Immersive Learning with the Metaverse's Environment to Increase Academic Success and Motivation in learning Arabic as a Second Language for Non-Native Speakers

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Abstract

The metaverse's environment offers a unique opportunity for immersive learning experiences that can enhance education in ways never before possible. By creating virtual environments that simulate real-world scenarios, students can actively engage with the material and practice their skills in a safe and controlled setting. This technology has the potential to revolutionize the way we learn, making education more interactive, engaging, and effective for students of all ages. The integration of the metaverse's environment into Arabic language learning can provide non-native speakers with a more engaging and interactive learning experience. By creating virtual environments that simulate real-life situations, students can practice their language skills in a more realistic and practical way. The participants were 60 learners from non-native speakers enrolled in an Arabic Language course for intermediate level in the Arabic Language Center for Non-Native Speakers at the faculty of education at Mansoura University. The findings of research found that the immersive approach could help increase students' motivation to learn Arabic as a second language, leading to greater academic success in the subject. Additionally, the use of the metaverse can also help bridge the gap between language learners and native speakers, providing opportunities for real-time communication and cultural exchange.

Keywords: Metaverse's environment; Academic Success; Arabic Language; Non-Native Speakers

1. Introduction

Immersive learning refers to a learning approach that uses realistic and engaging learning methodologies to present learners with realistic scenarios. For example, immersive learning using virtual reality training technology provides learners with a sense of presence and immersion in a virtual environment where they can practice and apply skills during simulations. The metaverse's environment enables immersive learning experiences by offering new capabilities like co-presence for group learning, coaching, and mentoring. Companies are already bringing their operations into the metaverse, creating digital twins of their offices and products. The Creator Economy is emerging for immersive learning content creators due to the increasing demand for immersive learning content. (What Is Immersive Learning? - an Introduction to Learning in the Metaverse, 2022) (Jones, 2023)

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Metaverse technology capabilities provide potential features that can be developed for specific functionalities. These capabilities are dynamic and can change through interaction in the metaverse. Technology plays a key role in virtual teams, and existing classifications of technology capabilities do not yet account for metaverses and their unique characteristics. Metaverse technology capabilities are dynamic and represent a starting point that can evolve as avatars interact in the metaverse. Metaverse technology capabilities support communication, rendering, interaction, and team processes. (John et al., 2009) (Alanah et al., 2011) (Fang et al., 2022)

2. Purpose of the research

The aim of this research is to design an immersive learning environment with metaverse technology to increase academic success and motivation in learning Arabic as a Second Language for Non-Native Speakers. By creating a virtual world where students can interact with native speakers, practice real-life scenarios, and receive instant feedback.

3. Research Questions

- Does immersive learning with the metaverse's environment affect academic success in arabic language as a second language for non-native speakers compared to traditional learning methods?
- To what extent can learning through immersive learning with the metaverse's environment increase motivation for learning Arabic as a second language?

4. Study of the context

– Explanation of immersive learning

Immersive learning is facilitated by the use of immersive technologies, inducing a sense of presence, co-presence, and identity. It focuses on the impact of immersion on learning and perceptual processes rather than technological features. Immersive learning involves the use of technological affordances to enhance learning experiences. (Beth et al., 2024) (Mohammad et al., 2022)

– The role of immersive learning in education

Immersive learning is a teaching and learning approach that integrates technology with traditional methods of education, providing a more realistic and stimulating environment for growth. It focuses more on the experience of learning rather than if a student's answers are right or wrong. It incorporates digital media, simulations, and other interactive tools to create "immersive" experiences for learners. This type of education can be used in both online and offline classes through simulations, role-playing, or other activities that allow students to experience firsthand what they are learning about. Immersive learning enables students to practice real-world skills in a safe environment and achieve mastery through guided rehearsals. It establishes an emotional connection with learners and allows for individualized instruction at their own pace. Immersive learning also provides a platform for geographically dispersed learners to interact and exchange knowledge. (Buljan, 2022) (Movchan, 2018) (*Immersive Learning - Center for Engaged Learning*, 2023)

– The character of generation Z students

Immersive learning experiences have been shown to improve participation and amplify engagement in education, particularly benefiting generation-Z students who prefer learning from the internet. Various studies have highlighted the motivations, benefits, and design methods of immersive systems in education. The role of immersive technologies in educational inclusion has also been discussed. Additionally, evaluation methods for immersive systems in education have been investigated. Overall, immersive learning plays a significant role in enhancing learning outcomes and educational experiences. (Mohammad et al., 2022)

Generation Z students are characterized by being true digital natives, diverse, and experiencing high rates of depression and anxiety. They expect immediate feedback, crave autonomy in education, and are the most diverse generation yet. Teachers need to adapt by using technology in education, understanding different cultures, and being aware of mental health issues among students. It is important to provide support and create a safe learning environment for Generation Z students. (*Teaching Digital Natives: Tips for Teaching Generation Z Students*, n.d.) (*Generation Z Defined; the 5 Characteristics of Today's Students - McCrindle*, 2016)

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– **Explanation of metaverse**

The metaverse is a virtual platform that enables sociocultural interactions among individuals in a computer-generated environment where multiple users can interact simultaneously from remote physical locations. It is anticipated to be the next digital realm that can fundamentally change how people interact. The term 'metaverse' refers to a three-dimensional virtual world inhabited by avatars of real people, creating a universe beyond the physical world. Metaverse platforms vary by immersiveness, fidelity, and sociability, offering different experiences to users. Avatars play a key role in mediating the virtual experience in the metaverse, enhancing social perception and interactions between individuals. (Do et al., 2023) (VİSCONTİ, 2022) (Shin, 2022)

– **Metaverse technologies**

Metaverse technologies encompass immersive technologies such as Virtual Reality (VR) and Augmented Reality (AR) that enable multisensory interactions with virtual environments, digital objects, and people. These technologies offer unique communication channels, personalization, and vividness, allowing for immediate feedback and collaboration. Metaverse technologies can enhance team processes and improve virtual project outcomes by providing support for communication, rendering, and custom tools. (Mystakidis, 2022) (Alanah et al., 2011)

Metaverse technologies encompass a range of technologies such as spatial computing, digital humans, and virtual spaces, shared experiences, gaming, and tokenized assets. These technologies include extended reality, blockchain, artificial intelligence, 3D reconstruction, and gaming engines like Unity and Unreal. The metaverse is expected to occupy a key place in Web 3.0, characterized by decentralization and interoperability. It needs 3D modeling, IoT, and other relevant areas for metaverse development. (*What Is the Metaverse? An Explanation and In-Depth Guide*, 2022) (Abrol, 2022) (*7 Top Technologies for Metaverse Development*, 2024)

– **Metaverse Tools**

Metaverse tools and technology encompass a wide range of capabilities, including cognitive artificial intelligence algorithms, movement and behavior tracking tools, customer identification technology, immersive visualization systems, shopper engagement technologies, machine learning-based product recognition tools, spatial computing technology, immersive remote collaboration tools, behavioral predictive analytics, extended reality technologies, 3D modeling, geospatial mapping, and event modeling and forecasting tools on blockchain-based metaverse platforms. These technologies play a crucial role in shaping consumer behavior, optimizing purchase journeys, and supporting communication, rendering, interaction, and team processes in virtual environments. The metaverse provides a unique context for studying virtual projects due to its immersive nature and technology capabilities. (Veronika & Elvira, 2022) (Gheorghe et al., 2022) (Alanah et al., 2011) (Marek & George, 2022)

Metaverse tools include immersive remote collaboration tools, augmented analytics tools, extended reality technologies, data visualization tools, customer behavior analytics, virtual work environments, sensory and tracking technologies, and image processing computational and object tracking algorithms. These tools are essential for optimizing operational workflows and enhancing customer engagement in virtual marketplaces within the metaverse. (Gheorghe et al., 2022) (Daniel. et al., 2022) (Veronika et al., 2022) (Kristina & Raluca-Ştefania, 2022)

Some of the top metaverse professional tools that developers can use include Webaverse, a browser-based, open-source metaverse engine, and Blender, an open-source tool for creating three-dimensional content. These tools can help in building immersive virtual worlds and gaming experiences, as well as support the complete 3D pipeline for modeling, game creation, rendering, and more. Metaverse development tools aim to provide developers with the resources needed to create innovative and engaging experiences within the metaverse. (*https://101blockchains.com/top-metaverse-professional-tools/*, 2024) (Bhati, 2023)

– **metaverse platforms for education**

Metaverse technology has been explored for educational purposes, with the potential to enhance learning experiences in non-traditional classes. The concept of the metaverse involves a combination of real world and virtual reality, where daily activities and economic life are conducted through avatars representing real individuals. The metaverse can be a platform for social, economic, and cultural activities that create value. Some metaverse applications have already been integrated into education, displaying the need to understand its concept and types for educational implementation. The ASF's metaverse roadmap outlines four types of the metaverse based on augmentation versus simulation and intimate versus external axes. (Mustafa, 2022) (Nara et al., 2021)

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Several companies are actively shaping metaverse platforms for education in 2024, offering immersive and interactive virtual classrooms with features like 3D avatars, interactive elements, and real-time collaboration tools. These platforms aim to enhance student engagement and provide tailored learning experiences for educational institutions. Companies like Rejolut, Solulab, Appinventiv, and Rising Max are leading the way in creating versatile and innovative metaverse solutions for education. Additionally, companies like Antier, Edverse, Metaverse, and Hivelance focus on inclusivity, accessibility, and customization to cater to diverse learning needs. The development process for metaverse education platforms typically involves consultation, discovery, requirements gathering, solution and strategy design, development, testing, deployment, and maintenance and support phases. (*Top 10 Companies Leading the Metaverse Education Platform Development 2024*, 2024) (*https://www.antiersolutions.com/metaverse-for-education/*, 2024)

- **Metaverse Platform Criteria Overview**

To select the right Metaverse platform, businesses should focus on personalization, decentralization, user experience, platforms and accessibility, and integrations. They should compare their requirements with the features of different platforms to make an informed decision. (Landtsheer, 2023)

The metaverse needs to be dependable, continuous, and real-time to satisfy spatial-temporal extensibility requirements. It involves the merging of the virtual and real worlds, with companies like Microsoft and NVIDIA investing in metaverse technologies. A McKinsey study shows enthusiasm for the metaverse in the USA across different age groups. The metaverse is also used in educational settings for personalized learning material recommendations based on student knowledge levels. (Farid., 2023) (Yunifa & Hani, 2022)

- **Ethical concerns surrounding metaverse technology**

Ethical concerns surrounding metaverse technology use include data privacy, user profiling, and digital personality mining for marketing purposes. Businesses must ensure transparency, user consent, and data control to maintain ethical standards. Utilitarian perspective and ethical decision-making are crucial to addressing privacy concerns and preventing data breaches. Stakeholders must consider various ethical theories and develop action plans to navigate ethical challenges in metaverse usage. Transparency and user control over personal data are essential for ethical business practices in the metaverse. (Muhammad et al., 2022) (Simon, 2022)

- **Explanation of immersive learning in the metaverse**

Immersive learning in the metaverse involves creating immersive and experiential learning environments through 2D and 3D platforms. Students can engage in learning activities, customize avatars, and express feelings through emojis, enhancing social presence and reality. The use of 3D learning content and group work can lead to higher satisfaction levels among students. Experiential learning in the metaverse is believed to positively influence learning outcomes by promoting active participation and involvement. (Dongkwang & Hyejin, 2023) (Leonel & Patrick, 2023)

- **immersive learning with metaverse for teaching languages**

Immersive learning for teaching languages involves surrounding yourself with the language you are learning, whether through living in a country where the language is spoken or creating immersive experiences in your everyday life. This method has been shown to be highly effective in language acquisition, as it puts your learning in context and mimics the experience of native speakers. Blended learning, combining online and classroom environments can also enhance the immersive learning experience for language learners. (Admin, 2019) (*The Benefit of Immersive Language-learning Experiences and How to Create Them | Cambridge English*. 2021)

Immersive learning for teaching languages using virtual, fully immersive learning environments is a promising approach that lacks systematic investigations on the incremental value of immersive technologies and different immersion degrees. Studies show the potential benefits of increased immersion, but there is a gap in research on how immersive technologies can enhance intercultural learning in language teaching. VR interventions for language learning are less studied compared to AR, and there is a need for more research on the impact of VR on language learning outcomes. (Rebecca et al., 2021)

5. Methodology

This research addressed the effects of immersive learning with the metaverse to increase academic success and motivation. The research was guided by the following research questions:

- Does immersive learning with the metaverse's environment affect academic success in Arabic language as a second language for non-native speakers compared to traditional learning methods?

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- To what extent can learning through immersive learning with the metaverse's environment increase motivation for learning Arabic as a second language?

– **Research Design**

The researcher employed a quasi-experimental design with a convergent parallel mixed-method approach to explore the effects of immersive learning through the Metaverse's Environment on academic success and motivation in learning Arabic as a second language. The study aimed to compare two groups of learners: one group using the traditional Moodle Learning Management System (LMS) for instruction (control group), and the other using an immersive virtual environment (Metaverse's Environment) for learning (experimental group). The researcher used both quantitative and qualitative data collection methods simultaneously to assess academic achievement and learner motivation.

– **Participants and sample size**

The researcher recruited individuals to participate in the research. The researcher-recruited participants from the sample population of 60 learners from non-native speakers enrolled in an Arabic Language course for intermediate level in the Arabic Language Center for Non-Native Speakers at the faculty of education at Mansoura University. All learners enrolled in the Arabic Language course for intermediate level had the opportunity to volunteer for participation in the research. The researcher randomly assigned all participants to either the control group that learned Arabic lessons with traditional methods or the experimental group that learned Arabic lessons with metaverse.

– **Learning Environments and Tools**

To provide a balanced and well-structured learning experience, the researcher developed two parallel digital environments tailored to each group.

o **Moodle LMS for the Control Group**

The control group received instruction through a course delivered on the Moodle LMS. This platform was selected for its user-friendliness and its widespread use in educational institutions. Moodle enabled the researcher to easily upload Arabic learning resources, assign activities, and administer pre- and post-tests. Learner progress data were automatically stored and organized within the system, simplifying the data collection and analysis process. The content included six lessons focused on Arabic language topics: Homeland, Village, Sea, Commerce, Ministries, and Promotion.

o **Metaverse's Environment for the Experimental Group**

The experimental group participated in the same six Arabic lessons, but within a virtual 3D immersive environment known as Metaverse's Environment. This environment was custom-built by the researcher using a combination of advanced technologies and development tools:

- Microverse Builder (Croquet.io): This browser-based platform was used to create collaborative 3D spaces with real-time synchronization capabilities. It enabled multiple learners to interact simultaneously within the same virtual environment.
- Unity Game Engine: The Unity engine was employed to design and develop the 3D models, environment interactions, and user interface elements that made the virtual space engaging and interactive.
- WebXR and WebGL Technologies: These web standards were leveraged to enable cross-platform compatibility and browser-based access to the Metaverse environment, ensuring learners could engage with the space without the need for high-end hardware.
- Real-Time Collaboration Software: Integration of collaborative tools allowed learners to engage in-group activities, discussions, and shared exploration of the virtual content.
- Blockchain-Based Decentralized Finance Tools (optional): Although not central to content delivery, these tools were explored as part of the platform's infrastructure to support secure, decentralized interactions and data integrity within the environment.
- The six Arabic lessons—Homeland, Village, Sea, Commerce, Ministries, and Promotion—were embedded directly into the Metaverse environment through interactive objects, guided narration, virtual scenarios, and quizzes integrated into the 3D scenes.

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- **Procedure**

Two separate instructional sessions were conducted. The control group completed their learning session using the Moodle LMS. The experimental group experienced the same instructional content inside the Metaverse's Environment one. Prior to the session, all learners completed a pre-test to assess their existing knowledge. After completing the lesson, they were given a post-test to evaluate their learning outcomes.

The control group engaged with lesson resources, activities, and assessments using traditional LMS tools. Meanwhile, the experimental group navigated through the virtual lessons, interacted with 3D environments, and completed activities integrated into the Metaverse space.

- **Data Collection Instruments**

  - **Content Test**

In the present research, the author aimed to test the effects of immersive learning with the metaverse's environment to increase academic success by comparing participant learning in two groups when engaging in Moodle LMS and metaverse's environment. The author used a pre- and post-test model to measure participant learning. The pre- and post-tests consisted of 30 questions each, drawn from existing assessments of student understanding of design Arabic lessons.

  - **Survey of motivation in learning Arabic as a second Language**

The survey is a 5-point Likert-type scale (1 = Strongly Disagree - 2 = Disagree - 3 = Neutral - 4 = Agree - 5 = Strongly Agree) that measures the five dimensions (Intrinsic Motivation - Extrinsic Motivation - Social Interaction & Communication - Presence & Engagement - Perceived Usefulness & Value). Overall, higher scores represented a greater response and a greater likelihood of using the metaverse's environment to increase academic success and motivation.

- **Data Analysis**

To address both research questions, the researcher utilized quantitative data derived from pre- and post-tests to evaluate academic performance, as well as survey responses to assess learner motivation. The data were analyzed using appropriate statistical techniques. A mixed ANOVA (Repeated Measures) was employed to examine within-group differences over time, while independent samples t-tests were used to compare outcomes between the experimental and control groups. These analyses enabled the researcher to determine whether immersive learning through the Metaverse environment had a statistically significant effect on both academic achievement and motivation in learning Arabic as a second language.

  - **Research Question 1**

Research Question 1 was the following:

Does immersive learning with the metaverse's environment affect academic success in Arabic language as a second language for non-native speakers compared to traditional learning methods?

To address this question, the researcher performed statistical analysis on the pre- and post-test scores from both the control group (who used the Moodle LMS) and the experimental group (who engaged with the Metaverse's Environment). Descriptive statistics (mean, standard deviation) were used to summarize learners' performance, and a mixed ANOVA (Repeated Measures) was conducted to examine within-group and between-group differences over time. This analysis allowed the researcher to assess whether the immersive learning environment had a statistically significant impact on academic success in comparison to traditional learning methods.

  - **Research Question 2**

Research Question 2 was the following:

To what extent can learning through immersive learning with the metaverse's environment increase motivation for learning Arabic as a second language?

To answer this question, data from the post-intervention Survey of Motivation in Learning Arabic as a Second Language were analyzed. The survey, which used a 5-point Likert scale, measured five motivation dimensions: Intrinsic Motivation, Extrinsic Motivation, Social Interaction & Communication, Presence & Engagement, and

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Perceived Usefulness & Value. Descriptive statistics were used to summarize participant responses across these dimensions. Comparative analyses, such as independent sample t-tests, were conducted to examine significant differences in motivation levels between the experimental and control groups.

6. Results

This section presents the findings of the study in response to the two research questions. The study investigated the effects of immersive learning with the Metaverse's Environment on academic success and motivation for learning Arabic as a second language, comparing it to traditional learning methods via Moodle LMS. Data from pre- and post-tests, along with a motivation survey, were analyzed to address these research questions.

○ Research Question 1

Does immersive learning with the metaverse's environment affect academic success in Arabic language as a second language for non-native speakers compared to traditional learning methods?

The data for Research Question 1 were collected through the scores of pre- and post-tests administered to both the control group (who learned via Moodle LMS) and the experimental group (who learned via the Metaverse's Environment). The independent variable was the learning environment (traditional via Moodle LMS vs. immersive via the Metaverse), and the dependent variable was the learners' academic achievement as reflected in their test scores. The pre- and post-tests were identical and aimed to assess learners' understanding of Arabic as a second language. A mixed ANOVA (Repeated Measures) was conducted to analyze within-group and between-group differences in performance across the two testing points, as presented in Table 1 and Table 2.

Table 1: Multivariate Tests Table

Effect	"F" value	sig	Partial Eta Squared
Between groups	840.43	.000	.935
Within groups	28.21	.000	.327

It is clear from Table 1 that the main effect of (academic success) is significant: participants significantly improved from pre- to post-test overall, $F(1, 58) = 840.43$, $p < .001$, $\eta^2 = .935$ → very large effect size. And the interaction between academic success and Group is also significant: $F(1, 58) = 28.21$, $p < .001$, $\eta^2 = .327$ → the experimental group improved significantly more than the control group.

Table 2: Tests of Between-Subjects Effects

Source	Type III Sum of Squares	DF	Mean Square	F	Sig.	Partial Eta Squared
Intercept	49654.008	1	49654.008	27740.560	.000	.998
group	21.675	1	21.675	12.109	.001	.173
Error	103.817	58	1.790			

There is a significant difference between groups overall, with the experimental group showing higher scores than the control group across both time points, $F(1, 58) = 12.11$, $p = .001$, $\eta^2 = .173$.

Over all, A 2 (Group: Experimental vs. Control) × 2 (Time: Pre-test vs. Post-test) mixed ANOVA revealed a significant main effect of Time, $F(1, 58) = 840.43$, $p < .001$, $\eta^2 = .935$, indicating that scores significantly improved from pre- to post-test across all participants. There was also a significant Group × Time interaction, $F(1, 58) = 28.21$, $p < .001$, $\eta^2 = .327$, suggesting that the experimental group showed significantly greater improvement than the control group. This is supported by the between-subjects effect of Group, $F(1, 58) = 12.11$, $p = .001$, $\eta^2 = .173$. Together, these results indicate that the intervention applied to the experimental group was more effective in enhancing post-test scores.

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- **Research Question 2**

To what extent can learning through immersive learning with the metaverse's environment increase motivation for learning Arabic as a second language?

The independent variable for Research Question 2 was the type of learning environment (traditional Moodle LMS vs. immersive Metaverse environment), and the dependent variable was the total score on the motivation survey, which measured five key dimensions: Intrinsic Motivation, Extrinsic Motivation, Social Interaction & Communication, Presence & Engagement, and Perceived Usefulness & Value. The survey was administered after the learning experience to both the control and experimental groups. An independent samples t-test was used to analyze the differences in motivation scores between the two groups, allowing the researcher to assess the extent to which immersive learning influenced learners' motivation to study Arabic as a second language. The results are presented in Table 3.

Table 3: Independent Sample T-Test.

Levene's Test for Equality of Variances				**t-test for Equality of Means**				
survey	**N**	**F**	**sig**	**Std. Error Difference**	Mean Difference	**T**	**DF**	**sig**
assumed	30	.256	.615	.47468	5.23333	58	11.0	.000
not assumed	30			.47468	5.23333	57.4	11.0	.000

An independent samples t-test was conducted to compare survey scores between two groups. Levene's test showed equal variances could be assumed ($F = 0.256$, $p = .615$). There was a significant difference in survey scores between the groups, $t(58) = 11.025$, $p < .001$. The mean difference of 5.23 (95% CI [4.28, 6.18]) indicates that one group scored significantly higher on the survey than the other.

7. Discussion

The primary aim of this research was to investigate the impact of immersive learning through the Metaverse's Environment on academic success and motivation in learning Arabic as a second language, comparing it with traditional learning methods using Moodle LMS. The results of the research indicated significant improvements in both academic performance and learner motivation in the experimental group exposed to the Metaverse environment.

- **Research Question 1**

Does immersive learning with the metaverse's environment affect academic success in Arabic language as a second language for non-native speakers compared to traditional learning methods?

The first research question explored whether immersive learning with the Metaverse's Environment affects academic success in Arabic language acquisition when compared to traditional learning methods. The results showed that the experimental group, who engaged with Arabic lessons in the Metaverse, exhibited significantly higher post-test scores than the control group, which used Moodle LMS. This difference suggests that immersive learning environments can enhance learners' ability to acquire new knowledge and skills, particularly in a second language context.

The positive impact of the Metaverse on academic success is consistent with previous research highlighting the effectiveness of immersive technologies in promoting engagement and deeper learning. For example, studies have shown that virtual environments enable learners to interact with content in a dynamic and interactive manner, which can improve comprehension and retention (Slater & Wilbur, 1997; Radianti et al., 2020). By providing learners with a 3D, interactive environment, the Metaverse may offer richer, more engaging experiences compared to traditional e-learning platforms like Moodle, which primarily rely on text-based and multimedia content.

- **Research Question 2**

To what extent can learning through immersive learning with the metaverse's environment increase motivation for learning Arabic as a second language?

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The second research question aimed to determine whether immersive learning with the Metaverse's Environment increases motivation for learning Arabic as a second language. The findings revealed that the experimental group reported significantly higher motivation scores across all five dimensions measured in the motivation survey: Intrinsic Motivation, Extrinsic Motivation, Social Interaction & Communication, Presence & Engagement, and Perceived Usefulness & Value. These results suggest that the immersive experience offered by the Metaverse not only enhanced academic performance but also significantly boosted learners' motivation to engage with and continue learning Arabic.

The increase in motivation observed in the experimental group is in line with prior research on the role of virtual environments in fostering learner engagement and motivation (Gee, 2003; Deterding et al., 2011). Immersive learning environments are often designed to be interactive and dynamic, which can heighten students' sense of presence and engagement (Jenson & Aagaard, 2020). The high scores in the Presence & Engagement and Social Interaction & Communication dimensions suggest that learners in the experimental group felt more connected to the learning experience and to their peers, potentially due to the collaborative and interactive nature of the Metaverse.

- **Limitations of the research**

While the results of this research are promising, several limitations must be acknowledged. First, the research was conducted over a relatively short period, with only one learning session for each group. Longer-term researches would be beneficial in understanding the sustained effects of immersive learning on both academic performance and motivation. Additionally, the sample size in this research was limited, which may affect the generalizability of the findings. Future research should include larger, more diverse participant pools to confirm the results and explore potential differences based on demographic factors such as age, prior language proficiency, and familiarity with digital technologies.

Another limitation is the lack of qualitative data in the research. While the motivation survey provided useful insights into learners' attitudes, further research incorporating qualitative methods such as interviews or focus groups would provide a deeper understanding of the learners' experiences in the Metaverse environment. This could help identify specific features of the virtual learning environment that contribute to motivation and engagement.

8. Conclusion

Overall, the comparison of academic performance before and after implementing immersive learning in the metaverse for teaching Arabic language showed promising results. Students (non-native speakers) demonstrated significant improvements in their understanding and proficiency in the language, as well as increased motivation and engagement. The benefits of using immersive learning in the metaverse for teaching Arabic language were evident, but there were also limitations such as access to technology and resources. As the metaverse technology continues to evolve and expand, the availability of professional tools like Webaverse and Blender will be crucial for developers looking to create cutting-edge virtual experiences. By utilizing these tools, developers can bring their creative visions to life and push the boundaries of what is possible within the metaverse. With the support of these tools, the future of virtual reality and immersive learning experiences within the metaverse looks promising and exciting.

Educators must recognize the unique characteristics of Generation Z students and adapt their teaching methods accordingly to meet the needs of this diverse and tech-savvy generation. By embracing technology, promoting cultural understanding, and prioritizing mental health, teachers can create a more inclusive and supportive learning environment for their students. Ultimately, by catering to the needs of Generation Z, educators can help ensure that these students reach their full potential and achieve academic success.

In conclusion, immersive learning is a powerful tool that enhances student engagement and retention of information. By creating a dynamic and interactive learning experience, students are able to develop a deeper understanding of complex concepts and apply them in practical settings. As technology continues to advance, the potential for immersive learning to revolutionize education is limitless. It has the ability to transform traditional teaching methods and create meaningful, personalized learning experiences for students of all ages and backgrounds.

9. Recommendations

The research recommends that educational institutions integrate immersive learning environments like the Metaverse into language curricula to enhance both academic success and learner motivation. Educators should design engaging and interactive content that fosters intrinsic and extrinsic motivation, with opportunities for social interaction within virtual environments. Long-term studies are necessary to assess the lasting impact of immersive learning, and content should be tailored to the specific needs of language learners. Future research should also focus on ensuring that

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immersive environments are inclusive, accessible, and ethically designed, with attention to data privacy and the digital divide. Collaboration between educators and technologists is crucial to creating effective and pedagogically sound virtual learning experiences.

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Appendices

Appendix A: The Survey of motivation in learning Arabic as a second Language: (Strongly Disagree - Disagree - Neutral - Agree - Strongly Agree) . 1 being Strongly Disagree, and 5 being Strongly Agree.

Element	Indicators	1	2	3	4	5
Intrinsic Motivation	I find learning Arabic in a metaverse environment enjoyable.					
	I feel curious to explore Arabic culture in the virtual world.					
	I enjoy interacting with virtual characters who speak Arabic.					
	The immersive setting makes Arabic learning more exciting than traditional methods.					
	I look forward to using the metaverse to practice Arabic.					

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Element	Indicators	1	2	3	4	5
Extrinsic Motivation	I am more motivated to learn Arabic when achievements or rewards are part of the metaverse platform.					
	I feel a sense of accomplishment after completing Arabic language tasks in the virtual world.					
	Using the metaverse makes me want to reach higher levels in Arabic proficiency.					
	I would be more committed to learning Arabic if virtual progress badges or points are given.					
	External rewards in the metaverse (e.g., unlocking new content) keep me motivated to practice Arabic.					
Social Interaction & Communication	I feel more comfortable practicing Arabic with avatars than with real people.					
	Interacting with others in the metaverse improves my confidence in speaking Arabic.					
	Group tasks in virtual Arabic environments make language learning more engaging.					
	I enjoy practicing Arabic with other learners in immersive virtual settings.					
	The social features of the metaverse help me stay committed to learning Arabic.					
Presence & Engagement	I feel like I am "inside" an Arabic-speaking environment while learning in the metaverse.					
	I lose track of time while learning Arabic in immersive virtual settings.					
	I pay more attention to Arabic lessons in the metaverse than in traditional platforms.					
	The immersive experience keeps me focused on learning.					
	I feel more involved and emotionally connected when learning Arabic through virtual environments.					
Perceived Usefulness & Value	I believe learning Arabic in the metaverse is more effective than traditional methods.					
	I feel my Arabic language skills improve faster using immersive tools.					

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Element	Indicators	**1**	**2**	**3**	**4**	**5**
	The metaverse offers more opportunities for practical language use.					
	I consider the immersive method a valuable supplement to language classes.					
	I am more motivated to continue learning Arabic because of the immersive experience.					

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