science and technology, especially in underprivileged environments (Castellanos et al., 2024).

Studies suggest that GBL platforms have benefitted student performance in mathematics, with learners readily adapting to this new instructional method (Madrid et al., 2024). The application of game-based techniques boosts scholastic achievement and cultivates curiosity and creativity among students, interpreting the learning experience as more interactive and enjoyable. Ultimately, the expanding research base and practical use of GBL across diverse fields highlight its transformative influence in current education. Gamification and game-based learning have become a massive deal in education. Not only are the game elements increasingly used in different academic areas, but they are also gaining the most popularity. Gamification is a method of using game elements in teaching settings to get people more involved and interested in learning. This model strengthens the engagement of students and makes them more interested in learning, on the one hand, and it increases their academic success significantly on the other hand. For this reason, language teachers can also use it comfortably as an effective tool for facilitating language acquisition. (Thurairasu, V.,2022).

Game-based learning (GBL) offers several advantages, such as better problem-solving skills, improved communication abilities, and heightened enthusiasm for learning, especially among younger individuals who tend to be more responsive to visual prompts (Chiao & Niu, 2024). However, along with its benefits come certain challenges that need addressing. These include the necessity for adequate training for educators and the incorporation of GBL within current educational systems (Castellanos et al., 2024).

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Game-based learning (GBL) significantly enhances student engagement by transforming the learning process into an enjoyable and immersive experience, which fosters higher motivation levels (Montagu-Cairns, 2025; Lampropoulos, 2023). The structured rewards, challenges, and goals embedded in game-based environments create a focused learning atmosphere that encourages active participation and sustained interest in the subject matter (Nahar, 2023). By integrating elements of interactivity and competition, GBL helps students remain engaged while making learning more dynamic and stimulating.

Beyond engagement, GBL plays a crucial role in skill development, particularly in areas that require critical thinking and decision-making, such as law and entrepreneurship (Montagu-Cairns, 2025; Daniel et al., 2024). It also enhances social-emotional development via collaboration with peers, overcoming difficulties, and being flexible, a must-have skill in today's classrooms and companies (Lampropoulos, 2023). Moreover, it is by GBL that students get digital tools by which they enhance their tech skills to survive in the world of e-learning and working.

Additionally, GBL acts as a connection between theoretical learning and its practical application. It enables students to figure out applications where theoretical knowledge can be used. Thus, it also becomes a means of better conceptualisation and easier memory of advanced concepts (Mikrouli et al., 2024). In entrepreneurship education, for instance, GBL has been shown to boost self-efficacy, enhance resource management skills, and encourage creative idea generation (Daniel et al., 2024). However, while GBL presents numerous advantages, its effectiveness is influenced by factors such as students' prior gaming experience, the quality of game design, and the availability of adequate training and resources for educators (Mikrouli et al., 2024; Lampropoulos, 2023). Addressing these factors is essential to optimising the benefits of GBL in various educational contexts.

According to Ishaq and Teams, Research shows that the game scores in terms of usability are at 90%. The results of the quasi-experiment-based pre-test and post-test study have come in. However, interestingly, the results indicate that the scores for the LLG are significantly better than those for the adopted mobile application and those for the traditional group we have taught from. Our functionality test showed that J-WMYH is effective for enhancing knowledge. (Dahalan, N. M., Dahlan, A., Abdullah, Z., & Wan Abd Halim, W. A. F.,2022)

Dunia Belajar Jawi Game

Dunia Belajar Jawi is an interactive game designed to assist students with Jawi, particularly in mastering Jawi writing. The research shows that students struggle to master Jawi writing, especially in connecting letters to form words. The conventional approaches and resources employed in teaching Jawi are insufficient because they do not cater to the visual learning preferences essential for grasping this intricate script. (Malik et al., 2024)

Dunia Belajar Jawi utilises the AVUZARZAD approach, which assists learners in determining if the letter can relate to other letters or not. The Dalil Avu Zar Zad method provides an easy formula to assist students in mastering Jawi writing. The Dalil aspect involves a Letter Key Table that maps each Rumi letter to its corresponding single Jawi letter. Specifically, the letters hamzah, alif, va, wau, zai, ro, zal, and dal - collectively referred to as Avu Zar Zad - are those that are not connected; these are marked with a symbol (-) after each letter. Conversely, any

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Jawi letters outside of the Avu Zar Zad group can connect with following letters and are denoted by a (+). (Dalilah, B. D., & Abdul Kahar, A. R. , 2008).

In the realm of Dunia Belajar Jawi, learners must fulfil three levels, with each level comprising three words that need to be connected together. First, students must match the letters from Rumi with Jawi, then distinguish them using either a + or—symbol. This is accomplished by applying the AVUZARZAD technique. Finally, the last step requires students to match the connected letters together to form words.

Research Problems

Adopting Game-Based Learning (GBL) in Jawi script teaching raises research problems requiring extensive inspection. The main question is the GBL efficiency in Jawi literacy enhancement. Even though GBL has been shown to be successful in its implementation in different educational settings, the extent to which it can be used to improve learners' knowledge of and competence in the Jawi script still has several unclear areas (Salleh et al.,2021).

It would be the best approach to research if properly GBL-based technological modification of the age-old backward low-tech tradition in the classrooms would have a significant encouraging enhancement on university students' Jawi writing and reading abilities, textual analysis, and general language development; hence, adult educators are challenged in mastering technology to develop students' literacy. Work in this regard also requires an investigation of the reasons for the unwillingness of educators to use educational technology and free software such as ChemCollective, Virtual Molecular models, and CTools that students could engage with over the Web. Then, a situation where teachers could recognise that students' problem-solving process is paramount is to suggest to teachers through technology that the students who engage in a solution are developing a needed skill.

Also, one of the main obstacles to applying GBL to the Jawi script is the game-based learning approach and culturally relevant materials that must be implemented. Making content that is intellectually attractive and resonates with the learners about their culture is so perfect that the learner's motivation is boosted, and the learning is effective (Castellanos et al., 2024). The study has to prioritise the overlay between technology and education. Interactive educational media can be used to apply the drawing and transliteration method in context.

Teachers can also be accountable for the learners' progress. In addition, the Jawi script must be treated with respect like other successful technological tools in higher education. Its functions should scale up throughout life periods and job markets in line with the economy's digitally transforming labour demands. More online learning technologies, like the computer-assisted writing program, promote students' independence, which provides effective writing practice. Focusing on these research problems is key in creating GBL ways to help Jawi script literacy grow and keep this essential cultural dimension.

Research Objectives

Here are three innovative research objectives that will push the boundaries of our understanding of game-based learning in the context of Jawi script education:

- To evaluate the effectiveness of the Dunia Belajar Jawi game in enhancing students' ability to connect Jawi letters. The objective is to doubt the game and the students' comprehension of Jawi's style and design. It is a way to test the game's effectiveness by

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the pre-test and post-test differences in the test performance. (Plass et al., 2020; Salleh et al., 2021)

- To analyse user acceptance and engagement levels of the Dunia Belajar Jawi game among primary school students. This objective aims to determine the students' impressions, the trigger behind their self-motivation, and their long-term satisfaction with the application using User Acceptance Testing. (Rajendran et al., 2024; Castellanos et al., 2024)
- To identify key design and implementation factors that influence the effectiveness of game-based learning for Jawi script education. This objective identifies several basic principles and key technologies that determine the choice of GBL in Jawi education. (Montagu-Cairns, 2025; UZEDA et al., 2024)

Methodology

This study employed a structured assessment approach, evaluating student performance through pre-tests and post-tests and measuring user acceptance of the Dunia Belajar Jawi game. 32 Level 1 students from Sekolah Rendah Agama participated in the study, which was open to students from SRA/KAFA or SRAI institutions, specifically those in Standard 1 through Standard 3.

The AVUZARZAD technique was first discussed with the students before and after the first lesson to facilitate the acquisition of a deep understanding. The method of joining Jawi letters was explained, and then the teacher demonstrated how it was done. This was followed by administering a pre-test, which consisted of nine questions and was aimed at determining the students' basic knowledge level. The students had half an hour to finish their test.

Following the pre-test, students were given a 30-minute break before engaging in the post-test session, where they interacted with the digital game Dunia Belajar Jawi. The post-test, identical in format to the pre-test, required students to answer nine questions within a 30-minute timeframe. Before the post-test, a brief introductory session on Dunia Belajar Jawi was provided to familiarise students with the game's mechanics. Before the post-test, a short introduction about Dunia Belajar Jawi was given to ensure the students understood the game mechanics.

The study is the last phase of the User Acceptance Testing that proposes smart usability, ease of use, and overall satisfaction from the participants' feedback. For instance, students were split into small groups of three each, and the facilitator was responsible for clearing the survey-related questions and checking the precision of the replies. Hence, they accurately represented the students' experiences. The structured method enabled a thorough evaluation of educational outcomes and user interaction with the platform, which was gamified.

Result And Finding

Performance Test

Table 1 presents the mean and standard deviation for the pre-test and post-test results, which helps determine the usefulness of the intervention. Data from 32 participants were collected,

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making it possible to analyse their performance before and after accessing the Dunia Belajar Jawi website.

Table 1: Paired Samples Statistics - Pre-Test and Post-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre	6.4688	32	1.93415	.34191
	Post	7.5313	32	1.50235	.26558

The pre-test was, on average, 6.47, while the mean for the post-test increased to 7.53, a change of about 1.06 points. This upward development indicates that the measure benefited students who acquired the knowledge and skill to form Jawi letters.

The standard deviation (SD) values also confirm this result by presenting the changes in the distribution of the scores. Specifically, the pre-test SD was observed at 1.93, which showed a difference in the initial performance levels of the students. On the other hand, the post-test SD had dropped to 1.50, implying that the pupils were more consistent in expressing themselves after getting the practice. The post-test SD, the deviation in the score, which used to be more uniform and with lower variation earlier, represents a proper increase in the improvement of student learning.

Besides, the drop in the standard error of measurement (SEM) from 0.34 in the pre-test to 0.27 in the post-test shows that the post-test scores are more precise. It follows that the intervention contributed to the rise in overall student performance and the consistency and accuracy of their answers with full knowledge.

These outcomes manifest that the gamified learning platform Dunia Belajar Jawi successfully allows students to connect Jawi letters, and therefore, it remains a high-quality application. The findings reveal a substantial improvement in literacy, which makes it possible to incorporate game-based learning methods in the area of Jawi education.

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User Acceptance Test

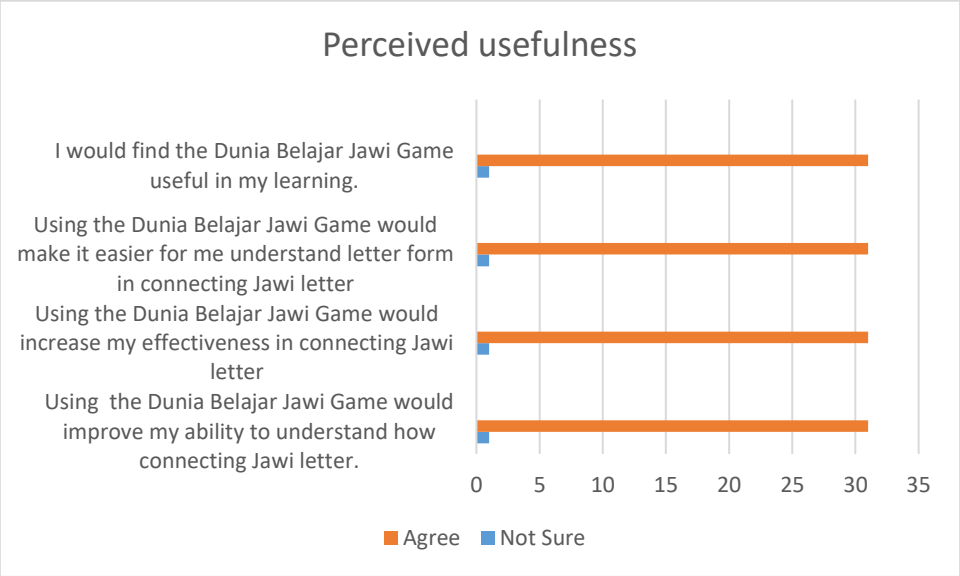

Figure 1: Perceived Usefulness Chart

Furthermore, the horizontal bar chart in Figure 1 illustrates the survey findings regarding the perceived usefulness of the *Dunia Belajar Jawi* game as an educational tool for learning the Jawi script, a writing system for the Malay language based on Arabic letters.

The chart presents responses to four key statements assessing different aspects of the game's usefulness: (1) General usefulness in learning, (2) Ease of understanding letter forms when connecting Jawi letters, (3) Effectiveness in connecting Jawi letters, and (4) Ability to understand how to connect Jawi letters.

Responses were categorised into two groups: orange bars represent "Agree," while blue bars indicate "Not Sure." The survey results suggest that approximately 31 respondents agreed with each statement, while only one selected "Not Sure." This significantly positive feedback shows that most participants discovered the game as a highly qualified tool for mastering the Jawi script, particularly in which they could connect letters effectively.

All participants agreeing to every statement show a strong affinity among users with the game's ability to increase Jawi literacy. The current results strengthen the game's importance for building engagement and understanding, thereby confirming Dunia Belajar Jawi as a practical and interactive education tool. The results imply that Dunia Belajar Jawi is key to connecting Jawi letters more efficiently and this tool's value as a gamified learning resource for Jawi education is justified.

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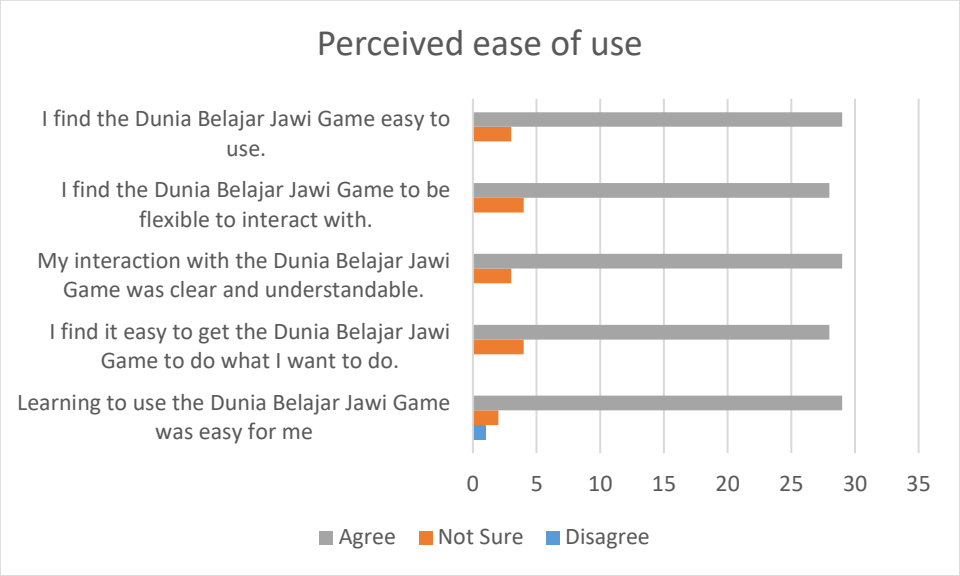

Figure 2: Perceived Ease of Use Chart

Additionally, Figure 2 presents a horizontal bar chart illustrating survey results on the perceived ease of use of the Dunia Belajar Jawi game. The survey assessed five usability aspects: (1) general ease of use, (2) flexibility of interaction, (3) clarity and understandability of interaction, (4) ease of achieving desired learning outcomes, and (5) overall learning experience.

Responses were categorised into three groups: grey bars represent "Agree," orange bars indicate "Not Sure," and blue bars denote "Disagree."
The findings show that approximately 30 participants consistently agreed with each usability statement. A small proportion (around 2-3 respondents) selected "Not Sure" for some statements, while only one participant disagreed with the final statement concerning the learning process.

These results suggest that most respondents perceived the game as user-friendly across all evaluated aspects. The overwhelming number of "Agree" comments confirms the game's usability excellence, which is facilitated by a user-friendly interface, a maximum degree of interactivity, and an instructive environment that is simple to operate. At the same time, the lack of "Not Sure" and "Disagree" answers makes it clear that students have a reasonable opinion of the usability and that their digital learning tool, in this case, through Jawi, was very successful.

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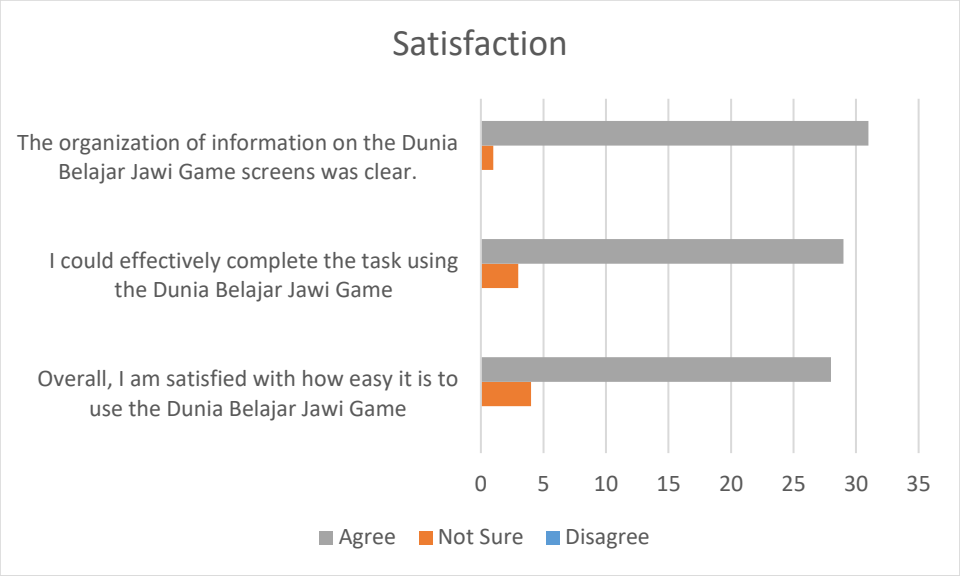

Figure 3: Satisfaction Chart

Furthermore, Figure 3 illustrates the satisfaction ratings for the Dunia Belajar Jawi game across three key aspects: (1) organisation and clarity of information on game screens, (2) effectiveness in task completion, and (3) overall satisfaction with ease of use. Responses were categorised into three groups: grey bars represent "Agree," orange bars indicate "Not Sure," and blue bars denote "Disagree" (with no responses recorded in this category).

The poll results show that about 31 participants considered the game's interface well-organized, and almost 30 claimed they could complete tasks quickly using the game. Approximately 29 of them were happy with its user interface. Meanwhile, only a few (from one to two) of the total number of 1 to 2 claimed to be "Not Sure" about each of them, and at the same time, no player indicated the opposite of their choice.

Furthermore, these satisfaction appraisals provide solid evidence of their educational utility by interpreting the same statistics with the perceived ease of use and usefulness. This is evident as the game visualises data, guides the user through task execution, and promotes optimal user interaction. The study's outcome also shows that the online learning platform, Dunia Belajar Jawi, is an impressive strategy for learning the Jawi script in one of the most varying linguistic positions in the world.

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EISSN: 2637-0905
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DOI: 10.35631/IJMOE.724070

Dunia Belajar Jawi Interface

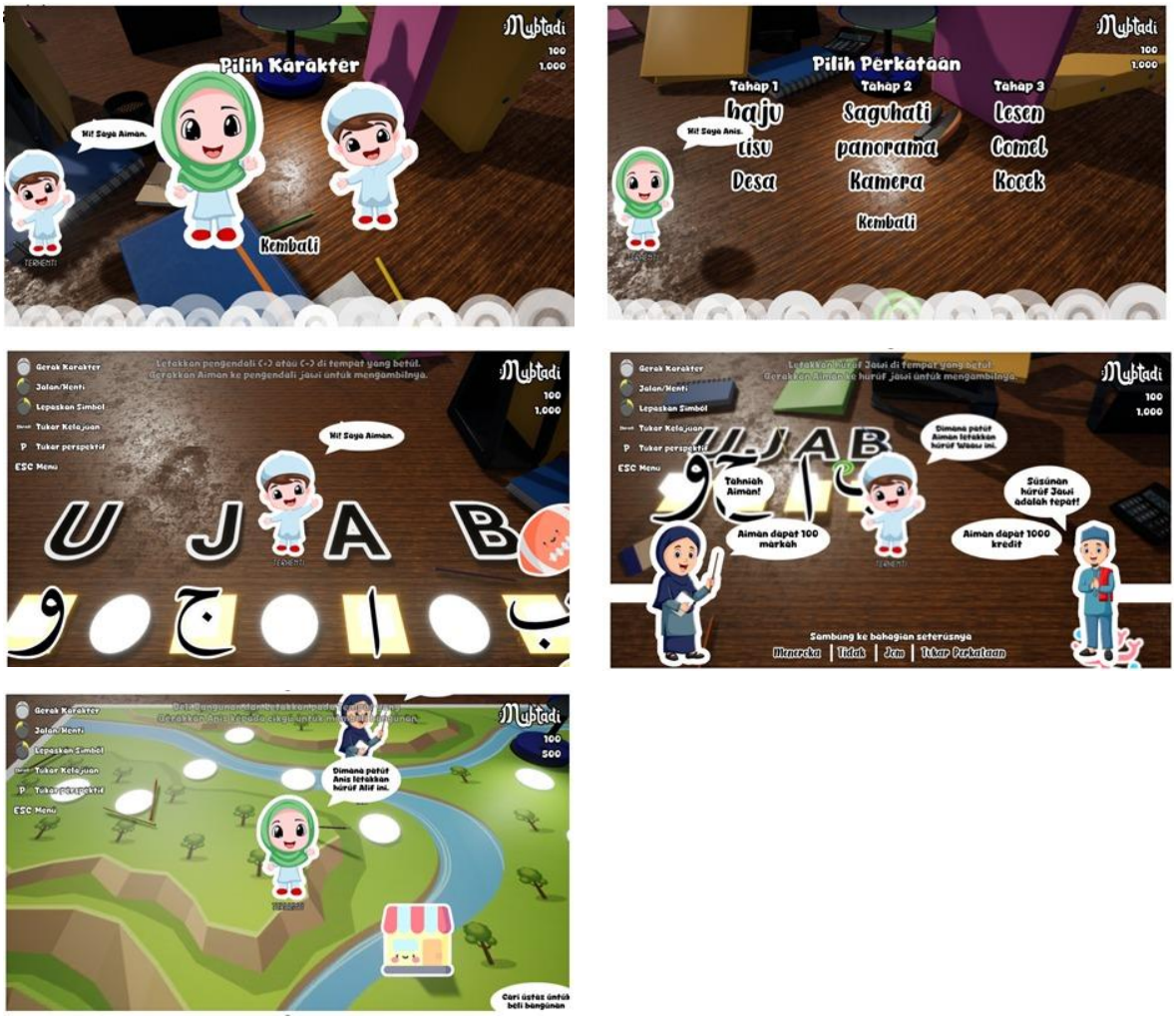

Figure 4: Dunia Belajar Jawi Interfaces

Conclusion And Suggestions

The evaluation of data from pre-tests and post-tests indicates a notable enhancement in participant scores after the test. This is demonstrated by an uptick in mean scores alongside a decrease in both standard deviation and standard error of the mean. These results underscore personal advancement and a more consistent improvement among participants, implying that the intervention successfully boosted learning outcomes and nurtured a deeper comprehension of the content addressed.

The data clearly indicates that the Dunia Belajar Jawi Game is an effective educational resource that adeptly merges instructional value with ease of use. The consistently favourable feedback across all three areas shows that the game meets its educational goals while upholding excellent usability standards. Both performance data and user feedback strongly support the effectiveness of the Dunia Belajar Jawi Game. The statistical analysis reveals significant improvement in participant performance, with mean scores increasing from 6.47 to 7.53. Importantly, the decreased standard deviation (from 1.93 to 1.50) and lower standard error of mean indicate that participants not only improved but also showed more consistent performance after using the game.

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EISSN: 2637-0905
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The increase in scores substantiates users' high assessments regarding the game's perceived usefulness. The more consistent post-test results correlate with participants clearly understanding the game's mechanics and subject matter.

The decreased standard deviation indicates that the game effectively standardises learning experiences. This is further supported by the elevated satisfaction scores concerning how information is organised and how tasks are completed. The notable enhancement in scores is linked to the satisfaction reported by participants. Additionally, the smaller range of post-test scores aligns with feedback regarding the game's clarity and effectiveness.

The convergence of objective performance indicators and subjective user assessments offers compelling proof that the Dunia Belajar Jawi Game is not only effectively designed for usability but also fulfils its primary educational goals. This game adeptly integrates a captivating user experience with robust pedagogical principles, leading to significant learning enhancements and elevated levels of user satisfaction.

The outcomes from the conducted tests align with earlier research. In relation to Debchaudhury (2024), the advantages of Game-Based Learning (GBL) extend beyond just fostering motivation; it has been associated with enhanced reasoning capabilities, especially within scientific frameworks. Evidence shows that participants engaged in GBL demonstrate superior performance, highlighting improved cognitive skills. A comprehensive review further confirms these findings, indicating that GBL positively affects self-regulated learning and promotes active engagement, resulting in overall better academic achievements (Zakaria et al., 2024). This implies that GBL makes the educational experience more enjoyable and significantly enhances learning effectiveness.

An additional important factor of Game-Based Learning (GBL) is its impact on boosting students' self-efficacy, a key factor for achieving academic success. Participation in GBL activities has enhanced students' confidence regarding academic and extracurricular endeavours (Mokhtar et al., 2024). The positive relationships between GBL and heightened self-assurance suggest comprehensive advantages for students, indicating that as students immerse themselves in game-related content, they cultivate a more robust conviction in their capabilities to excel in diverse areas.
Here are several strategies to enhance this research:

1. Expand Sample Size for Generalizability
   Although 32 students can provide interesting observations, enlarging the sample to different schools or regions can make the study more widely applicable and enhance its statistical strength.
2. Longitudinal Study for Retention Analysis
   Along the same lines, regular assessments would be beneficial to measure the effect of the instructional strategies and gauge their connection to the actual practice of Jawi, in addition to the immediacy that only the test can tell.
3. Comparative Analysis with Traditional Learning.
   On the other hand, the study will be better if the researchers can also identify what is pleasant in developing educational video games that are as good as Jawi's traditional methods.
4. Integration of Teacher and Parent Perspectives

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EISSN: 2637-0905
IJMOE
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Learning teacher support and parental perspectives could help identify problems and formulate strategies for teaching GBL in Jawi script to children.

5. Adaptive Learning Features
   On the other hand, the researchers could test if such technologies, like self-controlling technologies in education, could improve learner-student engagement.
6. Cultural Sensitivity in Game Design.
   Checking whether the game's content is aligned with the social and linguistic diversity of the Jawi learners would have a tremendous educational impact and increase the program's acceptability.

Technology Accessibility and Usability Studies. One way to look at it is that the drive for GBL makes the programs easily accessible, compatible with most devices, and user-friendly for all learners, from the less privileged to the more fortunate.

Acknowledegment
The authors would like to express their deepest gratitude to all individuals and organisations who contributed to the completion of this research. Special thanks go to the students and teachers of Sekolah Rendah Agama in Kuala Selangor for their participation, cooperation, and valuable feedback, which significantly enriched this study. Also, our academic mentors say the truth and deserve our respect for the hard work and valuable discussions that contributed to the creation of this research. Beyond that, we are grateful to the colleges we independently perform in for providing the resources that nourish the study and the research facilities designed to meet our study needs. To our families and friends, emotionally complete. We also want to thank them from the bottom of our hearts because completing such an arduous journey would have been impossible without their constant support and motivation.

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