LEARN Journal: Language Education and Acquisition Research Network
ISSN: 2630-0672 (Print) | ISSN: 2672-9431 (Online)
Volume: 19, No: 1, January – June 2026

Language Institute, Thammasat University
https://so04.tci-thaijo.org/index.php/LEARN/index

A Gamified Metaverse Approach to Enhancing Motivation in Global Higher Education Learners

Pornpimol Sukavatee[a,*], Jintavee Khlaisang[b]

[a] pornpimol.s@chula.ac.th, Department of Curriculum and Instruction, Faculty of Education, Chulalongkorn University, Thailand
[b] jintavee.m@chula.ac.th, Department of Educational Technology and Communications, Faculty of Education, Chulalongkorn University, Thailand
[*]Corresponding author, pornpimol.s@chula.ac.th

APA Citation:
Sukavatee, P., & Khlaisang, J. (2026). A gamified metaverse approach to enhancing motivation in global higher education learners. *LEARN Journal: Language Education and Acquisition Research Network*, *19*(1), 537-568. https://doi.org/ 10.70730/HWEV2703

Received 11/09/2025

Received in revised form 18/12/2025

Accepted 26/12/2025

ABSTRACT

This study examines the effectiveness of a gamified metaverse environment in enhancing motivation among non-English major higher education learners in Thailand, with a particular focus on the promotion of global citizenship. Employing a Research and Development (R&D) design, the study initially identified gamified and metaverse components relevant to learner motivation through Exploratory Factor Analysis (EFA). A mixed-methods evaluation was subsequently conducted with 68 participants. Quantitative results demonstrated a high overall level of motivation (M = 4.05, SD = 0.51), with particularly strong effects observed on identified regulation (M = 4.73, SD = 0.41) and intrinsic motivation. Qualitative findings further highlighted enjoyment, novelty, and perceived future benefits as key motivators for participation. Despite some technical and instructional challenges, the findings indicate that integrating gamification into metaverse-based learning environments is a promising approach for sustaining learner motivation in Thai higher

education and offers transferable design principles for language educators and policymakers seeking to implement immersive, motivation-enhancing practices in global university contexts.

Keywords: global citizenship, gamification, metaverse learning environment, motivation

Introduction

In the 21st century, language proficiency, particularly in English, is paramount for higher education learners aspiring to cultivate global citizenship. This necessitates the development of 21st-century skills, such as effective communication and technological literacy, which are crucial for navigating a borderless society and a rapidly changing technological landscape (Partnership for 21st-century skills, 2020; UNESCO, 2022; United Nations, 2020). However, traditional language learning environments often struggle to sustain learner motivation, a factor widely recognized as crucial for successful language acquisition. Within the Thai context, instructional practices often emphasize rote memorization of vocabulary and grammar rather than communicative application, thereby leaving learners with theoretical knowledge but limited practical ability. Furthermore, the scarcity of authentic opportunities to use English outside the classroom further diminishes motivation and practice, given that English is not commonly used in daily life. These factors collectively impede the development of sustained communicative competence.

To address these inherent motivational challenges, innovative pedagogical approaches are gaining traction. Several studies have consistently demonstrated that the integration of gamification—the application of game-design elements in non-game contexts—significantly enhances learners' motivation (Heryadi & Muliamin, 2016; Van Roy & Zaman, 2018). Similarly, the integration of the metaverse into language learning has been shown to augment learners' interest and engagement through immersive and interactive experiences (Lee, 2023; Mystakidis, 2020). Collectively, gamification and metaverse learning environments, including immersive 3D virtual worlds, are recognized as potent tools, offering unique opportunities to enhance engagement and motivation by fostering more interactive, enjoyable, and relevant learning experiences that contribute to sustained motivation. While gamification and metaverse have been studied separately, fewer studies integrate them in higher education language learning.

This research project, from which this article is derived, aims to investigate sustainable language learning development through the application

of gamification within a metaverse environment to enhance English oral communication and motivation among higher education learners in their capacity as global citizens. This article specifically focuses on the innovation's contribution to the enhancement of learner motivation.

The primary purpose of this research is to examine the effects of a gamified metaverse environment on enhancing motivation among higher education learners, specifically non-English majors, within the context of language learning aimed at cultivating global citizenship.

Literature Review

Global Citizenship and Language Learning

According to Akçay et al. (2024), global citizenship refers to a perspective that embraces accountability not only to one's national identity but also to global considerations. In terms of key competencies, global citizens are expected to possess robust oral and written communication skills, the ability to collaborate effectively in teams, proficiency in foundational technologies, and the capacity to analyze and resolve complex problems. They must also demonstrate sensitivity to change, adaptability in adjusting to and initiating transformation, and strong leadership capabilities. Furthermore, global citizens are anticipated to communicate fluently in more than one foreign language, appreciate artistic expression across diverse cultures, and uphold a high level of moral reasoning. Among these competencies, language proficiency and robust communication skills, both oral and written, are emphasized as particularly crucial, forming the foundation for meaningful interaction, collaboration, and engagement in an increasingly interconnected world.

Several studies underscore the connection between language learning activities and the development of global citizenship. Rupavijetra and Rupavijetra (2020) investigated the TWINCLE Program, a student exchange initiative involving Japanese and international faculty and students. Activities encompassed exchanges, seminars, English presentations, and problem-solving tasks focused on global environmental issues. Findings indicated that participants developed more positive attitudes toward English communication, particularly in speaking and listening, concurrently acquiring intercultural collaboration skills and direct experiences of global citizenship. Similarly, Lenkaitis and Loranc (2021) investigated a six-week Lingua Franca Virtual Exchange via Zoom involving 55 university students from Mexico, Poland, Spain, and the United States. Through weekly discussions predicated on culturally diverse images, learners demonstrated increased social responsibility and heightened awareness of global citizenship. Complementing these

findings, Tarsoly and Ćalić (2022) conducted a study involving University College London students engaged in group work and project-based language learning. Results revealed that language learning fostered global citizenship by providing cultural experiences, encouraging intercultural interaction, and enhancing critical thinking. Learners critically questioned dominant narratives, developed empathy, and cultivated respect for diversity. Collectively, these studies suggest that language learning, when complemented by interactive and intercultural activities, plays a significant role in cultivating global citizenship.

Motivation in Language Learning

Motivation is defined as an internal state that propels an individual to decide on, perform, and sustain specific behaviours to achieve desired outcomes (Pintrich & Schunk, 1996). Within the context of language learning, it constitutes a complex blend of desire, effort, and positive attitudes towards the language and the learning process (Gardner, 1985). Motivation is considered paramount for successful language communication and for learners to choose language study for future benefits, such as career advancement or further education.

Gardner (1985) conceptualized motivation as comprising four key components: defined goals, effortful behavior, a desire to attain these goals, and positive attitudes toward the activity. In his theory of language learning motivation, Gardner identified two primary orientations: Integrative Orientation, wherein learners are motivated by a desire to interact with members of the target language community and to understand their culture and values; and Instrumental Orientation, where motivation stems from practical benefits such as academic success, career advancement, or financial gain, often driven by external rewards rather than intrinsic interest.

Building on this foundation, Deci and Ryan (1985) introduced Self-Determination Theory (SDT), which positions extrinsic motivation on a continuum reflecting varying degrees of internalization. This continuum encompasses:

1. External regulation refers to motivation primarily driven by external rewards or punishments (e.g., praise or reprimands).
2. Introjected regulation refers to motivation stemming from internal pressures such as guilt or obligation.
3. Identified regulation refers to motivation predicated on recognizing the personal importance or value of an activity.
4. Integrated regulation represents the most self-determined form of extrinsic motivation, wherein actions align with one's personal values and identity (e.g., learning a language as part of one's role in a multicultural context).

Subsequently, Noels et al. (2000) developed the Language Learning Orientations Scale—Intrinsic Motivation, Extrinsic Motivation, and Amotivation (LLOS-IEA) to investigate second language (L2) learning motivation through the theoretical lens of SDT. The LLOS-IEA was designed as a psychometrically validated instrument to measure learners' reasons for studying a second language, emphasizing the degree to which these reasons are internalized. The scale comprises 21 items divided into three main motivational categories: Intrinsic Motivation, Extrinsic Motivation, and Amotivation. Each subscale is measured with three items on a 7-point Likert scale, thereby offering a detailed and reliable profile of learners' motivational orientations in L2 contexts.

1. Intrinsic motivation refers to learning a language for the inherent enjoyment and satisfaction it provides. Noels et al. (2000) delineated three subtypes. Intrinsic motivation to know reflects intellectual curiosity and the pleasure of acquiring new ideas through language. Intrinsic motivation to accomplish is the satisfaction derived from mastering tasks or overcoming challenges. Intrinsic motivation to experience stimulation captures the excitement and enjoyment of employing the language itself.

2. Extrinsic motivation entails learning for reasons external to the activity itself. The LLOS-IEA categorizes this into three forms. External regulation is the least self-directed, wherein learners primarily study for rewards or to conform to others' expectations. Introjected regulation occurs when learners experience internal pressure, such as guilt, if they do not engage in study. Identified regulation is more autonomous, as learners recognize the personal value of learning, such as future opportunities or career advancement.

3. Amotivation is characterized by the absence of motivation to learn. Learners exhibiting amotivation may perceive little value in studying a language or doubt their capacity to succeed. This often precipitates disengagement or a lack of effort.

Gamification in Education

Gamification involves the application of game processes, game thinking, and game design elements in non-game contexts to enhance engagement, motivate action, support learning, and solve problems (Kapp, 2012; Werbach & Hunter, 2012). According to Werbach and Hunter (2015), the key components of gamification encompass dynamics, mechanics, and components. Dynamics represent the overarching aspects of the gamified experience, such as emotions, narrative, and progression. Mechanics refer to the fundamental processes that drive engagement, such as challenges,

competition, and rewards. Components are the concrete elements, such as points, badges, and leaderboards, that operationalize the mechanics.

Building on this, scholars have elucidated the mechanisms that explain how gamification influences behavior and learning. For instance, Sailer et al. (2013) emphasize mechanisms such as motivational affordances (e.g., points or achievements) that satisfy psychological needs, social relatedness fostered through competition or cooperation, and feedback mechanisms that guide learner progress. Similarly, Kapp (2012) highlights mechanisms related to cognitive engagement and problem-solving, while Toda et al. (2019) underscore the importance of tailoring game elements to learner profiles to maximize effectiveness.

To guide effective gamification design, Huang and Hew (2018) present the GAFCC model, which outlines five principles for effective gamification design. Goals provide learners with clear direction and motivation, for example, through the awarding of badges for completing activities. Access enables learners to select tasks at varying levels of difficulty, thereby supporting gradual skill development. Feedback, whether immediate or cumulative, assists learners in tracking progress and enhancing performance, for example, through leaderboards or skill badges. Challenge encourages learners to engage in competition with themselves or others, thereby fostering curiosity and persistence. Finally, collaboration promotes teamwork and interaction, enabling learners to feel part of a group and learn from peers.

Chou (2013) proposes the Octalysis framework, which identifies eight core drives of gamification: epic meaning and calling, development and accomplishment, empowerment of creativity and feedback, ownership and possession, social influence and relatedness, scarcity and impatience, unpredictability and curiosity, and loss and avoidance. These drives encompass both intrinsic and extrinsic sources of motivation, as well as positive motivators that encourage engagement through enjoyment and fulfillment, and negative motivators that leverage avoidance of loss or fear of missing out. The Octalysis model provides a comprehensive structure for understanding how diverse motivational factors can be strategically integrated into gamified systems to sustain user engagement and behaviour.

Huang and Soman's (2013) five-step approach to integrating gamification into education commences with understanding the target audience and the learning context, which involves analysing student characteristics and environmental factors. Following this, the second step focuses on defining clear learning objectives, categorised into general, specific, and behavioural goals. The third stage necessitates structuring the learning experience by organising content and anticipating potential challenges. Subsequently, identifying available resources involves assessing

the feasibility of applying gamification elements. Finally, the process concludes with the application of the most suitable gamification elements to each stage of the learning experience, carefully selecting those that align with the defined objectives and context.

Several studies, including those by Daliranfirouz et al. (2024) and Flores-Aguilar et al. (2023), have indicated that gamification generally enhances both extrinsic and intrinsic motivation, leading to improved academic performance. However, Li et al. (2024) identified a more negligible overall effect on intrinsic motivation in a meta-analysis, noting that it strongly supported autonomy and relatedness but exhibited less influence on competence. Dah et al. (2023) introduced the concept of gamification equilibrium, cautioning against shallow gamification that relied excessively on external rewards, which could diminish internal drive. Other research, such as that by Luarn et al. (2023) and Jones et al. (2022), highlighted how specific gamification features cultivated psychological needs such as social connection, achievement, and immersion, mediating intrinsic motivation and fostering supportive learning environments. While gamification consistently boosted motivation and engagement, its direct link to improved learning outcomes was sometimes less clear, with some studies (e.g., Boudadi & Gutiérrez-Colón, 2020; Laffey, 2022; Matyakhan et al., 2024) demonstrating varied results regarding achievement and writing proficiency, and Mekler et al. (2017) suggesting that certain elements primarily serve as effective extrinsic motivators for task quantity rather than intrinsic drive.

Metaverse Learning Environments

The metaverse, as an evolving digital environment, has seen its definition evolve over time, yet core characteristics remain consistent. Early conceptualizations broadly described it as a fusion of the real and virtual worlds, categorised into augmented reality (AR), mirror worlds, lifelogging, and virtual worlds (Kye et al., 2021; Smart et al., 2007). More recent interpretations, however, increasingly define the metaverse as an interconnected three-dimensional (3D) digital space that merges physical and virtual elements, enabling users to interact through avatars in a network of realistic social environments across diverse platforms (Li & Yu, 2023; Mystakidis, 2022; Zhang et al., 2022). In essence, the metaverse constitutes a persistent, networked simulation that leverages virtual, augmented, and mixed reality technologies, wherein users, represented by avatars, engage in real-time social interactions within shared virtual spaces, unconstrained by physical limitations.

Kye et al. (2021) have delineated six fundamental characteristics of the metaverse. First, a metaverse necessitates a shared space wherein multiple users can coexist simultaneously. It must also feature a graphical user

interface, appearing in either two or three dimensions, to facilitate user interaction. Crucially, immediacy ensures that user interactions occur in real-time, while interactivity enables users to engage with and modify the virtual environment. Furthermore, persistence dictates that the metaverse continues to exist and function even in the absence of active users. Finally, socialization enables users to form communities and participate in social activities within this virtual realm.

Distinct metaverse platforms can be distinguished by their unique objectives, activities, currencies, and characteristics. For instance, Decentraland and Sandbox operate on blockchain systems, enabling users to engage in activities such as creating, buying, selling, and exchanging digital assets and virtual land through the use of digital currency. Horizon Worlds, developed by Meta, facilitates the creation and exploration of virtual worlds, event participation, and gaming through Virtual Reality (VR) devices such as Oculus Rift S and Meta Quest 2. Roblox functions as a metaverse game platform, integrating gaming, social networking, and online commerce, enabling users to create games, interact, and trade goods and services through its proprietary currency, Robux. Spatial.io provides virtual spaces for diverse activities, including exhibitions, learning, and meetings, wherein users interact via voice, video, text, and customizable avatars. Lastly, Gather.Town is a 2D metaverse platform specifically designed for professional work and meetings, offering features for creating virtual offices and meeting rooms, customising avatars, and facilitating interaction through various communication methods, alongside specific functionalities for calendar integration, meeting management, and status display.

The metaverse and virtual reality have been employed in research to investigate their influence on student motivation and engagement in educational settings. A study by Muthmainnah et al. (2023) surveyed 251 university students in the UAE with prior experience in metaverse learning, concluding that it significantly impacts learning motivation and both directly and indirectly augments learning engagement through motivation. Similarly, Agustini et al. (2023) developed a virtual reality and gamification approach for 20 history students in Indonesia, observing that this method also positively affected learning motivation by increasing student interest, enjoyment, and satisfaction during the learning process.

Based on the study's findings, the integration of gamification and metaverse environments appears to enhance students' interest, engagement, and motivation, while also providing opportunities to develop global citizenship through communicative, intercultural, and collaborative tasks (e.g., Lenkaitis & Loranc, 2021; Matyakhan et al., 2024; Muthmainnah et al., 2023; Rupavijetra & Rupavijetra, 2020; Tarsoly & Ćalić, 2022). However, current studies seldom identify, in a systematic and empirically solid

approach, which design elements of gamified metaverse environments are most effective in enhancing motivation and oral communication within higher education, especially in EFL settings. To address this gap, the current study initially formulated a set of items based on theories of global citizenship, second language motivation, gamification, and metaverse learning, and subsequently utilized Exploratory Factor Analysis (EFA) to determine the underlying component structure. EFA was therefore employed not as an end in itself, but as a means to develop a theoretically grounded and data-driven framework to inform the subsequent design of the innovation. Simultaneously, previous research on motivation and gamified-metaverse learning emphasizes both quantitative results (e.g., questionnaire scores, achievement metrics) and qualitative aspects such as enjoyment, perceived relevance, and learners' reflections on their experiences (e.g., Agustini et al., 2023; Huang & Hew, 2018; Kapp, 2012; Sailer et al., 2013). Because motivation is a complex construct that encompasses not only intensity and direction but also learners' meaning-making processes and contextual limitations, a mixed-methods approach was employed. Quantitative data derived from a motivation scale facilitated the analysis of the overall level, while qualitative interview data offered comprehensive insights into students' experiences within the gamified metaverse, their perceptions of its connection to self-development and global citizenship, and the influence of technical or instructional factors on their motivational responses. In this manner, the existing literature on motivation, gamification, metaverse learning, and global citizenship collectively guided both the selection of EFA for construct development and the implementation of the mixed-method appraoch embedded in research and development design to achieve a more comprehensive understanding of the innovation's impact.

Research Methodology

Research Design

This study employed a Research and Development (R&D) methodology, comprising two main phases. Phase 1: Exploration and Design involved the identification of appropriate gamification elements and metaverse components to enhance learner motivation and improve English oral communication among university students in their role as global citizens. The insights garnered from this phase informed the development of a gamified metaverse learning environment. Phase 2: Implementation and Evaluation focused on assessing the efficacy of the developed learning environment in fostering learner motivation.

Phase 1: Exploration and Design

This phase employed a two-stage methodology to develop an innovative and sustainable language learning approach that integrates gamification within a digital metaverse environment.

Stage 1: Investigation of Appropriate Components for Innovation

This stage aimed to determine the essential components of a gamified metaverse-based learning innovation designed to enhance motivation and improve English oral communication among university students as global citizens. A 61-item questionnaire was developed and validated by experts. Data were analysed using Exploratory Factor Analysis (EFA) with Principal Component Analysis, considering Eigenvalues, percentage of variance, cumulative variance, and factor loadings. Orthogonal rotation via the Varimax method was also applied.

Participants in Phase 1

After the instrument was developed and validated, the researchers then administered it to 349 university students selected through simple random sampling from public universities across three regions of Thailand (Central, North, and Northeast), with six universities from each region to ensure comparable regional representation while keeping the study logistically manageable.

Findings from Exploratory Factor Analysis (EFA)

The study identified four key components deemed essential for designing a gamified metaverse-based learning innovation to enhance English oral communication and learner motivation among university students.

First, Gamification Design within the Metaverse Environment (21 variables; loadings .441–.758; eigenvalue 4.227) guided decisions about the overall game structure. In practice, this led to the use of avatars, points, quests, leaderboards, and virtual spaces that students could explore collaboratively within the metaverse platform.

Second, Enhancement of English Speaking and Listening Skills (13 variables; loadings .566–.813; eigenvalue 2.476) informed the design of communicative tasks. Accordingly, the innovation incorporated scenario-based role-plays, information-gap tasks, and listening–speaking missions that required real-time interaction and negotiation of meaning in English.

Next, Motivation Development (18 variables; loadings .468–.686; eigenvalue 1.471) shaped how the activities supported intrinsic and extrinsic motivation. Drawing on this component, the metaverse quests were structured to provide optimal challenge, meaningful goals linked to students' academic and professional futures, options for choice, and opportunities for collaborative problem-solving.

Ultimately, Feedback Mechanisms through Gamification (9 variables; loadings .516–.657; eigenvalue 1.092) determined the feedback design. In the final innovation, learners received immediate in-platform feedback (e.g., score updates, badges, progress bars) combined with teacher and peer feedback on their oral performance.

As illustrated in Figure 1, based on these findings, the innovation was thus translated into design principles that shaped the content, tasks, interaction patterns, and feedback systems of the gamified metaverse environment with the following essential characteristics:

1. It incorporates a gamification model within a digital metaverse environment.
2. It supports and enhances English speaking and listening skills.
3. It fosters both intrinsic and extrinsic motivation for English oral communication.
4. It delivers effective feedback through gamified mechanisms.

Figure 1

Essential Components from Factor Analysis of Innovation and Innovation Design

Four Essential Gamified and Metaverse Components & Design Concepts

Gamification in a Digital Metaverse Environment

Design Concept:
Innovation: Gamification & Digital Metaverse
Platform: Spatial
Learning Environment: Realistic 3D Space
Core Game Mechanics: Avatars, Learner Interaction, Point Accumulation, Leaderboards, Quests

English Oral Communication Enhancement

Design Concept:
Five-step learning design: Pre-task, Vocabulary, Grammar, Discussion, Reflection.

Four lessons: Routine, Leisure Time, Culinary Culture, Technology & Careers.

Motivation Strategies	Gamified Feedback
Design Concept: ***Gamification Elements:*** • Experience points (XP) • Leaderboards • Badges • Quests	Design Concept: ***Feedback Mechanisms:*** • Leaderboards - Display Player Score Rankings • Badges - Recognize Outstanding Players per Lesson

A prototype of the gamified metaverse-based learning innovation was created using the four aforementioned components as a guide. This version included virtual learning environments, task sequences, gamification mechanisms, and feedback features. This version was improved based on a pilot study after initially being assessed by an expert review.

The experts reviewed the designs, sample tasks, and metaverse environment using a structured evaluation form. Their feedback highlighted the need to (1) simplify some task instructions, (2) more explicitly align certain quests with targeted speaking and listening outcomes, and (3) adjust the distribution of rewards to better reflect task difficulty. In response, task descriptions were revised for clarity, additional language support (e.g., key phrases and examples) was embedded in the environment, and the scoring and badge system was recalibrated to ensure a clearer link between performance and rewards.

In order to assess usability and learner satisfaction, a pilot study was then carried out with 20 non-participating students who had similar characteristics in terms of language proficiency and technology background. After completing the program over the course of two sessions, participants raised specific problems, such as occasional lag in particular virtual rooms, inadequate time for some missions, and the need for clearer onboarding instructions for first-time users, which were identified through open-ended comments.

Based on these preliminary findings from the experts and the pilot study, multiple revisions were made prior to the full-scale deployment in Phase 2. Technical modifications were implemented to enhance stability and decrease loading durations; the sequence and timing of tasks were adjusted to provide additional opportunities for oral interaction; and an orientation module was incorporated to familiarize students with navigation, interaction tools, and game rules within the metaverse environment. The updated version of the innovation was subsequently adopted for implementation and assessment in the next phase of the study.

Stage 2: Design and Development of the Innovation

Based on the EFA results, a preliminary version of the innovation was developed and reviewed by five experts in English language teaching and educational technology for content validity and quality assurance. A prototype was subsequently tested in a pilot study involving 20 university students. Learner satisfaction was evaluated utilising mean and standard deviation. The prototype was subsequently revised and refined based on pilot findings, resulting in an improved version for implementation in the subsequent phase of the study.

Phase 2: Implementation and Evaluation

This phase investigated the effects of employing the gamified metaverse-based learning innovation developed in Phase 1 on motivation among higher education students in their capacity as global citizens.

Participants in Phase 2

Phase 2 involved 68 non-English-major undergraduate students from six public universities in three regions of Thailand (Central, Northern, and Northeastern). Two public universities were first randomly selected from stratified random sampling by region and university, followed by purposive sampling. Within each university, an invitation was distributed to non-English majors, and students who volunteered and met the inclusion criteria were purposively selected until the target sample size was reached. This process yielded 28 participants from the Central region, 22 from the Northern region, and 18 from the Northeastern region.

The sample size of 68 was planned to provide sufficient data for the intended quantitative analyses while remaining feasible in terms of scheduling and implementing the metaverse-based activities across multiple institutions. Participants met three inclusion criteria: (1) enrollment as undergraduate students in a Thai public university, to ensure a relatively homogeneous institutional context; (2) non-English-major status, as these students typically have fewer opportunities for oral English practice; and (3) basic technological competence (e.g., ability to use computers or tablets), which was necessary for effective participation in the digital learning environment.

A cohort group of 33 participants comprising 13 males and 20 females volunteered to take part in semi-structured interviews to investigate their perceptions of the gamified metaverse environment Creswell and Plano Clark (2018) suggest that the selection of approximately 50 percent of quantitative participants for qualitative follow-up would furnish sufficient depth for elucidating quantitative findings.

Research Instruments

Motivation Questionnaire

The primary instrument employed to measure learner motivation was an adapted version of the Language Learning Orientations Scale—Intrinsic Motivation, Extrinsic Motivation, and Amotivation Subscales (LLOS-IEA) developed by Noels et al. (2000). In its original form, the LLOS-IEA comprises 21 items rated on a 7-point Likert scale. In the present study, the scale was expanded and adapted to better reflect the learning context and research focus. All original items were retained, and additional items were developed to capture context-specific aspects of motivation related to technology-enhanced and metaverse-based learning. This process resulted in a 35-item questionnaire that continued to assess three broad motivational orientations: amotivation, extrinsic motivation (including identified regulation), and intrinsic motivation. Intrinsic motivation was further differentiated into three subtypes: (a) Knowledge—motivation derived from the desire to explore and understand new ideas or content; (b) Accomplishment—motivation stemming from the satisfaction of overcoming challenges or achieving goals; and (c) Stimulation—motivation driven by the enjoyment of engaging in exciting or stimulating activities.

In adapting the response format, the original 7-point Likert scale was modified to a 5-point scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). This decision was made to align with common practice in Thai higher education surveys, reduce cognitive load for respondents, and ensure consistent use of response categories across all instruments employed in the study. Although this change reduces the number of response options, the underlying continuum of agreement is preserved, allowing interpretation of the motivational constructs in a manner consistent with previous LLOS-IEA research. In this study, the scale is used to examine patterns of motivation within the sample rather than to make direct numerical comparisons with mean scores reported in studies using the original 7-point format.

To ensure content validity, the adapted questionnaire was reviewed by three experts in English language teaching. Each item was evaluated for clarity, relevance, and appropriateness of language. The Item-Objective Congruence (IOC) index was employed to assess content validity, with all items achieving IOC values of no less than 0.67. On this basis, the questionnaire was judged appropriate and valid for use in the present context. Moreover, reliability was checked using Cronbach's alpha, and it revealed reliability coefficients of .858.

Semi-structured Interview Guide

To collect qualitative data, a semi-structured interview guide was developed to explore students' motivation and learning experiences following their participation in a sustainable language learning innovation. This innovation integrated gamification within a digital metaverse environment to enhance learners' motivation and English oral communication skills in the context of global citizenship at the higher education level.

The interview guide comprised five open-ended questions, each designed to address specific aspects of the learners' experience. The first question focused on students' overall learning experience and aimed to identify elements of the learning environment that fostered motivation. The second question prompted participants to compare their experiences in the metaverse-based learning environment with traditional classroom settings. The third question explored perceived changes in learners' motivation to communicate in English following engagement with the innovation. The fourth question aimed to investigate the influence of the innovation on learners' extrinsic motivation. The final question invited participants to offer suggestions for improving the innovation, encompassing its overall effectiveness and areas for further development.

To ensure content validity, the interview questions were reviewed by experts in the fields of English language teaching and educational technology. To assess the validity of each question, IOC was employed. Every item achieved IOC values of 0.67 and higher. Questions that initially fell below this threshold were revised according to expert feedback prior to implementation in the study. The following are the sample interview questions: 1) Can you describe your experience using the gamified Metaverse environment for learning English communication? What aspects of it did you find most motivating? 2) Compare the differences between a metaverse learning environment and a traditional classroom? How are they different? and 3) How will the Metaverse environment benefit you in becoming a more effective communicator in your future studies or professional life?

Ethical Considerations

This study was reviewed and approved by the Research Ethics Review Committee for Research Involving Human Subjects of Chulalongkorn University (COA No. 352/67; Project Number: 670213). Before participants completed the questionnaire, they were informed about the purpose of the study, what they were asked to do, any possible risks or benefits, and their right to stop participating at any time without any negative consequences.

Those who agreed to take part provided written informed consent. Their answers were kept confidential and were combined with those of other participants in the report, so their identities were not revealed.

Data Collection

Spatial.io was employed as the metaverse platform to implement the intervention over four weeks. The platform provides 3D immersive environments in which users interact via avatars using voice, video, and text in settings such as virtual classrooms and meeting rooms. In this study, gamification was operationalized through specific mechanics. Quests were implemented as task-based speaking missions (e.g., information-gap role-plays, problem-solving discussions, short presentations) that required students to use English to achieve communicative goals aligned with lesson objectives. Many quests were framed around issues such as intercultural communication, international travel, or crises, encouraging learners to consider how English functions as a lingua franca and how their choices affect others in a global community. Successful completion of quests earned digital badges displayed in the digital environment to reinforce achievement, while a custom leaderboard recorded points for quest completion and target behaviors (e.g., initiating interaction, asking follow-up questions, using target vocabulary), thereby directly linking game progression to oral communication outcomes and to dispositions associated with responsible global citizenship.

Before implementation, the instructor participated in training on the use of Spatial.io and the gamified instructional design. This preparation included guided practice in navigating the platform, setting up virtual classrooms, monitoring student activity, addressing common technical issues, and following a written protocol outlining the sequence of activities, task instructions, and feedback guidelines. The protocol also specified explicit learning objectives related to global citizenship, such as using English to collaborate in technology-mediated international contexts, expressing opinions on globally relevant topics, and demonstrating respectful, ethical behaviour in online interactions.

The intervention consisted of four metaverse-based units, with one unit completed per week. The platform enabled students to complete the quests independently, with flexibility in time and location, and log data from the Spatial.io dashboard indicated that they spent approximately 90 minutes per unit per week. Each unit followed the same implementation protocol: (1) a brief orientation to the platform and weekly activities conducted by the instructor, (2) independent exploration and completion of speaking quests in the metaverse environment, and (3) a short debriefing and reflection. To ensure consistency across participating classes, the same lesson plans, task

descriptions, badge criteria, and leaderboard rules were used for all groups, and the instructor adhered to the written protocol and verified completion of required steps after each unit.

Following the four-week implementation, a motivation questionnaire was administered to 68 undergraduate students to measure their motivation after engaging with the innovation. Subsequently, semi-structured interviews were conducted with 33 participants who volunteered to participate from both maximum score improvement and minimal score improvement to obtain in-depth qualitative data on their learning experiences and perceived motivational changes.

Data Analysis

Quantitative data obtained from the motivation questionnaire were analysed using descriptive statistics, specifically mean and standard deviation, to identify overall trends in learner motivation. To interpret the mean scores, intervals were illustrated as in Table 1.

Table 1

Intervals of Mean and The Interpretation of Motivation in Learning English

Mean Score	Interpretation Level
4.51 – 5.00	Very High
3.51 – 4.50	High
2.51 – 3.50	Moderate
1.51 – 2.50	Low
0.00 – 1.50	Very Low

The resulting qualitative data from the semi-structured interview were analysed using thematic analysis supported by MAXQDA software. All interviews were transcribed verbatim and anonymized before analysis. The two researchers first familiarized themselves with the data through repeated readings and memo-writing, noting initial ideas and recurring patterns. An initial set of codes was then jointly developed and systematically applied across all transcripts.

To assess intercoder reliability, both researchers independently coded 20% of the transcripts using the shared code system, after which Cohen's Kappa was calculated, yielding $\kappa = 0.73$, indicating substantial agreement. Coding discrepancies were discussed until consensus was reached, and the codebook was refined accordingly. The agreed codebook was then used to code the remaining transcripts, and codes were grouped into broader themes through iterative reviewing, refining, and defining of thematic categories.

Trustworthiness was augmented through strategies incorporating rich description and researcher reflexivity notes, contingent upon the establishment of intercoder agreement.

Results

Quantitative Results

As shown in Table 2, the quantitative analysis of the motivation questionnaire indicated that students demonstrated a high overall level of motivation following engagement with the gamified metaverse-based learning innovation (M = 4.05, SD = 0.51). Among the various types of motivation measured, Identified Regulation recorded the highest mean score (M = 4.73, SD = 0.41), classified as "very high," suggesting that students strongly recognized the personal relevance and future value of learning English. Similarly, External Regulation (M = 4.53, SD = 0.51), Intrinsic Motivation – Knowledge (M = 4.51, SD = 0.60), and Intrinsic Motivation – Accomplishment (M = 4.50, SD = 0.58) all received "very high" ratings, indicating robust engagement driven by both external incentives and internal satisfaction derived from learning and achievement. Intrinsic Motivation – Stimulation received a slightly lower mean score (M = 4.30, SD = 0.65) but was still interpreted as "high," reflecting students' enjoyment of and interest in the learning experience. Notably, Amotivation had the lowest mean score (M = 2.07, SD = 1.48), categorized as "low," suggesting that learners exhibited minimal disinterest or feelings of helplessness in the learning process.

Table 2

Mean and Standard Deviation of Motivation in Learning English

Motivation	*M*	***SD***	Level
1. Intrinsic Motivation – Knowledge	4.51	0.60	Very High
2. Intrinsic Motivation – Accomplishment	4.50	0.58	Very High
3. Intrinsic Motivation – Stimulation	4.30	0.65	High
4. Identified Regulation	4.73	0.41	Very High
5. Introjected Regulation	3.68	0.98	High
6. External Regulation	4.53	0.51	Very High
7. Amotivation	2.07	1.48	Low
Overall	4.05	0.51	High

Qualitative Results

Analysis of the interview data revealed that the gamified metaverse-based learning innovation effectively cultivated and enhanced students' motivation. Three salient themes emerged from the qualitative data:

Enjoyment and Novelty of the Learning Experience

A majority of students reported a high level of engagement and enjoyment, largely attributable to the integration of gamification elements into the learning environment. Students articulated that learning no longer felt like passively attending a lecture but rather like "playing a game" with clearly defined goals, such as completing quests to progress through stages or competing on a leaderboard. These features fostered a sense of challenge and encouraged active learning. Additionally, creatively designed tasks, such as role-playing scenarios and podcast production, served as important instruments that prompted students to apply their language knowledge in meaningful and authentic ways, thereby practicing listening and speaking skills more effectively.

> "Learning in the Metaverse made me feel like I was playing a game, not studying. It made me want to keep playing." (S5)
>
> "The game was fun and very novel. It gave me new inspiration to learn." (S11)
>
> "It didn't feel like sitting through a lecture. It felt like I was in a game." (S8)
>
> "Using the Metaverse for learning made it more engaging. It helped me focus more on my English lessons." (S26)

Learning for Self-Development and Future Goals

Students demonstrated both intrinsic and extrinsic motivation. The enjoyable learning environment and challenging tasks promoted intrinsic motivation, encouraging students to participate willingly and independently. At the same time, students also identified a strong connection between developing English skills and achieving future goals, such as further education or career advancement. This reflects identified regulation, a form of extrinsic motivation where learners value the activity as personally meaningful. Students viewed English as a vital tool for self-development and life opportunities, which drove their commitment to improving their communication skills.

> "I feel like I want to develop myself for the future. For example, in the job market, if you can speak a third language, you can get language bonuses. So I want to speak and improve my skills for future work." (S7)

> "Personally, I had the chance to work in a hospital and use English. It allowed me to realize that the English I learned from the metaverse was practical." (S21)

> "Using English in the future is going to be essential. English will definitely be more necessary. Lessons should become more challenging over time, and we should keep improving ourselves." (S15)

Challenges and Suggestions for Improvement

Although students generally expressed positive attitudes toward the innovation, some technical and instructional challenges were noted. The most prevalent issues involved unstable internet connections, platform limitations, and the complexity associated with submitting assignments. Suggestions for improvement encompassed offering more diverse and challenging content, refining group assignment methods, and augmenting interaction with instructors.

> "The downside is that the system isn't very stable." (30)

> "It was too complex. The Spatial platform didn't provide clear instructions, so we ended up duplicating tasks, like submitting and reviewing assignments separately." (S10)

> "I think it would help to group students by similar language proficiency levels from the start. Sometimes the random grouping meant someone was way ahead, and that made communication difficult." (S20)

The quantitative and qualitative results offer evidence that supports that the gamified, metaverse-based innovation significantly improved motivation among students. The questionnaire results showed an overall high level of motivation ($M = 4.05$), with very high means for Identified Regulation and intrinsic motivation subscales, and low amotivation, indicating that students both enjoyed the learning activities and recognized their personal and future value. These patterns were reflected in the interview data, wherein students consistently characterized the experience as pleasurable, innovative, and similar to playing a game, emphasizing gamification elements and creative activities (such as role-plays and podcasts) as primary factors enhancing

engagement. At the same time, students' emphasis on self-development, career opportunities, and the practical usefulness of English in real-life contexts aligns closely with the high scores for Identified Regulation and other forms of extrinsic motivation. Finally, the challenges reported in interviews—such as technical instability, complexity of assignment submission, and group composition issues—help contextualize the quantitative results by suggesting factors that may have constrained motivation for some learners, especially in terms of sustained stimulation. Therefore, the integration of survey and interview findings reinforces the conclusion that the metaverse-based gamified environment successfully enhanced both intrinsic and extrinsic motivation, while simultaneously identifying opportunities for improvement.

Discussion

Enhancing Learner Motivation

The results strongly indicate that the gamified metaverse approach significantly enhances learner motivation in higher education, as supported by both quantitative and qualitative data. The high overall motivation score (M = 4.05, SD = 0.51) and, particularly, the "very high" scores in Identified Regulation, Intrinsic Motivation (Knowledge, Accomplishment), and External Regulation, alongside a "low" Amotivation score, align well with Self-Determination Theory (SDT) and gamification principles.

The findings from this study indicate that the implemented gamified innovation significantly enhanced learner motivation within a digital learning environment. Quantitative results from the motivation questionnaire revealed a particularly high score in Identified Regulation (M = 4.73, SD = 0.41), a form of extrinsic motivation wherein individuals recognize the personal value of an activity. This suggests that students perceived the skills they were developing as beneficial for their future academic and professional aspirations, a conclusion further supported by interview responses wherein students articulated the direct utility of effective English communication in digital contexts. This outcome aligns with Gardner's (1985) concept of Instrumental Orientation, which posits that long-term practical goals frequently drive language learning. Furthermore, these results are consistent with previous research, including that by Flores-Aguilar et al. (2023), who observed a significant increase in identified regulation through gamification, and Daliranfirouz et al. (2024), whose study with university-level EFL learners similarly found that gamification enhanced the perceived value of learning when aligned with personal goals.

In addition to extrinsic motivation, the study also demonstrated high levels of Intrinsic Motivation, specifically within the subcategories of Stimulation (M = 4.30, SD = 0.65), Accomplishment (M = 4.50, SD = 0.58), and Knowledge (M = 4.51, SD = 0.60). These scores suggest that students were motivated by the enjoyment derived from the learning experience, the satisfaction of overcoming challenges, and a genuine desire to acquire new knowledge. Interview data corroborated these quantitative findings, with students describing their experience as "fun" and "exciting," and noting that the missions and point-based rewards fostered a sense of "playing a game rather than studying". Such observations reinforce prior research highlighting gamification's capacity to enhance intrinsic motivation. For instance, Luarn et al. (2023) established a direct positive relationship between gamification elements related to achievement and immersion and learning motivation, mediated by basic psychological needs. Specifically, achievement-oriented features contributed to satisfying the need for competence, while immersive experiences supported the need for autonomy, both of which are reflected in the high scores for Accomplishment and Knowledge observed in the present study.

However, the extant literature on gamification's impact on intrinsic motivation is not entirely consistent. A meta-analysis by Li et al. (2024) concluded that while the overall effect size of gamification on intrinsic motivation is modest, it remains statistically significant. Conversely, experimental studies have presented varying results; Mekler et al. (2017) found that basic gamification elements, such as points, leaderboards, and levels, did not significantly influence intrinsic motivation or perceived competence, instead primarily increasing the quantity of output and suggesting their function as extrinsic incentives. Similarly, Jones et al. (2022) reported that while gamified classrooms enhanced students' perceived autonomy and competence, they did not significantly affect intrinsic motivation in terms of interest or enjoyment when compared to traditional classroom settings.

This observed inconsistency in the field can be explained by the Gamification Equilibrium framework proposed by Dah et al. (2023), which posits that many gamification initiatives fail due to superficial design—an overreliance on external rewards such as points and badges. Such approaches risk triggering the overjustification effect, wherein extrinsic rewards undermine pre-existing intrinsic motivation. The success of the innovation in this study appears to stem from its capacity to achieve a crucial balance between extrinsic elements, such as points and missions, and intrinsic motivational design, incorporating elements such as challenge and enjoyment. The students' notable remark that the experience "felt more like playing a game than attending a class" suggests that the innovation effectively

transcended mere superficial reward systems, thereby providing a genuinely engaging and intrinsically motivating learning experience.

Furthermore, this outcome can be interpreted through established gamification models, such as the GAFCC model proposed by Huang and Hew (2018), which identifies five core elements driving Motivation: Goals, Access, Feedback, Challenge, and Collaboration. The innovation successfully integrated these elements through the thoughtful design of its tasks, leaderboards, and group-based activities. These findings are also supported by López-Martínez et al. (2022), who observed high intrinsic motivation among university students when utilising gamified tools such as Kahoot, particularly within practice-based courses.

Finally, the very low level of Amotivation (M = 2.07, SD = 1.48) recorded in this study is indicative that the gamified metaverse learning environment fostered meaningful and engaging learning experiences. This low amotivation score implies that learners did not feel disengaged or perceive their efforts as futile, thereby further underscoring the positive and sustained motivational impact of the innovation within language learning contexts.

Instructional Challenges

A primary instructional challenge highlighted by the interview data was the perceived absence of real-time academic support. Unlike traditional classroom settings, where questions can be addressed immediately, learners in the metaverse environment often reported an absence of timely clarification, which consequently affected their motivation to persist with learning tasks. For some learners, this lack of immediate clarification appeared to create frustration and task avoidance, which likely reduced their motivation ratings relative to peers who experienced fewer difficulties. This pattern aligns with research on gamified language learning in Thai higher education, indicating that clear guidance and responsive support are essential factors for maintaining engagement and maximizing the motivational advantages of gamification (Abildina et al., 2023; Matyakhan et al., 2024). The absence of immediate communication channels between instructors and students can disrupt learning continuity, thereby leading to reduced engagement and motivation. During implementation, these issues should be generally handled with extra instruction rather than exclusion. The instructor ought to provide additional explanations during weekly orientations and debriefings, as well as repeat task instructions and platform procedures in the metaverse environment and through supplementary written prompts.

Furthermore, difficulties with group participation and formation emerged as a barrier. Students reported issues joining groups, such as arriving

late to find groups already full or formed. For instance, one participant noted having to improvise an extra chair for a group designed for four, which led to delays in completing the activity. Another participant expressed apprehension about joining existing groups for fear of disruption. These instances suggest that the self-directed nature of group formation inadvertently discouraged new social interactions, thereby limiting the potential for collaborative learning. This observation is consistent with Johnson and Johnson (2014), who found that highly structured cooperative learning promotes positive interdependence, individual accountability, and leads to better group processes and individual outcomes. In other words, unstructured group formation can impede participation and diminish the efficacy of cooperative learning. Therefore, future iterations of the innovation could thus profit from pre-assigned groups, more explicit role descriptions, and integrated channels for prompt instructor assistance (e.g., dedicated help spaces or office-hour slots within the metaverse).

Technical Issues

The qualitative data indicate that technical difficulties were not just inconveniences but factors that likely depressed some students' motivation scores, particularly for Intrinsic Motivation – Stimulation and, for a few learners, Amotivation. Beyond instructional concerns, technical difficulties constituted a significant barrier to learner motivation. Participants reported issues with platform stability, including unexpected log-outs, system lags, and the requirement for high-speed internet and advanced hardware for effective participation. Such limitations disrupted the flow of the metaverse activities and forced some students to repeat or abandon tasks. Similar patterns have been documented in online learning research, where unreliable connectivity and limited technological readiness are shown to hinder engagement and reduce the effectiveness of otherwise well-designed digital learning environments (Dewi et al., 2022). By contrast, studies of gamified instruction in contexts with more stable infrastructure, such as Matyakhan et al. (2024), tend to report consistently positive perceptions and strong motivational gains, suggesting that technical reliability is a key enabling condition for realizing the full benefits of gamification.

To compensate for these technical issues, the instructor should provide repeated explanations on how to log in, navigate Spatial.io, and troubleshoot common problems; allow extra time for students who are disconnected to rejoin and complete quests; and use alternative communication channels (e.g., learning management system, messaging) when in-platform communication fails. These modifications alleviated some of the adverse effects on motivation but were unable to entirely offset

ongoing connectivity challenges, particularly for students with restricted access to high-speed internet or appropriate devices. Collectively, the findings support the recommendations in the literature to consider infrastructure and access as fundamental elements of technology-enhanced language learning design, rather than solely external limitations (Matyakhan & Sukavatee, 2021).

Conclusion

This research demonstrates the significant potential of a gamified metaverse approach in enhancing motivation among global higher education learners in language acquisition. The innovation promoted high levels of intrinsic motivation (knowledge, accomplishment, stimulation) and extrinsic motivation through identified regulation, driven by the engaging, game-like experience and the perceived benefits for future personal and professional development. While technical and instructional improvements are necessary, the study confirms that integrating gamification within immersive metaverse environments creates a powerful and motivating learning space, thereby moving beyond traditional classroom limitations and effectively preparing learners to become competent global citizens.

Beyond these empirical findings, the study offers several practical contributions. For teacher training, it highlights the need to equip instructors with pedagogical and technological competencies to design, facilitate, and assess learning in immersive, gamified environments. For curriculum design, the findings support the integration of metaverse-based tasks as structured components of speaking and communication courses, aligning game mechanics (e.g., quests, rewards, avatars) with explicit learning outcomes. At the policy level, the results underscore the importance of institutional and national support for digital infrastructure, professional development, and innovation-friendly guidelines that enable the sustainable use of immersive technologies in English language education. Overall, the study confirms that integrating gamification within metaverse environments creates a powerful and motivating learning space that extends beyond traditional classroom limitations and supports the development of learners as competent global citizens.

Limitations and Suggestions for Future Research

While the findings of this study suggest that a gamified metaverse environment can enhance learner motivation, several limitations should be acknowledged.

First, the research employed a single-group design without a comparison or control group. As a result, causal inferences about the impact of the innovation are limited, and alternative explanations such as maturation, Hawthorne effects, or concurrent learning experiences cannot be fully ruled out.

Second, no pre-intervention baseline data on learners' motivation were collected, which restricts the ability to quantify individual change over time and to compare pre- and post-intervention motivational profiles.

Third, participation was based on voluntary recruitment and purposive sampling of non-English majors from six public universities, which may have introduced selection bias. Students who chose to participate may have been more motivated, more open to innovative learning environments, or more comfortable with technology than the wider student population.

Fourth, the study was conducted exclusively within the Thai higher education context, which limits the generalizability of the findings to other cultural, institutional, and linguistic settings. Replication in different countries and educational systems is therefore needed before broader claims can be made.

Fifth, the intervention period was relatively short (four weeks), which may not have been sufficient to capture longer-term patterns of engagement or the sustainability of motivational gains. The observed increase in motivation could partly reflect a novelty effect associated with first-time exposure to a gamified metaverse environment rather than a stable, enduring impact.

Sixth, some participants reported technical challenges, including unstable internet connectivity, platform glitches, and device constraints. These issues likely affected the learning experience for certain learners and may have influenced both their motivation and the extent to which they could fully engage with the tasks.

Finally, the study focused on self-reported motivational outcomes and did not include direct measures of language proficiency (e.g., standardized speaking tests or performance-based assessments). Consequently, the extent to which increased motivation translated into measurable gains in English oral communication remains unknown.

In light of these limitations, several directions for future research are recommended. Subsequent studies should employ more rigorous experimental or quasi-experimental designs, including comparison or control groups and pre–post measurements, to strengthen causal claims regarding the effects of gamified metaverse environments on learner motivation. Incorporating baseline and follow-up assessments of both motivation and language proficiency (e.g., oral performance tasks, rating scales, or

standardized tests) would provide a clearer picture of how motivational changes relate to actual communicative outcomes.

Future research should also address potential selection bias by using more diverse and representative samples, including students from different disciplines, institutions, and levels of technological readiness, as well as learners from non-Thai contexts. Cross-cultural comparative studies could help determine how cultural and institutional factors mediate the effectiveness of gamified metaverse approaches. In addition, extending the intervention over a longer period and incorporating delayed post-tests would allow researchers to distinguish short-term novelty effects from sustained motivational and proficiency gains.

Given the technical issues reported in this study, future work should systematically examine the impact of technological infrastructure, platform design, and technical support on learner motivation and engagement in metaverse environments. This may involve comparing different platforms, testing minimum technical requirements, and integrating in-platform support features. Finally, mixed-methods studies that combine self-report data, behavioural analytics (e.g., log data on time-on-task and interaction patterns), and performance-based assessments could offer a more comprehensive understanding of how learners experience gamified metaverse environments and how these experiences translate into both motivational and linguistic development.

Implications for Global Higher Education Learners

This gamified metaverse approach offers a viable and effective method for enhancing motivation among non-English major higher education students. Creating an engaging and less intimidating "safe zone" for language practice can significantly contribute to their preparedness as global citizens. The immersive, interactive nature encourages regular language usage, which is critical for developing sustainable language learning habits. The perceived benefits for future studies and careers further reinforce a proactive approach to language acquisition.

Acknowledgements

This research project was funded by the Fundamental Fund, Chulalongkorn University, Bangkok, Thailand in 2024 academic year.

About the Authors

Pornpimol Sukavatee: A professor at the Department of Curriculum and Instruction, and a member of Center of Excellence in Educational Invention and Innovation, Chulalongkorn University.
Jintavee Khlaisang: A professor at the Department of Educational Technology and Communications, and a member of Center of Excellence in Educational Invention and Innovation, Chulalongkorn University.

References

Abildina, S., Sardarova, Z., Ozgambayeva, R., Janzakova, S., Kalykbayeva, A., Bitikova, A., & Abdol, E. (2023). The effect of variables associated with the digital learning environment on students' motivation and attitudes. *International Journal of Education in Mathematics, Science, and Technology (IJEMST), 11*(6), 1497–1517. https://doi.org/10.46328/ijemst.3781

Agustini, K., Putrama, I. M., Wahyuni, D. S., & Mertayasa, I. N. (2023). Applying gamification technique and virtual reality for prehistoric learning toward the metaverse. *International Journal of Information and Education Technology, 13*(2), 247–256. https://doi.org/10.18178/ijiet.2023.13.2.1802

Akçay, K., Altinay, F., Altınay, Z., Daglı, G., Shadiev, R., Altinay, M., Adedoyin, O. B., & Okur, Z. G. (2024). Global citizenship for the students of higher education in the realization of sustainable development goals. *Sustainability, 16*(4), 1604. https://doi.org/10.3390/su16041604

Boudadi, N. A., & Gutiérrez-Colón, M. (2020). Effect of gamification on students' motivation and learning achievement in second language acquisition within higher education: A literature review 2011–2019. *The EUROCALL Review, 28*(1), 57–69. https://doi.org/10.4995/eurocall.2020.12974

Chou, Y.-K. (2013, October 11). *The 8 core drives of gamification (3): Empowerment of creativity & feedback*. Yu-kai Chou: Gamification & behavioral design. https://yukaichou.com/gamification-study/8-core-drives-gamification-3-empowerment-creativity-feedback/

Creswell, J. W., & Plano Clark, V. L. (2018). *Designing and conducting mixed methods research* (3rd ed.). SAGE.

Dah, J., Hussin, N., Zaini, M. K., Helda, L. I., Ametefe, D. S., Aliu, A. A., Suqi, W., & Caliskan, A. (2023). Gamification equilibrium: The fulcrum for balanced intrinsic motivation and extrinsic rewards in electronic learning systems. *International Journal of Serious Games, 10*(3), 83–116. https://doi.org/10.17083/ijsg.v10i3.633

Daliranfirouz, E., Amiryousefi, M., Geld, R., & Nejad Ansari, D. (2024). Gamification and the duality of extrinsic and intrinsic motivation. *Journal of English Language Teaching and Learning, 16*(33), 135–150. https://doi.org/10.22034/elt.2024.60736.2615

Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior.* Springer Science & Business Media. https://doi.org/10.1007/978-1-4899-2271-7

Dewi, S. A., Sadikin, A., & Hamidah, I. (2022). The effect of blended learning on student motivation and learning outcomes: A meta-analysis. *Education and Information Technologies, 27*(6), 8201–8218.

Flores-Aguilar, G., Iniesta-Pizarro, M., & Fernández-Río, J. (2023). "PE Money Heist": Gamification, motivational regulations and qualifications in physical education. *Apunts Educación Física y Deportes, 151,* 36–48. https://doi.org/10.5672/apunts.2014-0983.es.(2023/1).151.04

Gardner, R. C. (1985). *Social psychology and second language learning: The role of attitudes and motivation.* https://ci.nii.ac.jp/ncid/BA00118070

Heryadi, Y., & Muliamin, K. (2016). Gamification of M-learning Mandarin as second language. In *2016 1st International Conference on Game, Game Art, and Gamification (ICGGAG)* (pp. 34–37). IEEE. https://doi.org/10.1109/ICGGAG.2016.8052645

Huang, B., & Hew, K. F. (2018). Implementing a theory-driven gamification model in higher education flipped courses: Effects on out-of-class activity completion and quality of artifacts. *Computers & Education, 125,* 254–272.https://doi.org/10.1016/j.compedu.2018.06.018

Huang, W. H.-Y., & Soman, D. (2013). *A practitioner's guide to gamification of education.* https://inside.rotman.utoronto.ca/behaviouraleconomicsinaction/files/2013/09/GuideGamificationEducationDec2013.pdf

Johnson, D. W., & Johnson, R. T. (2014). Using technology to revolutionize cooperative learning: An opinion. *Frontiers in Psychology, 5,* 1156. https://doi.org/10.3389/fpsyg.2014.01156

Jones, M., Blanton, J. E., & Williams, R. E. (2022). Science to practice: Does gamification enhance intrinsic motivation? *Active Learning in Higher*

Education, 24(3), 273–289. https://doi.org/10.1177/14697874211066882

Kapp, K. (2012). *The gamification of learning and instruction: Game-based methods and strategies for training and education.* Pfeiffer.

Kye, B., Han, N., Kim, E., Park, Y., & Jo, S. (2021). Educational applications of metaverse: Possibilities and limitations. *Journal of Educational Evaluation for Health Professions, 18,* 32. https://doi.org/10.3352/jeehp.2021.18.32

Laffey, D. (2022). Gamification and EFL writing: Effects on student motivation. *The English Teachers Association in Korea, 28*(1), 23–42. https://doi.org/10.35828/etak.2022.28.1.23

Lee, S. M. (2023). Second language learning through an emergent narrative in a narrative-rich customizable metaverse platform. *IEEE Transactions on Learning Technologies, 16*(6), 1071–1081. https://doi.org/10.1109/TLT.2023.3267563

Lenkaitis, C. A., & Loranc-Paszylk, B. (2021). The role of intercultural virtual exchanges in global citizenship development. *Journal of International and Intercultural Communication, 15*(2), 222–234. https://doi.org/10.1080/17513057.2021.1876241

Li, L., Hew, K. F., & Du, J. (2024). Gamification enhances student intrinsic motivation, perceptions of autonomy and relatedness, but minimal impact on competency: A meta-analysis and systematic review. *Education Tech Research Dev, 72,* 765–796. https://doi.org/10.1007/s11423-023-10337-7

Li, M., & Yu, Z. (2023). A systematic review on the metaverse-based blended English learning. *Frontiers in Psychology, 13*. https://doi.org/10.3389/fpsyg.2022.1087508

López-Martínez, A., Meroño, L., Cánovas-López, M., García-de-Alcaraz, A., & Martínez-Aranda, L. M. (2022). Using gamified strategies in higher education: Relationship between intrinsic motivation and contextual variables. *Sustainability, 14*(17), 11014. https://doi.org/10.3390/su141711014

Luarn, P., Chen, C.-C., & Chiu, Y.-P. (2023). Enhancing intrinsic learning motivation through gamification: A self-determination theory perspective. *The International Journal of Information and Learning Technology, 40*(5), 413–424. https://doi.org/10.1108/IJILT-07-2022-0145

Matyakhan, T., Chaowanakritsanakul, T., & Santos, J. A. L. (2024). Implementing gamification to enhance reading engagement and reading comprehension of Thai EFL university students. *LEARN*

Journal: Language Education and Acquisition Research Network, 17(1), 212–239. https://so04.tci-thaijo.org/index.php/LEARN/article/view/270383

Matyakhan, T., & Sukavatee, P. (2021). Development of an online course using situated learning and ESA method to enhance English oral communication ability of university administrative staff. *An Online Journal of Education, 16*(2), OJED1602014. https://doi.org/10.14456/ojed.2021.30

Mekler, E. D., Brühlmann, F., Tuch, A. N., & Opwis, K. (2017). Towards understanding the effects of individual gamification elements on intrinsic motivation and performance. *Computers in Human Behavior, 71,* 525–534. https://doi.org/10.1016/j.chb.2015.08.048

Muthmainnah, Al Yakin, A., & Ibna Seraj, P. M. (2023). Impact of metaverse technology on student engagement and academic performance: The mediating role of learning motivation. *International Journal of Computations, Information and Manufacturing (IJCIM), 3*(1), 10–18. https://doi.org/10.54489/ijcim.v3i1.234

Mystakidis, S. (2020, July). *Distance Education Gamification in Social Virtual Reality: A Case Study on Student Engagement* [Conference paper]. *Proceedings of the 11th International Conference on Information, Intelligence, Systems and Applications (IISA 2020).* IEEE. https://doi.org/10.1109/IISA50023.2020.9284417

Mystakidis, S. (2022). Metaverse. *Encyclopedia, 2*(1), 486–497. https://doi.org/10.3390/encyclopedia2010031

Noels, K. A., Pelletier, L. G., Clément, R., & Vallerand, R. J. (2000). Why are you learning a second language? Motivational orientations and self-determination theory. *Language Learning, 50*(1), 57–85. https://doi.org/10.1111/0023-8333.00111

Partnership for 21st Century Skills. (2019). *Framework for 21st century learning definitions*. Partnership for 21st Century Skills. http://static.battelleforkids.org/documents/p21/P21_Framework_DefinitionsBFK.pdf

Pintrich, P. R., & Schunk, D. H. (1996). *Motivation in education: Theory, research, and applications*. Prentice Hall.

Rupavijetra, P., & Rupavijetra, P. (2020). Study the activities model of the student mobility "TWINCLE Program" for promoting global citizenship and internationalization for Japanese students of Chiba University, Japan. *CMU Journal of Education, 4*(1), 1–15.

Sailer, M., Hense, J., Mandl, H., & Klevers, M. (2013). Psychological perspectives on motivation through gamification. *Interaction Design and Architecture(s), (19),* 28–37. https://doi.org/10.55612/s-5002-019-002

Smart, J., Cascio, J., & Paffendorf, J. (2007). *Metaverse roadmap: Pathway to the 3D web.* Acceleration Studies Foundation.

Tarsoly, E., & Ćalić, J. (2022). Language learning and community engagement for global citizenship. In *Global citizenship in foreign language education* (pp. 267–287). Routledge. https://doi.org/10.4324/9781003183839-16

Toda, A. M., Oliveira, W., Klock, A. C., Palomino, P. T., Pimenta, M., Gasparini, I., Shi, L., Bittencourt, I., Isotani, S., & Cristea, A. I. (2019, July 15–18). A taxonomy of game elements for gamification in educational contexts: Proposal and evaluation. *2019 IEEE 19th International Conference on Advanced Learning Technologies (ICALT).* https://doi.org/10.1109/ICALT.2019.00028

UNESCO. (2022). *Strategy for technical and vocational education and training (TVET) 2022–2029: Transforming TVET for successful and just transitions*. UNESCO. https://unesdoc.unesco.org/ark:/48223/pf0000380899

United Nations. (2020). *The sustainable development goals report 2020.* United Nations. https://unstats.un.org/sdgs/report/2020/The-Sustainable-Development-Goals-Report-2020.pdf

Van Roy, R., & Zaman, B. (2018). Need-supporting gamification in education: An assessment of motivational effects over time. *Computers & Education, 127,* 283–297. https://doi.org/10.1016/j.compedu.2018.08.018

Werbach, K., & Hunter, D. (2012). *For the win: How game thinking can revolutionize your business.* Wharton Digital Press.

Werbach, K., & Hunter, D. (2015). *Gamification toolkit.* Wharton Digital Press.

Zhang, X., Chen, Y., Hu, L., & Wang, Y. (2022). The metaverse in education: Definition, framework, features, potential applications, challenges, and future research topics. *Frontiers in Psychology, 13.* https://doi.org/10.3389/fpsyg.2022.1016300