Salud, Ciencia y Tecnología - Serie de Conferencias. 2025; 4:1352
doi: 10.56294/sctconf20251352

ORIGINAL

The Concept of Interactive Arabic Learning Media Uses the First-Person Shooter Gamification Method

El concepto de medios interactivos de aprendizaje de árabe utiliza el método de gamificación del shooter en primera persona

Yoke Suryadarma[1], Faisal Reza Pradhana[2], Fitri Setyo Rini[1], Moh. Ismail[1], Nikmalathul Maisyaroh[1]

[1]Universitas Darussalam Gontor, Arabic Language Education Department. Ponorogo, Indonesia.
[2]Universitas Darussalam Gontor, Informatics Engineering Department. Ponorogo, Indonesia.

Cite as: Suryadarma Y, Pradhana FR, Rini FS, Ismail M, Maisyaroh N. The Concept of Interactive Arabic Learning Media Uses the First-Person Shooter Gamification Method. Salud, Ciencia y Tecnología - Serie de Conferencias. 2025; 4:1352. https://doi.org/10.56294/sctconf20251352

Submitted: 29-05-2024 **Revised:** 02-09-2024 **Accepted:** 13-05-2025 **Published:** 14-05-2025

Editor: Prof. Dr. William Castillo-González

Corresponding Author: Yoke Suryadarma

ABSTRACT

Arabic was a fundamental language for studying and advancing knowledge in the Qur'an and Hadith, which are essential guides for Muslims. This research aimed to develop a gamification concept using 3D First-Person Shooter (FPS) game technology for Arabic language learning in Integrated Islamic Elementary Schools (SDIT) in East Java. The study employed a Research and Development (R&D) approach combined with the waterfall model in the Software Development Life Cycle (SDLC). The results indicated that the concept and design of interactive Arabic learning media based on the first-person shooter gamification method using the flow of the Mechanic Dynamic Aesthetic (MDA) framework method have been successfully developed well and can be employed to aid teachers in developing easily Arabic-comprehensible teaching media for students. In conclusion, this game-based learning media was expected to improve the effectiveness and enjoyment of learning Arabic while increasing students' interest in Arabic language learning.

Keywords: Arabic Teaching; First Person Shooter; Game Education; Integrated Islamic Elementary Schools; Learning Media Concepts.

RESUMEN

El árabe es una lengua fundamental para estudiar y avanzar en el conocimiento del Corán y el Hadiz, que son guías esenciales para los musulmanes. El objetivo de esta investigación es desarrollar un concepto de gamificación utilizando la tecnología de juego 3D First-Person Shooter (FPS) para el aprendizaje de la lengua árabe en las Escuelas Elementales Islámicas Integradas (SDIT) de Java Oriental. El estudio emplea un enfoque de Investigación y Desarrollo (I+D) combinado con el modelo de cascada en el Ciclo de Vida de Desarrollo de Software (SDLC). Los resultados indican que el concepto y el diseño de los medios interactivos de aprendizaje del árabe basados en el método de gamificación del shooter en primera persona utilizando el flujo del método del marco Mecánico Dinámico Estético (MDA) se ha desarrollado bien con éxito y puede emplearse para ayudar a los profesores a desarrollar medios de enseñanza del árabe fácilmente comprensibles para los estudiantes. En conclusión, se espera que este medio de enseñanza basado en juegos mejore la eficacia y el disfrute del aprendizaje del árabe, al tiempo que aumente el interés de los estudiantes por el aprendizaje de la lengua árabe.

Palabras clave: Enseñanza del Árabe; First Person Shooter; Game Education; Escuelas Primarias Islámicas Integradas; Conceptos de Medios de Aprendizaje.

INTRODUCTION

In recent years, the integration of digital technology in education has become an increasingly prominent trend, particularly in the context of language learning. Advances in game-based learning and gamification have opened new opportunities to enhance student motivation and engagement in the learning process.[1] Amid the rapid development of technology, Generation Z, known as digital natives, tends to respond more positively to learning methods that involve dynamic interaction and visualization, such as those offered by 3D game technology. Recent studies indicate that the use of educational games, especially those based on 3D technology and gamification elements, can significantly improve learning outcomes and student interest, particularly in subjects perceived as difficult or less appealing,[2] such as Arabic.

Moreover, gamification methods that adopt the First-Person Shooter (FPS) game model are increasingly being applied in the development of educational media because they can create immersive and realistic learning experiences.[3] By providing an interactive and engaging gameplay experience, this approach not only helps to increase the attractiveness and engagement of students but also enables deeper mastery of material through simulation and repetitive practice.[4] These developments highlight the significant potential of game technology in enhancing the quality of education, especially within Islamic values-based education that integrates Arabic language learning as an essential part of the curriculum.

The Qur'an and Arabic are two inseparable entities. Muslim students in Indonesia, especially at the Integrated Islamic Primary School (SDIT) level, are required to study both simultaneously.[5] SDIT is one of the alternatives in the world of education today,[6] where SDIT combines Islamic principles and values in learning and combines them with the general curriculum, so that one of the compulsory subjects taught is Arabic.[7]

However, challenges in teaching Arabic at the primary level are often faced by teachers and students. Lack of student motivation and interesting learning methods are the main obstacles in achieving learning effectiveness.[8,9] On the one hand, the ongoing 4.0 technology era has produced many innovations in the field of education. Various new digital learning platforms have been developed to present learning materials in a more interesting and effective way.[10,11,12] In Arabic language teaching, many teaching media are used to stimulate students, such as animation media,[13] book media,[14] web media,[15] second the planning, and third the development. The research data is in the form of audio-visual debates from the 'Qatardebate' account and debate technical handbooks. All data were collected in a corpus of website-based debates. The results showed that (a and others, but have not been able to seriously increase students' interest in learning.

Initial observations in several SDITs revealed that Arabic is not a favorite subject among students. They perceive Arabic as more difficult than other languages due to the use of hijaiyah letters, which differ from the alphabet, and because it is not used in daily communication. Additionally, Arabic learning is mainly theoretical, with limited teaching methods beyond face-to-face instruction and textbooks. Although each SDIT has a computer lab with at least 20 high-spec PCs, these labs are not being fully utilized to enhance the Arabic learning process.

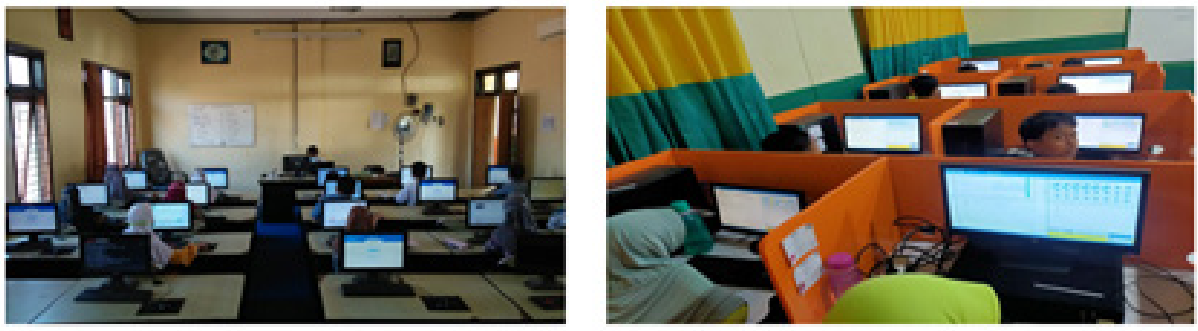

Figure 1. Computer laboratory facilities at integrated Islamic elementary schools

Based on the explanation above, this study aims to develop a modern learning concept for Arabic language subjects using 3D game technology on a PC platform. Educational games were chosen due to their popularity among children and adults in Indonesia, which has the largest number of gamers worldwide according to a 2022 survey.[16] Educational games have been shown to enhance student interest, engagement, and achievement in learning by incorporating game elements that boost motivation and participation.[17,18]

Concept of 3D educational game model designed following the model of first-person shooter game (FPS). FPS is a game genre that places players in a first-person perspective (3), making players feel as if they are the main character in a game that focuses on the use of various tools, weapons, and other elements.[19] The 3D game model has the advantage of implementing a virtual world that is very similar to real life, creating an interesting, interactive and visualized experience with a variety of information presented more effectively and equipped with audio visuals.[20]

https://doi.org/10.56294/sctconf20251352

PC-based media was chosen because SDIT schools restrict the use of smartphones during learning periods. The goal is to optimize the use of PCs in school computer labs through educational games. The content is sourced from the book Cinta Bahasa Arab Volume 1 by Hasimi. The research introduces several novelties: 1) The development of a first-person shooter game model for Arabic language learning, which has not been done before; 2) The use of 3D games for teaching Arabic; 3) The educational game design is based on the MDA Framework method.

METHOD

This research employed a Research and Development (R&D) approach combined with the waterfall model in the Software Development Life Cycle (SDLC). SDLC was chosen for its flexibility in accommodating user-requested changes. This approach ensures that the research can be conducted effectively and efficiently without compromising the quality of the final product. The SDLC waterfall model consists of five stages: requirements analysis, design, implementation, verification, and maintenance.[21,22] More clearly, the stages of SDLC waterfall model can be seen in figure 2.

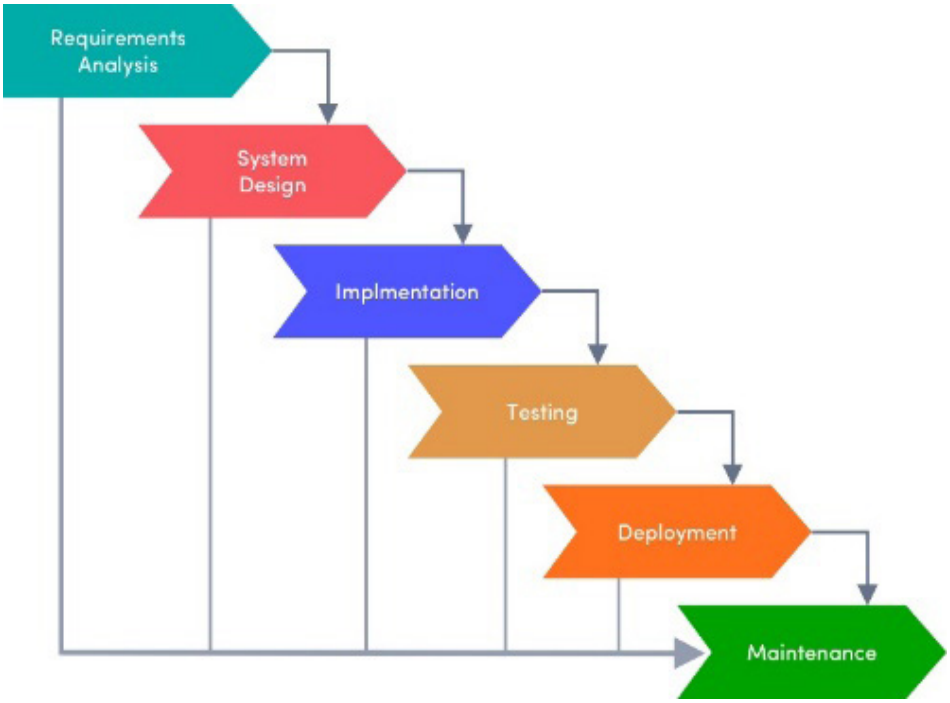

Figure 2. The stages of SDLC waterfall method

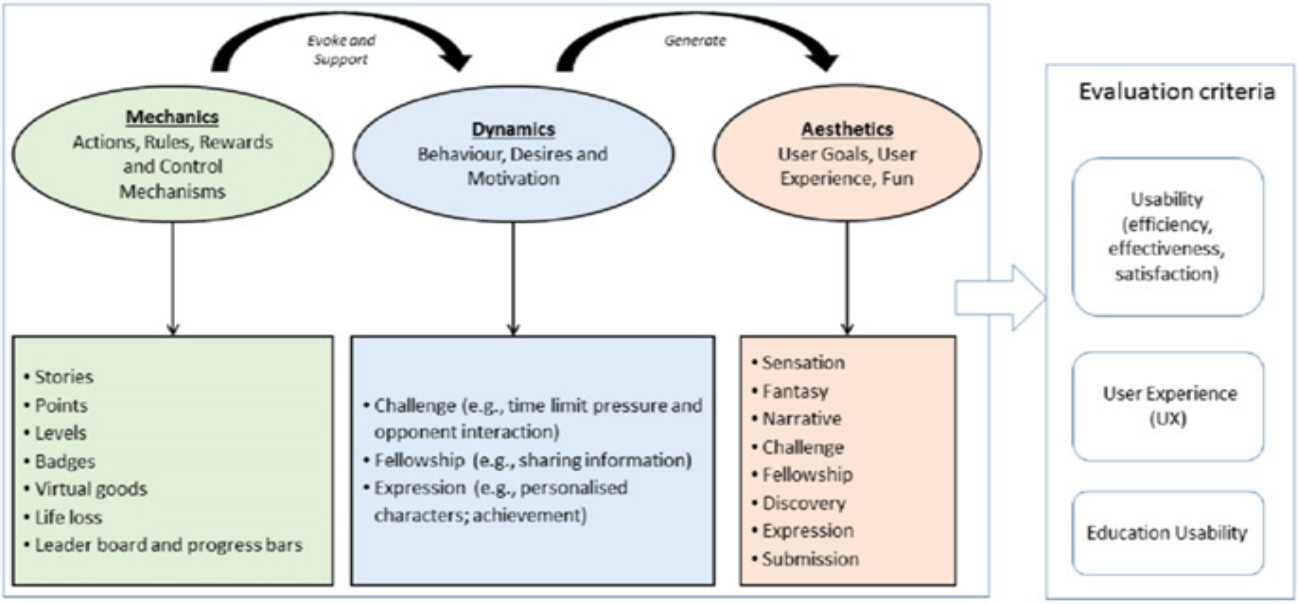

Figure 3. The element of MDA Framework

https://doi.org/10.56294/sctconf20251352

And for developing a gamification concept based on 3D First-Person Shooter (FPS) game technology for Arabic language learning in Integrated Islamic Elementary Schools (SDIT) in East Java, it was used and followed the flow of the Mechanic Dynamic Aesthetic (MDA) framework method (the MDA Framework) as a formal approach to game design and research. The MDA Framework consists of three key elements: mechanics, dynamics, and aesthetics, which guide the design of educational games. Each element serves as a reference point in the game development process.[23,24] The elements of the MDA framework can be seen in figure 3.

RESULTS

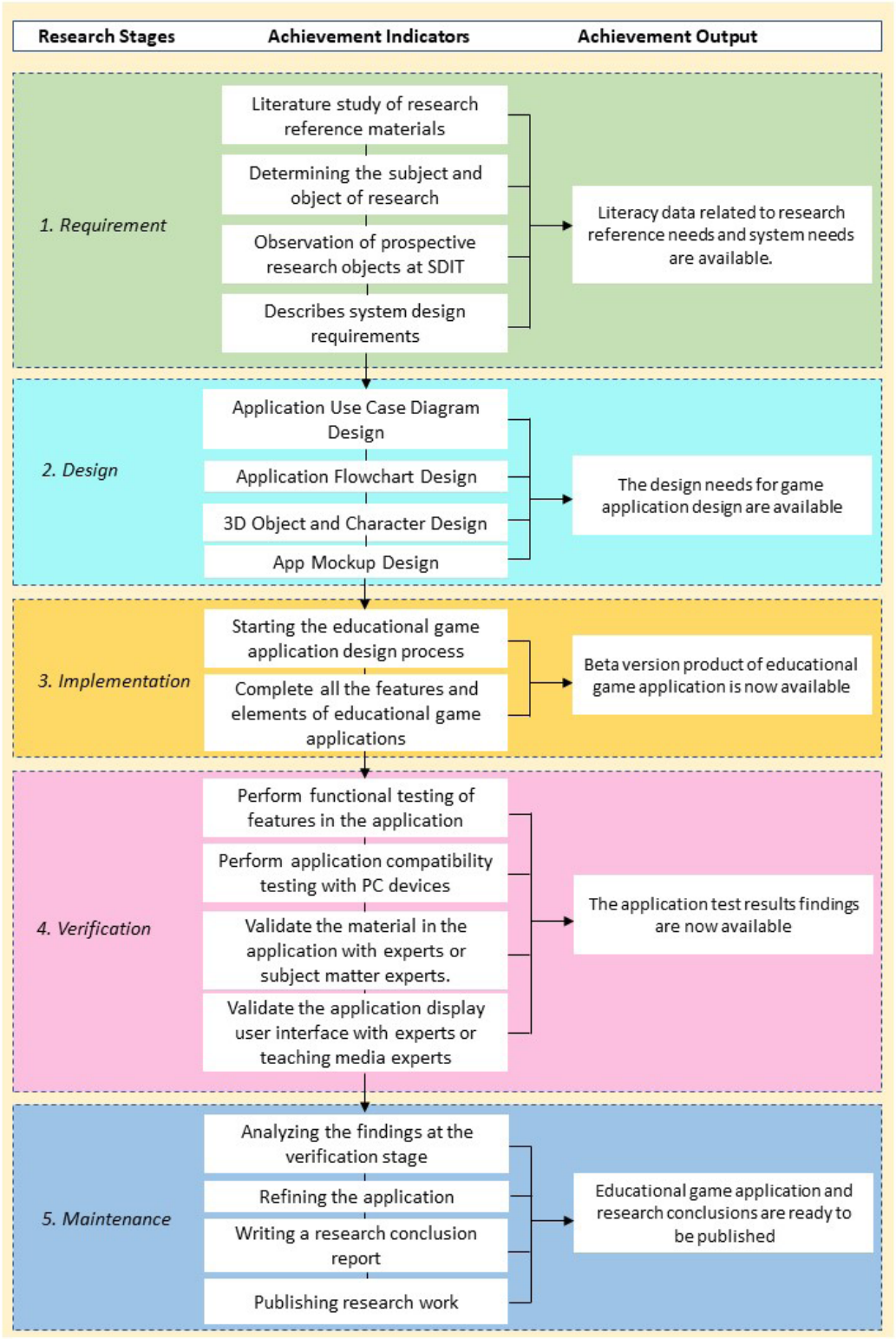

Figure 4. Research procedures, achievement indicators and outcomes of each stage of the SDLC model

The development of a gamification model of Arabic language learning based on 3D FPS game technology in this study uses a waterfall approach or Software Development Life Cycle (SDLC) model. The waterfall or SDLC model consists of five stages, namely requirements, design, implementation, verification, and maintenance. [21,22,25,26,27] The SDLC model is considered more flexible in providing changes to the needs requested by users. [21,22,26] The research procedures, achievement indicators and outcomes of each stage of the SDLC model are shown in figure 4.

Based on the figure above, the researchers conduct the research step by step until accomplish the product development. The details of every stage that have been carried out are as follows:

Requirement Analysis

At this stage, activities included conducting literature reviews, gathering research references, defining the research subject and object, and exploring and formulating problems and technological solutions for developing Arabic language educational games. Observations were conducted through interviews with Arabic language teachers at SDITs in East Java. Table 1 presents the results of the application development needs identified.

Table 1. Game Development Needs Analysis Results

Research Activity	Result
Identification of problems	Arabic is not yet a favorite subject for students at SDIT The current teaching media is limited to books, and the teaching model primarily relies on simple face-to-face methods. The use of PCs in the SDIT computer laboratory is not yet fully optimized.
Offered solutions	Arabic Language Teaching Media Concept Based on 3D Interactive Games
The content or substance of the planned application	The game content is planned to be taken from the book Cinta Bahasa Arab Volume 1
Technology plan to be used	First person shooters game based on PC Desktop

Design stages

At this stage, all design planning requirements for the 3D game concept are outlined. Figure 5 presents a mockup of the application, serving as a reference for game designers in creating the user interface, menu layout, background, and object placement within each game element.

Figure 5. Game mockup view (a) main menu, (b) Arabic vocabulary layout, (c) dialog and quiz view with npc

Along with the mockup design, a 3D character and environment design for NPCs was prepared. The character is depicted as a Muslim teenager, and the learning area is designed as a detailed 3D classroom. Figure 6 provides a detailed example of the 3D character and environment model.

https://doi.org/10.56294/sctconf20251352

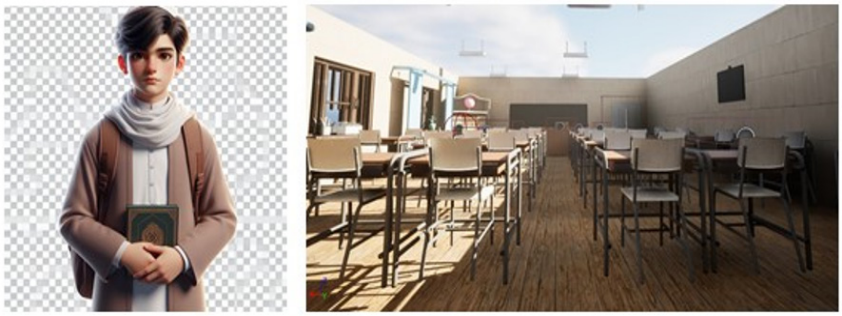

Figure 6. 3D NPC character and class environment design

As outlined in the method sub-chapter, the educational game concept follows the steps of the MDA Framework to define and clarify the needs for each game element. The MDA Framework is a framework often used in formal approaches to game design that has three key elements: mechanic, dynamic, and aesthetic elements. [23,28] Figure 7 describes the contents of each MDA framework component for the game. When the game content needs have been identified, the next step is to conceptualize an application flow that functions to make it easier for developers and users to design applications and read application flows. Figure 8 is a flow diagram that explains the user's position and all operations available in the application. Starting from the initial condition of the application being opened, several menu accesses until the user exits or exits the game application.

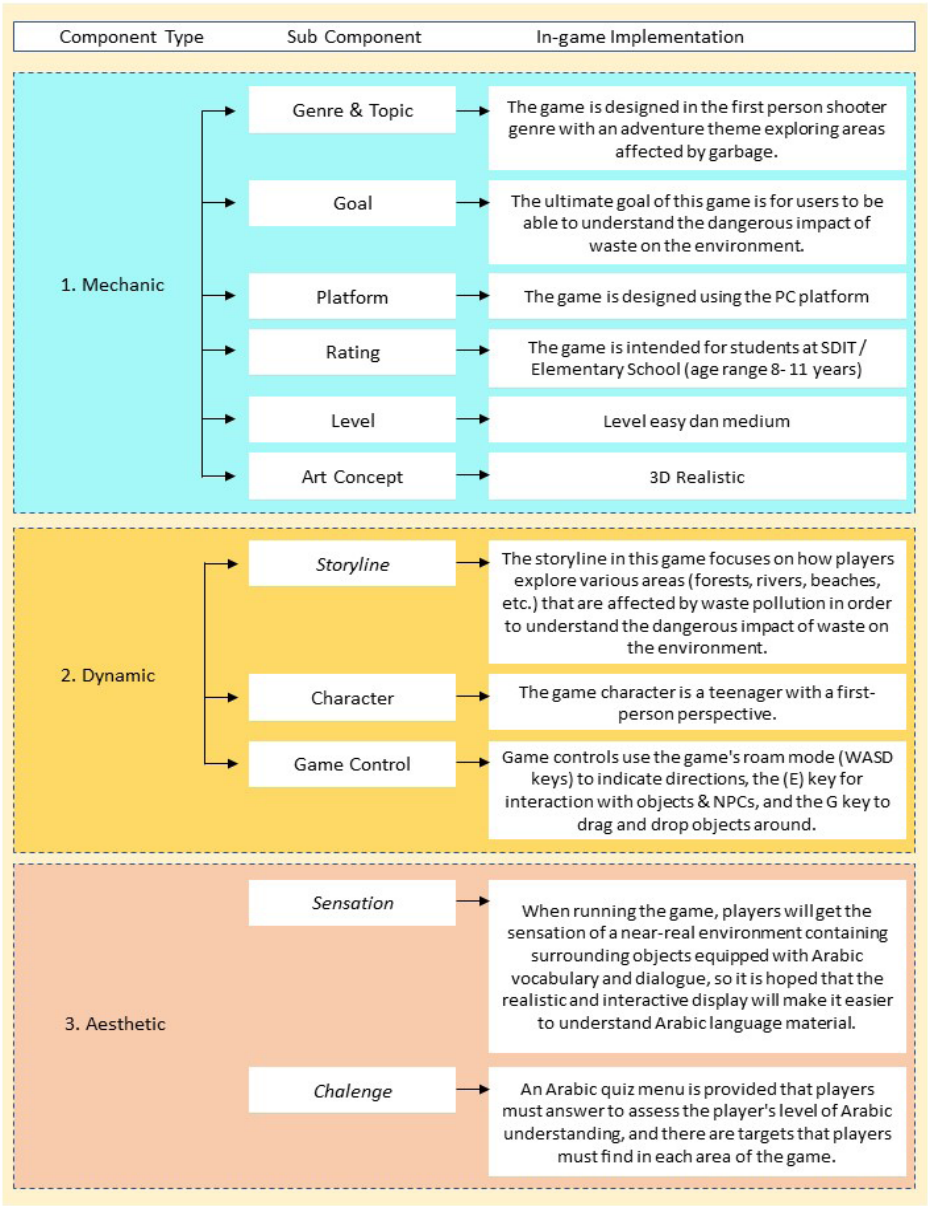

Figure 7. Application of MDA Framework components to the concept of 3D Game

https://doi.org/10.56294/sctconf20251352

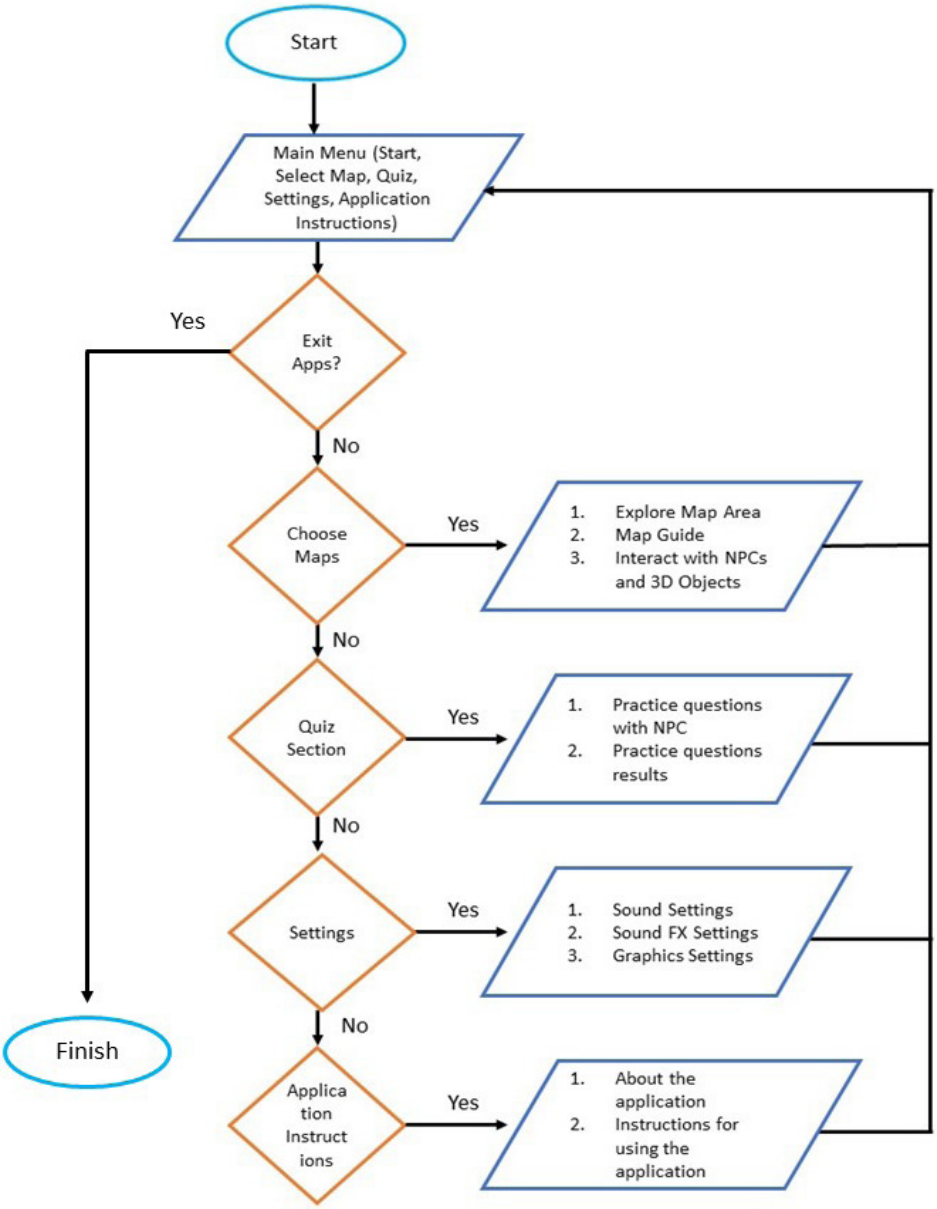

Figure 8. The concept of the flows of 3D Arabic game media

Implementation

At this stage, a 3d Arabic language game is designed to mature the concept and can be used as a sample that can be tested. the game is designed following all the steps that have been arranged at the design stage with various feature needs in it such as Arabic conversation, Arabic vocabularies and so on. An example of a sample game display that has been designed using the concept of teaching media based on 3d first person shooter games can be seen in figure 9.

Figure 9. Interface of the sample game designed based on the concept of Arabic 3D FPS Game

https://doi.org/10.56294/sctconf20251352

Testing and Deployment

The testing activity aims to prove that the concept of 3D games in Arabic language learning is in accordance with the needs of teachers and students, and to minimize unnecessary errors. The complete game application testing activities that will be carried out are as follows:

1. Usability testing: this test was carried out to check the performance of the features in the application to avoid features that do not work normally or bugs. The usability testing method uses the Blackbox method. After conducting this test, it was found that there were several bugs, especially in the game button function where the user could not access the button function. after revision, the game can finally function properly and normally.
2. Combability testing: testing was done by installing the game application onto a PC device in a computer laboratory to check the level of compatibility of the application with different computer specifications. After doing this test, there was a phenomenon where this game application can only be used on a PC or laptop that has a high processor chipset. But even though, it does not reduce the function of this Arabic language game application, it just requires a device that has a high processor chipset.
3. Testing the suitability of Arabic language materials: this test was addressed to learning material experts to check the suitability of the material in the application with existing book sources as well as the capability and the need of the students. The Arabic language material test and the game application interfaces in this study were carried out through a trial use by two Arabic language experts and Arabic learning technology, namely Dr. Moh. Ahsanuddin, from Universitas Negeri Malang and Dr.phil. Alif Cahya Setiyadi, from Universitas Darussalam Gontor followed by filling out an assessment questionnaire from the aspect of cognition content and from the aspect of information presentation and language. The results from both experts showed a score of 40,5 out of 45 (maximum score). This showed that 90 % of the Arabic material in this game is in accordance with the existing source books and also in accordance with the abilities and needs of students. This means that the Arabic interactive game can be used by students easily.
4. Testing media or game interfaces: testing is aimed at teaching media experts to assess the level of suitability of the user interface (UI) of game applications from the aspects of appearance. The two experts were involved in this test. The results from both experts showed a score of 41,5 out of 45 (maximum score). This showed that the Arabic game developed based on FPS has a very good user interface (UI) of the game application from the display aspect. so that it can be used by students and teachers comfortably. Figure 10 shows a testing activity of the research team with an education expert from the Universitas Negeri Malang.
5. Testing to potential users: testing planned to be tested on teachers and students of integrated Islamic elementary schools in the East Java region to get a response from users to the game application that had been designed and tested by the experts. This testing was not conducted yet.

Figure 10. The testing activity of the Arabic game with an education expert

Maintenance

Maintenance is the last stage of this research. Maintenance activities are carried out based on the results of the previous trial stage. maintenance activities aim to perfect the concept that has been designed, so that in the future, the concept of the 3D FPS game on Arabic language material can be well received and can get appreciation from those who need it, especially teachers and students of Arabic language subjects. sources of maintenance activities involve input from users and opinions from education experts. At least, there are several steps taken at this stage, namely:

1. Analyzing and validating the research findings obtained at the verification stage, both in terms of features, materials, media and user responses (ongoing process).

https://doi.org/10.56294/sctconf20251352

2. Improve and refine the game application based on the results of the analysis carried out in the first point.
3. Writing and completing the research report (ongoing process).
4. Publish the research work (ongoing process).

DISCUSSION

The need for learning Arabic games is a need of the ages. This is evidenced by the results of the aforementioned result above. The needs analysis revealed significant gaps in current Arabic language teaching methods and highlighted the potential for gamified learning tools. The findings, detailed in table 1, showed a strong preference among students and educators for a more interactive and technologically advanced approach to language learning. Gamification has been shown to drive learner engagement and motivation in the teaching of the Arabic language to non-native speakers.

Various studies have highlighted the effectiveness of gamified learning tools in improving learner engagement, fantasy, and motivation in Arabic language learning. According to Lampropoulos et al.[2] gamification methods are designed to make the learning process enjoyable and interactive, enhancing learners' motivation, achievement, and satisfaction with the learning process.On the other hand, Lamrani et al.[1] stated that the introducing gamified learning environments or digital-based games in class can stimulate learners' commitment and participation in classroom activities, encouraging collaboration and active engagement. In align with previous research, Parrales et al.[29] showed that gamification is most effective gamified strategies to motivate students and improve their performance in learning. Additionally, the use of gamification in learning can develop students' creativity and communication ability, helping them to enlarge their competence and skills.[30]

The design phase successfully translated the conceptual ideas into a tangible product. Figures 2 through 9 illustrate the various design elements, from initial mockups to the final user interface and 3D character models. The use of the MDA Framework ensured that every game element served an educational purpose while maintaining player engagement.[23,28,31] Successfully translating the conceptual ideas into a tangible product can be achieved through a focus on emotional value creation and functional differentiation, leading to transactional and relational outcomes. Different design elements play a crucial role in creating these outcomes. This show that MDA Framework method was exactly right to be employed in designing the 3D FPS game.

Testing was conducted to minimize unnecessary errors. Concept testing is planned through several testing methods, namely: testing the completeness of educational game features; testing the suitability of Arabic language materials in educational games; testing media or game interfaces; and testing potential users, planned to be tested on teachers and students of integrated Islamic elementary schools. Feedback from students and teachers would be the instrumental in refining the game's mechanics and educational content.

The results mentioned above are evidence that this FPS-based Arabic language game has been successfully integrated into the SDIT curriculum using the Arabic language book "Cinta Bahasa Arab" Volume 1. This can be seen from the results of the experts' assessment, which showed 40,5 out of a maximum score of 45 or indicated a high result that this game was very suitable for the abilities and needs of students in learning Arabic. The results of the Arabic learning technology experts, as depicted in figure 10, stated that this educational game is feasible to be piloted with Integrated Islamic Primary School students, with some notes including the need for affirmation of the basic competency content on the game's home page. This phase ensures that the game remains relevant, feasible, and effective as a learning tool for students.

The development and implementation of an FPS gamification approach in Arabic language education demonstrated significant potential for improving student engagement and learning outcomes. The structured approach outlined in this article provides a roadmap for educators and developers looking to integrate gamification into language learning. This research is in a line with the previous research conducted by Pratiwi et al.[3] proving that the FPS gamification approach could be used as the learning aid for students to learning something new. On the other hand, FPS gamification approach as founded by Herumurti et al.[4] could make gamification more interesting for users. Future research could explore the long-term impacts of such tools on language acquisition and student motivation.

CONCLUSIONS

This research really explained the concept of interactive Arabic learning media through the first-person shooter gamification method. It has been successfully designed using a 3-dimensional interactive simulation game that adheres to the flow of the Mechanic Dynamic Aesthetic (MDA) framework method. Game-based teaching media is anticipated to enhance students' engagement in learning Arabic by aligning with the preferences and needs of Generation Z, who are immersed in modern technology. Additionally, it aids teachers in developing easily Arabic comprehensible teaching media for students. This research aims to inspire the progress of learning technology in the digital era. It seeks to enhance the effectiveness and enjoyment of the Arabic learning experience, as well as increase students' interest in Arabic learning.

https://doi.org/10.56294/sctconf20251352

BIBLIOGRAPHIC REFERENCES

1. Lamrani R, Abdelwahed EH. Game-based learning and gamification to improve skills in early years education. Computer Science and Information Systems. 2020;17(1):339–56.

2. Lampropoulos G, Keramopoulos E, Diamantaras K, Evangelidis G. Augmented Reality and Gamification in Education: A Systematic Literature Review of Research, Applications, and Empirical Studies. Applied Sciences. 2022 Jan;12(13):6809.

3. Pratiwi F, Taurusta C. The Design Of The First Person Shooter Game "TB CARE" Using Unity3D: Perancangan Game First Person Shooter "TB CARE" dengan Menggunakan Unity3D. 2023.

4. Herumurti D, Yunanto AA, Senna GA, Kuswardayan I, Arifiani S. Development of First-Person Shooter Game with Survival Maze Based on Virtual Reality. In: 2020 6th Information Technology International Seminar (ITIS). 2020. p. 81–6. Available from: https://ieeexplore.ieee.org/abstract/document/9321076

5. Ikbal M. Pembelajaran Bahasa Arab Di Sekolah Dasar Islam Terpadu (SDIT) Bina Insan Batang Kuis. Ihya al-Arabiyah: Jurnal Pendidikan Bahasa dan Sastra Arab. 2018;4(1). https://jurnal.uinsu.ac.id/index.php/ihya/article/view/6930

6. Maimunah M, Lestari A. Tanfîdzi Namûdzaj At-Ta'lîm Terpadu 'Ala Ta'lîm Al-Lughah Al-'Arabiyyah Fil-Fashli Ats-Tsâlits Bil-Madrasah Al-Ibtidâiyyah Al-Mutakâmilah Bina Ilmi Lemabang Palembang. Taqdir. 2018;4(2):29–43.

7. Nofiansyah MT, Yamani Z, Bamualim M. Problematika Pembelajaran Bahasa Arab Di SDIT Darus Sunnah Sumbawa. Jurnal Al-Fawa'id : Jurnal Agama dan Bahasa. 2022 Sep 30;12(2):247–56.

8. Suryadarma Y, Nurcholis A, Pikri AH. The Effectiveness of Using the Media Game Jumping Word Circles in Teaching Arabic Vocabulary. IJAS: Indonesian Journal of Arabic Studies. 2023 Nov 28;5(2):144–58.

9. Asiri A. The Effectiveness of the Inquiry and Brain Storming Strategies in Developing Achievement and Creative Thinking Skills in Arabic Language of University Students. International Journal of English Linguistics. 2020 Dec 31;11(1):p253.

10. Bereczki EO, Kárpáti A. Technology-enhanced creativity: A multiple case study of digital technology-integration expert teachers' beliefs and practices. Thinking Skills and Creativity. 2021 Mar 1;39:100791.

11. Zaid AH, Martan M, Wicaksono EB. Tashmim al-Kitab al-Madrasi fi Darsi al-Imlai li Tanmiyati Maharah al-Kitabah li al-Mubtadiin li an-Nathiqin Bighairiha. International Journal of Arabic Language Teaching. 2021 Jan 21;2(02):162–77.

12. Fauzan A, Muriyatmoko D, Nahwa Utama S. Penerapan Teknologi Augmented Reality. ELSE (Elementary School Education Journal). 2020;4:63–78.

13. Suryadarma Y, Aldini A, Pradhana FR, Yani A. Implementation of Video Animation to Increase the Interest and Result of Students in Muthala'ah at Islamic Boarding School/ تنفيذ وسائط التعليم الفيديو في مادة المطالعة لترقية رغبة تعلم الطلاب ونتيجتهم بالمعهد العصري. ALSUNIYAT: Jurnal Penelitian Bahasa, Sastra, dan Budaya Arab. 2024 Apr 30;7(1):58–76.

14. Muslim B, Zikrina Z, Mukhlisah M. Taṭwîr Kitāb Al-Qirā'at Al-Rasyîdah Li Tarqiyyah Mahārah Al-Qirā'ah 'Inda Al-Ṭālibah Bi Istikhdām Al-Kitāb Al-Elektrûny Al-Tafā'uliy Fi Al-Madrasah Al-Mutawassiṭah Insān Qur'āny Aceh Besar. Jurnal Ilmiah Islam Futura. 2023 Aug 2;23(2):347–59.

15. Thoriq MA, Ahsanuddin M, Suryadarma Y. Taṣmīm Mudawwanah Al-Munāẓarah Al-Arabiyyah 'Ala Asās Al-Sam'iyyah Al-Baṣariyyah. Alsinatuna. 2022 Dec 29;8(1):109–27.

16. Dihni. Katadata Media Network. 2022. Jumlah Gamers Indonesia Terbanyak Ketiga di Dunia. Available from: https://databoks.katadata.co.id/datapublish/2022/02/16/jumlah-gamers-indonesia-terbanyak-ketiga-di-dunia

17. Hadijah S, Shalawati S. Pelaksanaan Pembelajaran Inovatif melalui Metode Flipped Learning. CEEJ. 2021 Apr 30;2(2):52–61.

https://doi.org/10.56294/sctconf20251352

18. Pratama UN, Haryanto H. Pengembangan game edukasi berbasis android tentang domain teknologi pendidikan. Jurnal Inovasi Teknologi Pendidikan. 2017;4(2):167–84.

19. Subastian R, Hestherananda W. Design and Development of Android-Based "Tracked" Person Shooter Game Models. Journal of Multimedia Trend and Technology. 2023 Aug 15;2(2):71–9.

20. Riski EF, Triayudi A, Mardiani E. Implementation of A Star Algorithm In Android Based Alien Shooter Games: Jurnal Mantik. 2020 May 31;4(1):866–72.

21. Bassil Y. A Simulation Model for the Waterfall Software Development Life Cycle. International Journal of Engineering & Technology (iJET). 2012;2(5).

22. Saravanos A, Curinga MX. Simulating the Software Development Lifecycle: The Waterfall Model. Applied System Innovation. 2023 Dec;6(6):108.

23. Putra SD, Yasin V. MDA Framework Approach for Gamification-Based Elementary Mathematics Learning Design. International Journal of Engineering, Science and Information Technology. 2021 Jul 2;1(3):35–9.

24. Kusuma GP, Wigati EK, Utomo Y, Putera Suryapranata LK. Analysis of Gamification Models in Education Using MDA Framework. Procedia Computer Science. 2018 Jan 1;135:385–92.

25. Abdullah AF, Suryadarma Y. Metode Penelitian Media Pembelajaran Bahasa Arab (Contoh-Contoh Penelitian dengan Pendekatan Praktis). Ponorogo: UNIDA Gontor Press; 2023.

26. Amrin A, Larasati MD, Satriadi I. Model Waterfall Untuk Pengembangan Sistem Informasi Pengolahan Nilai Pada SMP Kartika XI-3 Jakarta Timur. -. 2020 Jan 10;6(1):135–40.

27. Christanto HJ, Singgalen YA. Analysis and Design of Student Guidance Information System through Software Development Life Cycle (SDLC) and Waterfall Model. Journal of Information Systems and Informatics. 2023 Mar 6;5(1):259–70.

28. Bezivin J, Gerbe O. Towards a precise definition of the OMG/MDA framework. In: Proceedings 16th Annual International Conference on Automated Software Engineering (ASE 2001). 2001 p. 273–80. https://ieeexplore.ieee.org/abstract/document/989813

29. Parrales MLM, Carrillo M de JM, Ibujes MOS, Penafiel JST. Gamification for learning mathematics in secondary school: Most effective gamified strategies to motivate students and improve their performance in mathematics. Salud, Ciencia y Tecnología. 2024 Jan 1;4:1016–1016.

30. Rivera-Valderrama S, Sánchez LER, Rodas GCA, Guerra JIG. Effects of gamification on the development of soft skills such as creativity and communication in university students. Salud, Ciencia y Tecnología. 2024 Mar 18;4:871–871.

31. Hunicke R, LeBlanc M, Zubek R. MDA: A Formal Approach to Game Design and Game Research. Available from: https://users.cs.northwestern.edu/~hunicke/MDA.pdf

FINANCING

We are deeply appreciative of the Ministry of Education, Culture, Research, and Technology of Indonesian Government (KEMDIKBUD RI) for their financial support of this article through the research funding program 2024.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

AUTHORSHIP CONTRIBUTION

Conceptualization: Yoke Suryadarma, Faisal Reza Pradhana.
Research: Yoke Suryadarma, Faisal Reza Pradhana, Fitri Setyo Rini, Moh. Ismail, Nikmalathul Maisyaroh.
Product development: Yoke Suryadarma, Faisal Reza Pradhana, Nikmalathul Maisyaroh.
Data collection: Yoke Suryadarma, Faisal Reza Pradhana, Fitri Setyo Rini, Moh. Ismail.

Data analysis: Yoke Suryadarma, Fitri Setyo Rini, Moh. Ismail.
Drafting - original draft: Yoke Suryadarma, Faisal Reza Pradhana, Moh. Ismail.
Writing - proofreading and editing: Yoke Suryadarma, Moh. Ismail.

https://doi.org/10.56294/sctconf20251352