JOURNAL INFORMATIC, EDUCATION AND MANAGEMENT (JIEM)
Vol 8 No 1 (2026): September 2025 - February 2026, pp. 704 ~ 724
ISSN: 2716-0696, DOI: 10.61992/jiem.v8i1.258

Digital Resource Management and Gamification: Strategies for Building an Immersive Language Learning Environment for Millennial Students Through the Metaverse Platform

Fendri Prananta
Sekolah Tinggi Ilmu Tarbiyah Internasional Muhammadiyah Batam

Article Info

Article history:
Received 7 January 2026
Revised 10 January 2026
Accepted 13 January 2026

Keywords:
Digital Resource Management, Gamification, Immersive Learning, Language, Millennial Santri, Metaverse

ABSTRACT

Digital transformation requires Islamic boarding schools to innovate in order to meet the learning needs of millennial students who are digital natives. This study aims to formulate a comprehensive strategy for building an immersive language learning environment for millennial students through the integration of digital resource management and gamification on the metaverse platform. The research method used is library research with a qualitative approach. Data were collected from secondary sources such as books, scientific journal articles, and research reports, then analyzed using qualitative content analysis techniques. The results of the study indicate that effective strategies are built on four main pillars. First, the reconstruction of the learning ecosystem that transforms Islamic boarding schools into unlimited classrooms in the metaverse, shifting the role of educators to facilitators and curators of digital content. Second, the development of interactive and contextual digital content architecture, where language material is designed as 3D objects that can be manipulated in scenario-based simulation environments. Third, the integration of gamification mechanisms consisting of reward systems, progression mapping, and immersive storytelling to increase intrinsic motivation and memory retention. Fourth, the creation of immersiveness through avatars and socio-cultural simulations that build authentic and safe language practice communities. The synthesis of these four pillars produces a strategic framework that emphasizes that successful implementation depends on the digital leadership of Islamic boarding schools, santri-centered design, and alignment with Islamic boarding school values.

Corresponding Author:
Fendri Prananta | Sekolah Tinggi Ilmu Tarbiyah Internasional Muhammadiyah Batam
Email: fendriprananta@gmail.com

1. Introduction

The era of digital disruption, marked by the convergence of virtual, augmented, and extended reality technologies, has shaped a completely new global educational landscape, challenging traditional educational institutions to undergo a paradigmatic reconstruction in their methods, mediums, and philosophy of learning. In this wave of transformation, Islamic boarding schools, as one of the oldest pillars of education in Indonesia, face a complex dilemma: on the one hand, they must maintain the authenticity of religious and cultural values and traditional learning methods that have shaped the character of santri for centuries; on the other hand, they are required to respond creatively to the needs of the millennial generation of santri who are digital natives, whose ways of thinking, interacting, and obtaining information have been shaped by the logic of the internet, social media, and the world of gaming (Naisbitt & Naisbitt, 2021). The harmony between tradition and innovation is key to the sustainability of Islamic boarding schools, not only as living museums of Islamic intellectual heritage, but as active laboratories that produce future Muslims who are spiritually competent and technologically resilient. This context underlies the urgency to explore the integration of the latest technology, the metaverse, into the heart of the learning process in Islamic boarding schools, particularly in the realm of language learning, which is the main foundation for understanding Islamic teachings and communicating with the global world.

The focus on Arabic and English language learning in this study is not a random choice, but rather a response to a fundamental problem experienced by many Islamic boarding schools today. Arabic, as a tool for accessing primary Islamic texts (the Qur'an, Hadith, and classical Islamic texts), is often taught using methods that are highly textual, grammatical, and separated from their communicative context, resulting in students who are able to analyze i'rab (grammar) but are stutterers in everyday conversation. Meanwhile, English, as a window to knowledge and global intercultural dialogue, is often positioned as a supplement that does not receive adequate attention and methods, resulting in santri generally lagging behind public school students in their English proficiency. Consequently, there is a gap between instrumental language proficiency and communicative language proficiency, between declarative knowledge and performative skills. This condition is exacerbated by the characteristics of millennial santri, who have a high visual, auditory, and kinesthetic learning style, as well as a tendency to learn through exploration, collaboration, and instant feedback all of which are difficult to fulfill through conventional lecture and memorization methods (Prensky, 2023). This mismatch between teaching methods and learning styles is often the root cause of declining motivation and low long-term retention of language material.

Amid these challenges, the emergence of the metaverse platform offers a revolutionary opportunity. The metaverse is not just a 3D virtual space, but a persistent, connected, and shared digital ecosystem where users interact through their avatars. In the context of education, the metaverse promises to create an immersive learning environment, a space where learners do not just see or hear about a concept, but are virtually "inside" it, experiencing and interacting directly with the learning content. This potential for immersion is particularly well-suited to language learning, as language is essentially a social practice

that exists within a specific cultural context. Imagine a student being able to "walk around" a traditional market in Damascus through their avatar, hear the conversations of sellers and buyers in Amiyah Arabic, and then try to practice it all directly without leaving the boarding school complex. Or, they can participate in a simulated international conference in a virtual auditorium, presenting their thoughts on moderate Islam in English to avatars of participants from around the world (Mystakidis, 2022). This potential signals a leap from text-based language learning to experience-based learning.

However, the enormous potential of the metaverse will not be fully realized without two key elements that are the main focus of this research: digital resource management and gamification. This is where the gap lies. First, building a content-rich virtual world requires the management of thousands of digital assets, ranging from 3D models, animations, sound recordings, interaction scenarios, to user data in a structured, managed, and easily accessible manner. Without a robust digital resource management system, the pesantren metaverse environment risks becoming chaotic, contradictory, and ineffective from a pedagogical point of view. This management includes curating content that is in line with pesantren values, organizing intuitive information architecture, and ensuring the sustainability of these digital assets (van Rooij & Zirkle, 2024). Second, the long-term appeal and engagement of millennial santri in the metaverse environment greatly depends on how the learning experience is designed. This is where gamification principles become vital. Gamification does not mean turning learning into a game, but adopting game design elements such as clear goals, rules, feedback, stories, and progression into a non-game context to increase motivation and engagement. For santri who have grown up with online gaming culture, mechanisms such as quest completion, badge acquisition, and progress visualization can be powerful motivators, transforming learning tasks from burdens into challenges to be conquered (Deterding et al., 2021).

Therefore, the central question behind this research is: How to formulate a comprehensive strategy by combining the principles of digital resource management and gamification mechanisms to build an immersive language learning environment for millennial santri through the metaverse platform? This research is based on the belief that the integration of these three elements immersive technology (metaverse), content governance (digital resource management), and motivational design (gamification) can create a language learning ecosystem that is not only pedagogically effective but also culturally transformative. This ecosystem is expected to bridge the gap between the pesantren tradition and the digital future, between the need to preserve the purity of teachings and the demand to adapt to the times, and between language mastery as a tool and language experience as a way of life. In other words, this research does not merely propose the adoption of new technology, but rather designs a strategic framework for "digital enculturation," a process whereby pesantren values and practices are incubated and reproduced in a new digital space, giving birth to a new form of pesantren that is relevant and resilient in the 21st century (Iqbal & Hassan, 2023).

At the global level, educational trends in the metaverse have begun to be studied, but very few touch on the context of religious education, let alone Islamic boarding schools with their

unique socio-cultural characteristics. At the national level, literature on the digitization of Islamic boarding schools has begun to emerge, but it generally still revolves around basic e-learning or social media, not yet entering immersive areas such as the metaverse. Therefore, this study aims to contribute to the fields of education, instructional technology, and Islamic studies by offering a theoretical and practical model that can be used as a reference for Islamic boarding schools in Indonesia and similar Islamic educational institutions around the world to confidently step into this completely new era of learning without losing their most essential identity (Suprayogo, 2022).

This study departs from the fundamental problems faced by Islamic boarding schools in the era of digital disruption, namely the wide gap between the characteristics and expectations of millennial students, who are digital natives familiar with the dynamics of interactive virtual spaces and games, and conventional language learning models that are still often dominated by lecture methods, textual memorization, and practices limited to the physical environment of the Islamic boarding school. This problem is exacerbated by two things: first, the lack of optimal management of digital resources, where various language learning content (videos, audio, e-books) are often scattered across various platforms without curation, integration, and structures that support progressive and immersive learning; second, the low motivation and intrinsic engagement of students in the language learning process, which is perceived as difficult and irrelevant to their world, resulting in suboptimal retention or long-term memory. On the other hand, the enormous potential of the Metaverse Platform, which offers a three-dimensional immersive space, social interaction through avatars, and real-context simulations, has not been optimized for learning because there is no clear strategic framework that integrates digital content governance (resource management) with psychological mechanisms that drive motivation (gamification) specifically for the pesantren context.

The urgency of this research is very high and multidimensional. Academically, this research is urgent to fill the gap in the literature, which rarely discusses the convergence of digital resource management, gamification theory, and immersive learning design in a single, comprehensive framework, especially in the context of traditional Islamic education such as Islamic boarding schools. This is necessary to develop applicable theories and models at the intersection of education, technology, and management. Practically, this research provides an answer to the demand for digital transformation in pesantren to remain relevant and competitive. Pesantren need a concrete and proven roadmap to utilize cutting-edge technologies such as the metaverse not as a mere gimmick, but as a structured learning ecosystem with high educational value that remains based on Islamic values. Without a well-thought-out strategy, investment in metaverse technology risks being futile and having no significant impact on improving the language skills of santri. Socio-culturally, this research is important to ensure that millennial santri are not uprooted from their cultural and religious roots, but are instead able to use advanced digital spaces as a medium to deepen their knowledge of tools (Arabic/English) to understand religion and interact with the global world, while shaping their identities as moderate, digitally literate, and competitive Muslims.

Based on these issues and urgencies, the main objective of this study is to formulate a comprehensive and integrated strategy for building an immersive language learning environment on the metaverse platform. This objective is further operationalized: first, to analyze and design effective digital resource management principles for organizing, structuring, and distributing language learning assets in the metaverse ecosystem so that they are easily accessible, contextual, and support pedagogical objectives. Second, to identify and integrate gamification mechanisms (such as rewards, progression, storytelling) that are most suited to the motivational characteristics of millennial students in order to increase engagement, perseverance, and memory retention in the language learning process in the virtual world. Third, to develop a strategic framework model that integrates both elements of content management and motivational drivers into the design of an immersive learning experience in the metaverse that is authentic, interactive, and in line with the values and educational goals of Islamic boarding schools, so that it can ultimately be implemented to strengthen the linguistic and socio-cultural competencies of millennial students.

2. Method

This research, entitled "Digital Resource Management and Gamification: Strategies for Building an Immersive Language Learning Environment for Millennial Santri Through the Metaverse Platform," was conducted using a qualitative approach through library research. This method was chosen based on the exploratory and conceptual nature of the research, which aimed to develop a comprehensive strategic framework by synthesizing, critically analyzing, and reconstructing knowledge and previous findings that had been published in various written sources. Literature research is considered an appropriate method because it allows researchers to explore ideas at the intersection of multidisciplinary fields, including educational management, learning technology, game design, and digital sociology, without the limitations of a specific field context, thereby producing a conceptual model that can be widely applied in various Islamic boarding schools (Creswell & Poth, 2023). The focus is on an in-depth exploration of theories, concepts, and previous research results to answer the problem formulation of how to design an effective strategy, with the metaverse as the technological context, millennial santri as the learning subjects, and immersive language learning as the goal.

The main data sources in this study are secondary literature, which are classified into three main categories to ensure depth and breadth of coverage. First, academic books (monographs and reference books), both in Indonesian and English. These books form the backbone of the theoretical framework, particularly those discussing digital resource management theory, gamification principles in education, immersive learning design, and the metaverse technology landscape in education. Second, reputable international and national scientific journal articles (indexed in Scopus, Web of Science, or Sinta 1 & 2) published in the last five years. These journals are sources of empirical data and the latest findings related to the application of virtual reality/augmented reality technology in language learning, the effectiveness of certain gamification mechanisms, and studies on the learning behavior of millennials and Gen Z in a digital environment. Third, research reports such as dissertations,

theses, and study reports published by trusted research institutions. These reports provide more detailed and contextual data, often revealing the complexity of real-world implementation that is not fully covered in journal articles (Sugiyono, 2021). The time frame of 2020-2025 was chosen to ensure the data is up-to-date, given that the development of the metaverse and gamification in education is very dynamic and rapid in the post-pandemic era.

Data collection techniques were carried out systematically through a series of search, selection, and documentation stages. The process began with an intensive literature search using strategic keywords such as "digital resource management AND language learning," "gamification AND immersive learning," "metaverse AND education," "millennial santri AND digital learning," and their equivalents in Indonesian and Arabic. The search was conducted on trusted digital database platforms such as Google Scholar, IEEE Xplore, ScienceDirect, ERIC, and domestic journal portals such as Neliti and the Directory of Open Access Journals (DOAJ). The next stage was the selection and critical appraisal of each document found. The selection was based on inclusion criteria such as topic relevance, publisher/author credibility, year of publication, and methodological quality (specifically for empirical sources). Documents that passed the selection were then downloaded and organized using reference management software such as Mendeley or Zotero to facilitate citation and management. The final technique is in-depth note-taking and documentation. Each source is read carefully, and important points, key concepts, main arguments, and relevant findings are recorded in a prepared analysis matrix. This matrix includes columns for source identity, main concepts, findings/arguments, and relevance to the research focus, allowing researchers to efficiently track and compare information from various sources (Neuman, 2022).

The core stage of this research is Data Analysis Techniques, which are carried out through a qualitative content analysis and conceptual analysis approach. The collected and organized text data are not analyzed statistically, but rather through a process of meaning interpretation, theme grouping, and concept development. The process is iterative and involves several steps. First, data reduction is carried out by identifying and extracting units of meaning (keywords, sentences, or paragraphs) that are relevant to the research focus from the entire data corpus. Second, data display is carried out by grouping these units of meaning into categories of emerging themes, such as "digital asset management principles," "gamification models for motivation," or "immersion factors in the metaverse." Third, conclusions and verification are drawn by synthesizing the information in each category, finding relationships between categories, and reconstructing them into a coherent and logical narrative to answer the research questions. Conceptual analysis is used specifically to define and clarify core terms such as "immersive environment," "millennial santri," and "metaverse platform" in the context of this research , as well as formulating hierarchical and functional relationships between these concepts to build a complete strategic framework (Miles et al., 2020). This process is repeated until data saturation is achieved, which is when the addition of new data sources no longer produces significant themes or insights.

In library research, testing the validity of data or the credibility of findings is crucial given its nature, which depends entirely on the researcher's interpretation of the text. For this

reason, several strict data validity testing techniques are applied. First, triangulation of data sources. This technique is applied by comparing and checking the consistency of similar findings or concepts from various sources (books, journals, reports). If a concept about the effectiveness of a "reward system" in gamification is supported by theory from textbooks, demonstrated by research results in journals, and confirmed in implementation reports, then the credibility of that concept is considered high. Second, the use of primary and peer-reviewed literature. Data validity is maintained by prioritizing primary sources (such as major theoretical books or direct research reports) and secondary sources that have undergone peer review, thereby reducing bias and increasing academic accuracy. Third, audit trail or traceability. The entire research process, from search keywords, selection criteria, analysis notes, to the steps of drawing conclusions, is documented clearly and systematically. This allows other researchers to retrace the process and evaluate the logic used to arrive at the final conclusion, thus meeting the standards of dependability (Creswell & Poth, 2023). Fourth, expert review. The draft of the analysis and conceptual synthesis that has been compiled is then consulted and reviewed by experts or supervisors who are competent in the fields of educational technology, Islamic education management, or instructional design. The input and corrections from these experts serve as a form of external validation of the accuracy and depth of the analysis, ensuring that the resulting strategic framework is not merely a subjective construction of the researcher, but has been critically tested by the relevant authorities.

3. Result and Discussion

A. Reconstruction of the Learning Ecosystem: Digital Transformation of Islamic Boarding Schools Towards Boundless Classrooms in the Metaverse

The digital transformation of Islamic boarding schools is not merely the adoption of technology, but a philosophical and ecological reconstruction of the learning environment. Islamic boarding schools, which are traditionally centralized, location-bound (boarding schools), and hierarchical, are being reconstructed into a decentralized, open, and networked learning ecosystem through the metaverse (Lee & Kim, 2021). Boundless classrooms in the metaverse eliminate geographical and physical constraints, allowing students in remote Islamic boarding schools to collaborate with language experts from the Middle East or interact with native English speakers in a safe and managed virtual environment. This reconstruction requires a paradigm shift from 'the teacher as the sole source of knowledge' (teacher-centered) to 'a curated network of digital resources' (resource-rich networked learning). In this context, the roles of kiai, ustadz, and ustadzah are transformed into facilitators, digital content curators, and experiential learning designers who guide students in navigating the sea of information in the virtual world (Huda & Hasyim, 2022). This new ecosystem also requires sophisticated digital resource management, where all learning assets from digitized 3D classical texts, recorded lectures, to conversation simulations must be organized, indexed, and accessed seamlessly within the platform. The success of this transformation depends on visionary digital leadership from pesantren leaders and the ability to integrate the values of exemplary character with the dynamics of a participatory virtual

space (Riyanto & Fajar, 2023). Thus, the metaverse becomes a means to strengthen, not weaken, the pesantren's mission as a producer of generations with character and global competitiveness.

The digital transformation occurring in Islamic boarding schools is not merely a process of adopting new technological tools into traditional classrooms, but rather a fundamental philosophical and ecological reconstruction of the entire learning environment. Islamic boarding schools, as educational institutions historically built on the principles of physical attachment (muqim), a cohesive community (jama'ah), and the transmission of knowledge through hierarchical personal relationships between kiai and santri, are now faced with the imperative to redefine these boundaries. This study finds that this reconstruction is possible and triggered by the emergence of the metaverse platform, which offers a paradigm of "classrooms without boundaries" an open, decentralized, and networked learning ecosystem. In this new ecosystem, the virtual walls of the pesantren melt away, allowing learning spaces that were previously geographically confined to become accessible from anywhere, anytime, and by anyone with authorization, while still maintaining the core values of the pesantren as a moral and intellectual community (Al-Faruqi, 2023).

This reconstruction is primarily marked by a shift from a place-bound learning model to a presence-and-purpose-bound model. In the metaverse, the concept of "pondok" as a place of residence and learning together is not completely lost, but migrates and expands into digital form. Dormitory complexes, mosques, and classrooms can be replicated or even creatively developed into more complex virtual environments, such as giant digital libraries storing Islamic manuscripts from around the world, or simulations of historic cities such as 8th-century Baghdad or 10th-century Cordoba for the context of learning Islamic language and civilization. This fundamental shift requires Islamic boarding schools to build digital infrastructure that is not only technical (such as internet connectivity and devices) but, more importantly, digital cultural infrastructure, namely a set of norms, skills, and policies that regulate interaction and learning in this virtual space. It is this cultural infrastructure that will determine whether this transformation succeeds in building a healthy learning community or instead creates disorientation (Kemendikbudristek, 2021).

The most significant implication of this ecosystem reconstruction is the transformation of the roles of key actors in Islamic boarding schools, particularly kiai, ustadz, and ustadzah. Research findings show that in the metaverse ecosystem, scientific authority no longer comes exclusively from hierarchical positions or physical proximity, but is increasingly shifting towards the ability to facilitate, curate, and design meaningful learning experiences. Kiai and teachers are no longer "the sole source of knowledge" (the sage on the stage), but have transformed into "guides on the side" (the guide on the side) and "learning experience architects" (learning experience architect). Their roles include: (1) as curators who select, compile, and provide context for the abundant digital resources in the metaverse; (2) as facilitators who guide discussions and collaborations across virtual spaces; and (3) as moral mentors who ensure that interactions in the digital world adhere to the values of manners and good character. This transformation of roles requires a massive professional

development program to equip pesantren educators with competencies in digital literacy, virtual pedagogy, and online community management (Williamson et al., 2023).

Furthermore, this study reveals that at the heart of this new learning ecosystem is the implementation of advanced and integrated digital resource management (DRM). Classrooms without boundaries in the metaverse will be chaotic and ineffective if they are not supported by a content management system that allows learning resources, ranging from 3D-scanned classical texts, grammar explanation videos, interactive modules, to recordings of discussions with international scholars, to be organized, indexed, found, and accessed easily, personally, and contextually. This DRM system must function as the "brain" or central nervous system of the pesantren metaverse ecosystem. It must be able to recommend content to students based on their language proficiency level, interests, and learning patterns, while also tracking their progress and contributions in various virtual environments. Good management also includes aspects of digital preservation and security, ensuring that the digitized intellectual wealth of Islamic boarding schools is protected and sustainable (Chen & Zhang, 2022).

However, this reconstruction is not without challenges and risks. This study also identifies a number of critical issues that must be anticipated. First, the risk of cognitive and cultural dissonance, where students experience tension between the values of simplicity, focus, and high discipline emphasized in physical pesantren and the often free, stimulating, and commercial atmosphere of many general metaverse platforms. Second, the issue of the digital divide, which concerns not only access to devices and networks, but also the gap in motivation and digital literacy skills between students and their guardians. Third, the challenge of digital fatigue and threats to mental health if immersion is not regulated with clear proportions and objectives. Therefore, the reconstruction of the ecosystem must be accompanied by the formulation of specific policies and digital ethics guidelines (digital fiqh), which regulate the duration of use, the types of interactions allowed, and the mentoring mechanisms to ensure the digital well-being of all pesantren residents (Nurhayati et al., 2024).

Ultimately, the reconstruction of the learning ecosystem towards a borderless classroom in the metaverse is not an end in itself, but rather a strategic means to strengthen the main mission of Islamic boarding schools in the 21st century. Through well-managed virtual spaces, Islamic boarding schools can overcome their physical limitations, expand their global scientific networks, and offer previously unimaginable language learning experiences (Arabic and English), such as practicing muhadatsah with native speakers in the virtual market of Yemen or debating philosophical concepts in English in a replica of the House of Wisdom in Baghdad. This transformation, if carried out with the principle of "critical assimilation," which is adopting technology while maintaining the core identity and values, will enable Islamic boarding schools to not only survive but also become leaders in shaping millennial Muslims who are not only faqih fid din (religious scholars), but also muthaqqafun bid dunya (globally minded), digitally skilled, and ready to be part of a complex global society (Rahman & Syam, 2022). Thus, the reconstruction of the digital learning ecosystem

through the metaverse is a necessary evolutionary step for Islamic boarding schools to continue playing their central role in educating the nation and the people in the digital era.

B. Digital Content Architecture: Designing Interactive and Contextual Language Learning Assets on the Metaverse Platform

The effectiveness of learning in the metaverse greatly depends on the quality and design of the digital content architecture within it. Content architecture should not only be a transmediation of book text material to the screen, but must be designed natively for an immersive 3D environment. The main principles are interactivity and contextuality (Dalgarno & Lee, 2021). Language learning content, such as vocabulary (mufradat), grammar (qawa'id), and conversation (muhadatsah), needs to be realized as digital objects that can be touched, moved, and manipulated by student avatars. For example, students can 'pick up' a virtual 'book' object while hearing the pronunciation "kitābun," or compose sentences by stringing virtual words together in the air. Contextuality is achieved by creating scenario-based learning environments, such as a virtual market in Damascus for conversational Arabic language practice in buying and selling (hiwar al-bai'), or a virtual airport for learning English for travel (Hadi, 2023). This architecture requires a multidisciplinary approach that combines principles of language education, instructional design, and user experience (UX) design for the 3D world. Digital asset management is crucial, where each 3D model, interaction script, and audio recording must be cataloged with rich metadata (e.g., difficulty level, theme, target competencies) so that the system can recommend appropriate content according to the individual progress of students (Arikunto & Safrudin, 2024). Good design also considers cognitive aspects to avoid overloading working memory (cognitive load theory), so information is presented gradually and integrated with activities in the virtual world.

The design of digital content architecture for the metaverse platform is at the heart of the strategy to build an immersive language learning environment for millennial students. The findings of this study reveal that this architecture should be understood not as a static repository of digital material, but as a dynamic ecosystem that combines the principles of language pedagogy, immersive experience design, and advanced digital asset management. In the context of Islamic boarding schools, this transformation means converting the wealth of language knowledge that is often contained in classical texts (kitab kuning) and taught through the sorogan and bandongan methods into three-dimensional simulations that can be explored, manipulated, and experienced directly by santri avatars. The main challenge is to maintain scientific integrity (tsiqah) while creating appeal and relevance for the digital native generation, thus requiring a design approach that combines depth of content with the flexibility of the digital medium (Gee, 2023).

The first step in designing this architecture is to deconstruct language competencies into learning units that can be "grounded" in a virtual environment. The skills of listening (istima'), speaking (kalam), reading (qira'ah), and writing (kitabah) need to be broken down into a series of micro-skills which are then mapped into specific interactive scenarios. For example, the skill of "introducing oneself" in Arabic is no longer taught through memorizing

dialogues in textbooks, but is designed as an experience in the virtual lobby of an international dormitory, where students must approach avatars of other students from various countries, greet them with appropriate sentences, and respond to questions with the correct pronunciation and intonation, all through a voice chat feature with an automatic feedback system that analyzes the clarity and accuracy of speech (Reinhardt & Thorne, 2020). This approach shifts the focus from declarative knowledge ("I know the sentence") to procedural and conditional knowledge ("I know when, where, and how to use the sentence").

The main principle that emerged in the research findings was deep cultural contextualization. Language learning content in the metaverse must avoid the trap of teaching language as a sterile system isolated from its culture. Instead, each learning unit must be embedded in an authentic socio-cultural environment simulation. For Arabic, this means creating not just one, but a variety of virtual environments that represent dialectal variations and contexts of use: a madrasa in Cairo to learn formal Arabic (fusha), a diwan in Yemen to experience everyday conversation (amiyah), or a 17th-century Nusantara majelis ilmu to understand Islamic vocabulary in the local intellectual tradition. Each environment is equipped with interactive cultural artifacts such as musical instruments, traditional clothing, or manuscripts that, when touched, provide linguistic and historical explanations. This kind of contextualization teaches students that language is a window into the mindset and way of life of a society (Lantolf & Poehner, 2024).

The level of interactivity is the main determinant of the success of this architecture. Research shows that interactivity in the metaverse must go beyond simply "clicking and viewing." Learning assets need to be designed as objects with limited agency that are capable of triggering a series of actions and reactions. An object such as the "Kitab Alfiyah Ibn Malik" in a virtual library, for example, can be designed with several layers of interaction: in the first layer, students can turn the pages and read the text; the second layer, highlighting a verse (bait) will bring up a grammatical explanation (syarah) in the form of audio or pop-up text; the third layer, students can "call" a virtual teacher avatar (NPC) to provide a more in-depth explanation or give practice challenges applying the rules in the verse. For speaking skills, the environment can be designed with an AI-based conversation system (Conversational AI) that allows students to practice with virtual partners who can adjust the difficulty of the conversation, provide real-time corrections, and even evaluate pragmatic aspects such as topic appropriateness and politeness level (Godwin-Jones, 2022).

Another crucial finding is the need for a modular and customizable content architecture. Not all Islamic boarding schools have the same needs, and the skill levels of students vary. Therefore, the ideal architecture is one based on digital content "building blocks." These blocks can be: (1) Basic 3D Objects (such as furniture, buildings, clothing), (2) Scenario Packages (for example, "bargaining at the market," "ordering food at a restaurant"), (3) Vocabulary and Dialogue Banks that have been labeled based on difficulty level and context, and (4) Game Mechanics (such as point systems, puzzles, or quests). Teachers or content developers at Islamic boarding schools can then assemble these blocks with the help of a user-friendly interface to create learning experiences that are tailored to the local curriculum and the characteristics of the students. A pesantren in East Java may want to add local cultural

elements to the simulation, such as Arabic conversations taking place in the pesantren environment with a gamelan background, while modern pesantren may focus more on simulating academic presentations in English (Syamsuar & Rahmat, 2023).

Behind the attractive interface layer, a digital asset management (DAM) system and smart metadata are required. Every asset, from a 3D model of a mihrab to a recording of a sheikh's recitation, must be equipped with metadata that is not only descriptive but also pedagogical. This metadata includes: competency tags (e.g., "prayer vocabulary," "grammar isim isyarah"), cultural context tags, CEFR/ACTFL levels, learning prerequisites, and links to reference books. A DAM system integrated with the metaverse platform will enable an adaptive recommendation system, which can suggest new learning paths or challenges to students based on their interaction history and achievements. Moreover, this system enables embedded traceability and assessment. Each student's interaction with objects or NPCs can be recorded and analyzed to provide a holistic picture of their skill development, far beyond mere written test scores (Dharmawan & Putra, 2024).

However, this study also identifies a number of complex challenges. The cost of producing high-quality 3D assets and virtual environments is enormous, both in terms of time and money. Linguistic and cultural authenticity requires the involvement of linguists and native speakers in the design process to avoid cultural simplification or distortion. In addition, there is a risk of cognitive distraction, where the visual splendor of the metaverse world distracts attention from the goal of language learning itself. Therefore, the principle of coherence in multimedia learning theory must be strictly applied; every element in the virtual environment must have a clear instructional purpose and support the language acquisition process (Clark & Mayer, 2023).

Thus, the architecture of digital content for language learning in the metaverse represents a synthesis between the rich scientific tradition of Islamic boarding schools and new possibilities in the digital age. This architecture does not replace the role of teachers or the authority of the scriptures, but provides a powerful new medium for experiencing, practicing, and internalizing language. By designing interactive and contextual assets, Islamic boarding schools essentially build living laboratories of language and culture, where students do not merely learn about language, but actually live in that language for a period of time. This is what can ultimately spur intrinsic motivation, increase long-term retention, and most importantly, equip millennial students with comprehensive and relevant communicative competencies to engage in dialogue with global civilization, while remaining rooted in their Islamic and pesantren identities (Ibda & Hamid, 2025).

C. Gamification Mechanism: Integrating Rewards, Progression, and Storytelling to Increase Motivation and Language Retention Among Millennial Students

G fication, when designed appropriately, is a powerful strategy for increasing the intrinsic and extrinsic motivation of millennial students and strengthening long-term memory retention of language material. Gamification here does not mean turning learning into a game entirely, but integrating motivating game elements into the learning structure (Sailer & Homner, 2022). An effective framework usually stands on three main pillars: Reward,

Progression, and Storytelling. The reward system in question is not only points and badges, but more importantly social rewards (recognition within the community), access rewards (unlocking levels or secret content), and functional rewards (new avatars or accessories). Progression is clearly designed through a progress map that visualizes the journey of students from the 'beginner' (mubtadi') to 'advanced' (mutaqaddim) levels, providing a sense of achievement and clear goals (Zichermann & Cunningham, 2023). The storytelling element plays a crucial role in the context of Islamic boarding schools because it is in line with the tradition of storytelling and tales. An overarching narrative can be constructed, for example, where students play the role of 'seekers of knowledge' who travel through various virtual Islamic civilizations to collect 'words of wisdom' in order to complete a mission. Every grammar or conversation challenge is part of this storyline. This mechanism creates a flow state in which santri become so engaged that they lose track of time, while also deepening their cultural understanding of the language (Prensky, 2024). The integration of these three elements creates a cycle of sustained motivation, in which effort leads to progress, progress is recognized with rewards, and everything is woven into a meaningful story, thereby increasing santri's commitment and memory of the material.

The integration of sophisticated and contextual gamification mechanisms into the language learning environment in the metaverse is a strategic finding that directly addresses a classic problem in many Islamic boarding schools: how to maintain the intrinsic motivation of millennial students towards language learning, which is often considered difficult and boring. This study reveals that effective gamification should not be simplified as merely giving digital badges or empty points, but must be understood as a holistic motivational design approach that touches on the deep psychological aspects of learners. In an immersive metaverse ecosystem, gamification functions as a "motivational framework" that wraps learning activities into challenging experiences, provides clear feedback, and is emotionally satisfying. This mechanism needs to be built on three interrelated pillars: a meaningful reward system, a clear progression flow, and a deep storytelling narrative, all three of which are specifically designed with the psychographic profile of millennial students living at the intersection of collective religiosity and individualistic digital culture in mind (Kapp, 2023).

The first pillar, the reward system, must be designed to satisfy both extrinsic and, more importantly, intrinsic motivation. Research findings show that for millennial santri, the most effective rewards are social, functional, and authentic. Social rewards can take the form of public recognition on a healthy leaderboard that does not emphasize destructive competition but rather rewards progress and contributions to the community, such as the title "Helping Santri" for those who help their friends a lot in conversation quests. Functional rewards provide new abilities or access, for example, mastering certain vocabulary unlocks access to a secret area in a virtual library containing rare manuscripts, or obtaining digital items such as a "robe of knowledge" or "magic pen" that can be used to accelerate the learning process. The key to success is to make these rewards feel earned rather than given, and to have a direct connection to learning efforts. Immediate and informative feedback systems, such as visualizing fluency score improvements after speaking practice sessions, are already a

powerful form of reward because they fulfill the basic need for competence (Ryan & Rigby, 2020).

The second pillar, the progression flow, is a framework that guides students' learning journey from beginner (mubtadi') to advanced (mutaqaddim) levels. In the metaverse, this progression must be visualized spatially and narratively, not just as a linear graph on a dashboard. Students can begin their journey on "Basic Island" (Jaziratul Mubtadi'in) which contains basic quests, and gradually "sail" or "teleport" to more complex islands or worlds, such as "Conversation City" (Madinatul Hiwar) or "Grammar Mountain" (Jabalun Nahwi). Each level must have clearly defined learning objectives, appropriate challenges, and transparent mastery criteria. It is important to include scaffolding mechanisms that make it easier at the beginning of the level and are gradually released, as well as constructive failure recovery mechanisms. Failure in a conversation quest is not the end, but brings up an NPC tutor who offers remedial lessons or specific advice (Werbach & Hunter, 2022). Well-structured progression gives students a sense of control, direction, and continuous achievement, which fuels long-term motivation.

The third and most transformative pillar is storytelling. Research finds that the power of narrative has a special resonance in the pesantren culture, which is rich with stories of prophets, scholars, and events in Islamic history. Storytelling in metaverse gamification is not merely decorative background, but a framing of meaning that transforms learning tasks into part of a larger mission. An overarching narrative can be constructed, for example, where students play the role of "candidate ambassadors of civilization" assigned by a virtual council of knowledge to collect "language keys" scattered throughout various episodes of Islamic civilization. Each learning unit, such as learning interrogative sentences for questioning or trade vocabulary for negotiation, becomes a tool for solving puzzles and completing the episode. Storytelling can also be realized through NPC characters with backstories and personalities, so that conversational interactions with them feel like communicating with living entities, not just practicing with machines (Dickey, 2021). This approach utilizes the power of narrative transportation, where students are so carried away by the story that the cognitive effort expended to learn the language feels like a natural part of the immersive experience, thereby significantly improving memory retention.

The integration of these three pillars creates a continuous cycle of motivation, known as the engagement loop. This cycle begins when storytelling provides an interesting context and purpose (Why), triggering students to get involved. Progression then provides structure and measurable challenges (How), guiding students through a series of learning actions. After completing the challenges, the reward system provides recognition and feedback (What), which satisfies psychological needs and reinforces behavior. This satisfaction, in turn, encourages students to continue to the next stage of progression in a more in-depth narrative, thus recreating the loop. In the context of language learning, this loop directly influences the process of second language acquisition. The challenges designed in progression force students to pay attention to language forms (noticing), social interactions in storytelling create a need to communicate (pushed output), and the rewards given reinforce memory of successfully used language forms (positive reinforcement) (Cornillie et al., 2023).

However, this study also warns of the risks of implementing shallow or context-insensitive gamification. The overjustification effect can occur if extrinsic rewards (such as points) actually reduce students' intrinsic interest in the beauty of the language itself. Social inequality can arise if the leaderboard system only benefits students who already have better language skills, thereby marginalizing beginners. In addition, there is a risk of value misalignment if the narrative and rewards used contradict the values of simplicity, humility, and sincerity in learning that are upheld by Islamic boarding schools. Therefore, gamification design must adopt the principle of "humanistic gamification," which emphasizes collaboration, self-reflection, and self-mastery over mere competition. Rewards, for example, can be given for "perseverance," "independent learning," or "contributing to helping friends," not just for the highest scores (Bogost, 2024).

Thus, gamification mechanisms integrated into the pesantren metaverse have the potential to revolutionize motivation in language learning. These mechanisms transform learning from an imposed obligation into a chosen adventure, from passive memorization into active exploration, and from stressful exams into challenging quests. By designing rewards, progression, and storytelling that align with the world of santri values, pesantren not only increase participation and vocabulary retention rates, but also rekindle curiosity and excitement for learning language as a tool for understanding the holy book, embracing knowledge, and connecting with a wider community. Ultimately, this meaningful gamification can help produce millennial santri who are not only "alimun billah" (knowledgeable about God), but also "ghirun bil 'ilm" (passionate about knowledge), including language as its gateway (Al-Ghazali & Zaini, 2025).

D. Immersiveness and Identity: Strategies for Building Language Practice Communities through Avatars and Socio-Cultural Simulations in the Metaverse

The most transformative aspect of the metaverse for language learning is its ability to create a high degree of social and cultural immersion, which is the foundation for the formation of communities of practice. Immersion is achieved through two main channels: avatars and environmental simulations (Radianti et al., 2020). Avatars allow students to express their digital identities, which may be different from or an extension of their physical identities, with clothing choices (e.g., virtual robes, sarongs) that still reflect values of modesty. Through these avatars, a sense of social presence and co-presence is formed, reducing anxiety that often hinders language practice in the real world. They can interact verbally (voice chat) and nonverbally (avatar movements) with students from other Islamic boarding schools or with virtual/non-virtual tutors in a safe context. The key strategy is to build authentic socio-cultural simulations, such as presenting a virtual replica of the Grand Mosque for Arabic sermon practice, or a virtual international conference for English presentation practice (Mujib, 2024). Within these simulations, situated learning occurs where language is used functionally to complete tasks and build social relationships. Language practice communities are formed organically when 'practitioners' (students) who share the same learning goals (mastering the language) regularly interact, share resources, and support each other in this virtual space. This immersive environment not only trains linguistic competence but also pragmatic and sociocultural competence, namely understanding when,

where, and to whom an expression is used, which is the most complex aspect of language learning (Brown & Lee, 2022).

The pinnacle of language learning strategies in the metaverse lies in the platform's ability to create a level of immersion that has never been achieved before in digital education technology, which then becomes the foundation for the formation of an authentic and sustainable language practice community. This study reveals that immersion in this context is not merely high graphic realism, but a complex psychological and social condition in which students feel truly "present" in the target language environment, thus engaging in meaningful interactions that transcend physical boundaries. Two key instruments for achieving this condition are avatars as projections of digital identity and socio-cultural simulations as stages for interaction. The combination of the two enables the transformation of language learning from an isolated individual activity into a collective social experience embedded in a cultural context, which precisely addresses the needs of millennial students for relevant, contextual, and socially connected learning (Bailenson, 2023).

Avatars serve as the main interface as well as a representation of santri identity in the metaverse. Research findings show that avatar design for santri is not a matter of unlimited freedom to create fantastic characters, but rather a process of constructing a digital identity that remains in line with pesantren values. Students can customize their avatars' appearance within established ethical guidelines, choosing from a variety of modest Muslim clothing (such as gamis, koko, or hijabs in various styles), relevant accessories (e.g., digital prayer beads, notebooks), or even attributes that reflect academic achievements (sashes with language honors). The ability to have agency over self-representation has a profound psychological impact. Avatars that are self-congruent can increase self-confidence, reduce language anxiety, and encourage bolder linguistic identity exploration. A shy student in the real world may feel more comfortable trying complex Arabic conversations through an avatar that he feels represents his "more confident self." Moreover, avatars become a bridge to understanding other people's perspectives (perspective-taking), for example by temporarily "becoming" a trader in a Moroccan market or a diplomat at an international forum, which enriches their cultural empathy (Shin, 2021).

However, the true power of avatars is realized when they interact in carefully designed socio-cultural simulations. This is the stage where the theories of situated learning and communities of practice find their most ideal medium. This research identifies that simulations must go beyond physical replicas of a place; simulations must bring to life the systems of norms, values, and interaction patterns that are characteristic of the target language culture. A simulation of "Majelis Ilmu di Masjid Al-Azhar" (Scholarly Assembly at Al-Azhar Mosque), for example, not only displays accurate architecture, but also programs NPCs (Non-Player Characters) to behave in accordance with the etiquette of a scholarly assembly: greeting with a specific salutation, sitting in a specific manner, and using formal language (register) full of religious expressions. Students, through their avatars, must learn to navigate these unwritten norms in order to participate effectively. Such simulations create authentic communicative needs students no longer learn language to pass exams, but to

engage in a virtual social community, obtain information, build relationships, or complete tasks (Lave & Wenger, 2021).

The strategy for building a language practice community begins with targeted interactions in this simulation. According to research findings, a practice community is formed when a group of people with a common goal (in this case, language proficiency) regularly interact, share resources, and support each other in a specific domain. The metaverse catalyzes this process by providing a permanent and always accessible "meeting place." A 24-hour "English Conversation Cafe" in the metaverse, for example, could be a place where students from various Islamic boarding schools meet on a scheduled or spontaneous basis to discuss specific topics in English, guided by a moderator or AI bot. There, they are not just students in a classroom, but language practitioners who learn from each other. The rigid teacher-student hierarchy softens into a more fluid mentor-peer relationship, where more proficient students naturally help beginners, revise each other's sentences, and work together to find solutions to linguistic difficulties. These social practices, known as legitimate peripheral participation, are central to how people learn to become part of a community, and the metaverse provides a safe space for this trial-and-error process without excessive embarrassment (Wenger-Trayner & Wenger-Trayner, 2023).

The findings of this research also highlight the importance of simulating cultural conflicts or negotiations as a high-level learning strategy. An environment that is too sterile and always harmonious does not reflect the reality of cross-cultural communication. Therefore, simulations can be designed to bring about situations of reasonable cultural misunderstanding, for example, a student using an Arabic expression that is grammatically correct but considered too blunt in a particular culture, thereby offending an NPC. The challenge then is how to use language to correct the misunderstanding, apologize in a culturally appropriate manner, and restore the interaction. The emotional experience of dealing with this kind of communication "failure" provides a profound lesson about the close relationship between language, culture, and pragmatics. Complex role-play activities, such as negotiating in English to resolve limited resources in a humanitarian crisis simulation, force students to use language strategically, persuasively, and collaboratively skills that are invaluable in the real world (Thorne & Reinhardt, 2020).

However, this research does not ignore the challenges and risks of this strategy. Issues of representation and stereotyping are crucial; the design of the environment and NPCs must avoid reinforcing cultural prejudices and be carried out with in-depth research and consultation. Virtual social fatigue can occur if interactions are considered mandatory and too intense, so there needs to be private space and downtime in the metaverse ecosystem. The issue of inequality also arises, both in terms of technical connectivity and confidence in expressing oneself through avatars. Most importantly, there is the risk of identity dissonance, where one's digital identity in the metaverse becomes very different from one's identity as a student in a physical Islamic boarding school, giving rise to a conflict of values. Therefore, structured guidance and reflection are needed to help students integrate their virtual experiences with the core values of boarding school life (Ijab, 2024).

Thus, the strategy of building a community of practice through avatar immersion and simulation is the crown jewel of the entire language learning structure in the metaverse. This strategy recognizes that language is essentially a social practice, not just a set of rules. By providing students with a "second world" where they can live, interact, and be part of a community using the target language, the pesantren essentially creates an artificially enriched yet very real language acquisition environment. Here, language is no longer a subject to be studied, but a medium for becoming a confident learner, a cross-cultural communicator, and ultimately, a millennial santri who is fluent not only in reading classical texts, but also in dialoguing with the complexities of diverse human civilizations. The immersiveness of the metaverse, therefore, becomes a bridge that unites traditional piety with global citizenship (Turkle, 2022).

4. Conclusions

The integration of digital resource management and gamification in the metaverse platform offers a powerful new paradigm for building an immersive language learning environment for millennial santri. The reconstruction of the learning ecosystem opens up unlimited access and collaboration, interactive and contextual digital content architecture provides "living" material, integrated gamification mechanisms drive sustained motivation, and immersiveness built through avatars and simulations creates authentic communities of practice. The success of implementing this strategy is highly dependent on the readiness of human resources (kiai, ustadz, pesantren IT team), adequate digital infrastructure, and most importantly, a santri-centered design approach that remains guided by pesantren values and morals. This study recommends the need for a collaborative pilot project between pesantren, academics, and local metaverse developers to test this conceptual framework, as well as further research to measure its empirical impact on language learning outcomes and character development of santri in the digital era.

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