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Gamified Framework of Language Literacy Based on Anthropomorphism Cultural Representation Game Design

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ABSTRACT: Digital game-based learning (DGBL) offers opportunities to support Malay language literacy among primary school students. However, designing digital learning games that address learners' needs while incorporating appropriate game design elements and cultural representation remains a challenge. This study aims to develop a user-centred framework for Malay language literacy learning through culturally contextualized digital game design. The study involved 30 primary school students aged 7–9 years from private school in Sarawak. Data were collected through two experiments involving the use of existing digital learning games, observation, checklist evaluation, and ideation sketching. The qualitative data from the ideation activities were analysed thematically to identify learners' design preferences. The findings highlighted preferences for anthropomorphic animal characters, a forestry-themed environment, vibrant colours, and reward elements such as badges. The findings, together with the analysis of existing games and relevant literature, informed the proposed framework and its user specifications. The framework integrates self-paced learning, game content, user interaction, cultural user interface design, innovative game design, feedback mechanisms, game mechanics, learnability, and user experience. This study contributes a user-centred and culturally contextualized design framework to guide the development of digital learning games for Malay language literacy. However, its effectiveness in improving students' language proficiency requires further evaluation through prototype implementation and empirical testing.

KEYWORDS: Game framework, Game mechanisms, Language learning, Game design

INTRODUCTION

The integration of digital technologies into education has increasingly transformed conventional learning strategies by introducing innovative ways of delivering information through engaging and gamified learning environments The implementation of digital learning game that combines the immersive and interactive aspects of gaming contribute in the user's learning performance. The use of digital learning games in subjects such as mathematics, science, and language learning has become more common among primary school students. Previous studies have found that these games can positively influence students' skills, attitudes, and motivation towards learning (Dwi Prastiwi & Lestari, 2025; Usman et al., 2025).

Thus, it aligns to the educational strategies of curriculum in improving the language proficiency among the students (Ong Long et al., 2025). The interactivity of digital learning game can enhance the student's engagement and learnability that lead the learning to be more enjoyable. Thus, this study focuses on strengthening primary students' language literacy through the development of a framework for digital learning game that implements the game mechanics and gamified environments. The development of framework employs self-paced learning, Malay language alignment, cultural user interface (UI) design, game dynamics and game mechanics. These aspects have influenced the creation of gamified experience in improving language proficiency. Together, these elements provide a basis for designing a gamified learning experience that supports the development of language proficiency.

Several researchers have examined how digital learning games contribute to learning alongside the increasing use of touchscreen technologies such as smartphones and tablets. Despite these benefits, the use of mobile game applications among young learners may raise concerns about prolonged screen exposure, which can cause eye strain and encourage excessive gaming (Ongoro & Fangjiang, 2023). Poorly controlled gaming habits can also affect their social interaction as they may spend less time communicating and engaging with people around them. These factors may contribute to gaming addiction among young learners.

Beyond that, the psychomotor skills in operating the touchscreen technologies should be emphasized too in the research study. The young learners have limited capabilities in controlling their hand and finger movements, eye coordination compared to the adults due to their development of muscle growth and cognitive skills. They are at the age of exploring what they see, hear and touch in the context of exposure to their surroundings

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as the learning processes (TOPU, 2024; Kharisma et al., 2024). Thus, their capabilities in ensuring the precise movements while operating the technologies can address the concerns of the technology usage in education, specifically for touchscreen technology.

Therefore, play has been identified as the most significant activity that offers beneficial impacts on emotional, social, physical and cognitive skills for the children to unleash their potential and foster intellectual development from the early stage of learning. Thus, digital learning games can provide a supportive learning environment that allows children to explore, experiment, and develop their cognitive skills without the fear of failure. Besides, the term of play serves as a natural way for children to express their thoughts and feelings when the children engage in a group play (Nadir, 2024; Sharma et al., 2024; Wichaidit & Wichaidit, 2024). They are able to learn in navigating relationships, share responsibilities and develop a sense of community where these are the elements for intellectual growth and discovery of their capabilities and limits.

Therefore, digital learning games should be integrated into classroom teaching with careful consideration, as their potential to support learning may depend on how they are designed and implemented. Teachers may face challenges in implementing gamified learning activities due to limited time and the need to accommodate the different learning needs of students (Nurzhanova et al., 2023; Ramli & Mohamad Arsad, 2023). Maintaining individual student attention becomes increasingly challenging in classrooms with a large population of students. Furthermore, the instructional game design developed should correspond to the language learning curriculum that is suitable for primary education. It is essential that the instructional game design provides sufficient information for the students to enhance their learning process.

Besides, the game design and development that are suitable for the learning style and cognitive abilities of young learners has remained unaddressed. Maintaining a balance between fun and learning is a major challenge for the developers to fit into the user preferences that may cause them to lose interest in learning. If the digital game is designed to be too educational, it may cause them to suspend the gameplay, meanwhile if it is too entertaining, it may cause the deliverance of information of learning outcomes to be failed. Poorly balanced game design may cause frustration or boredom among young learners, which can affect their engagement in the learning activities (Kristensen et al., 2024: Ishak et al., 2023). Theame should be designed around the language curriculum with effective game mechanics included to make the learning activities more engaging and interactive.

Furthermore, existing traditional teaching and learning approaches may not motivate the young learners, specifically primary students to engage in language education. As this research study focuses on primary students, the focus group of learners would be involving the students of seven to nine years old to identify their needs in improving the educational strategies. Hence, digital learning games can be integrated into the school curriculum to introduce innovative learning approaches while also supporting students' motivation to learn. Digital learning games can also help students develop problem-solving skills by encouraging them to make decisions during the learning activities. By assisting the students to stimulate their cognitive skills through engaging activities and playing at the same time, the design of the games will incorporate mechanics and dynamics related to their developmental and emotional growth.

RESEARCH MOTIVATION

Studies on primary students in Sarawak State of Malaysia related to digital learning game indicate an increase in engaging and motivating the gamified learning experience. However, the language literacy in Malay language has been focused in this research study where the primary students are having difficulties in mastering the language proficiency. This happens due to the lack of fundamental knowledge and the dominance used of dialect languages are more focused rather than applying standard Malay language in their daily lives (Banseng et al., 2023; Othman et al., 2022). For example, some students primarily use Bahasa Melayu Brunei, Bahasa Melayu Sarawak, and other 40 more local dialects in their daily communication. Adjusting their spelling and verbal communication to conform to standard Malay language conventions has therefore become a motivation for this research, which aims to enhance students' Malay language proficiency. Meanwhile, there is also a lack of clarity on suitable game classification models and framework, focusing on the game design for primary students based on their self-paced learning. Thus, specifications of the game design to develop the framework that can accommodate the use of technology and development enable researchers to align the learning contents and structures with the Malay language.

LITERATURE REVIEW

Due to the diversity of the research study on digital learning game, it was important to emphasize on the highlighted elements contributing to the framework development. There is a growing concern on preparing the sufficient information on teaching and learning to enhance the opportunities for the students in acquiring the necessary knowledge effectively. In accordance with the Malaysian Education Blueprint 2026–2035, the study focuses on identifying learning techniques that can help improve students' proficiency in writing, spelling, and reading (Ministry of Higher Education, 2026). To address this need, this research study proposes the development of a framework that integrates a gamified learning environment, anthropomorphic characters as representations of local culture, and learning techniques to enhance user experience while supporting both language literacy and cultural learning.

Digital Learning Games

Since the 1980s, researchers have studied various skills by using games in improving educational strategies. The approach of gamified learning through games was not only just for learning but also provided the learners with enjoyment and engagement throughout the learning activities (Fu & Ismail, 2025; Patrocinio-Braz & Martín-Del-pozo, 2025). This led to the creation and development of digital learning game by identifying the specified user preferences, game design, human-computer interaction and edutainment to be implemented in teaching and learning.

As the communication skill among the students is a critical area of focus in education, the proficiency in mastering language literacy should be emphasized in this research study. With adequate practices and command of language, the students are also able to acquire knowledge conveniently and apply them in daily lives effectively. Thus, the implementation of digital learning games as the teaching strategies have brought innovation in interactivity of teaching and learning processes (Bayrak, 2025; Reer et al., 2025; Yau et al., 2025). By incorporating game elements in gamified learning environments, the students would feel motivated to venture into mastering the language literacy.

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The use of digital resources to engage students in learning are replacing the old ways of teaching from traditional into conventional strategies. Thus, the digital learning game has positively affected academic performances through the adaptation of digitalization and current learning techniques. The gamified learning technique for language literacy contributes to the enjoyment, entertainment, accomplishment and competitiveness (Koughan & Lee, 2025; Chowdhury et al., 2024; Kazu & Kuvvetli, 2024). These advantages may greatly affect the changes of nature in education as they are beneficial for the students. Since game design should correspond with the learning objectives, the development of content, rules, and game mechanics helps determine the players' objectives and how they interact within the game environment.

Therefore, by combining the game mechanics and game dynamics could create the enjoyment and engagement, ensuring an immersive learning experience in gamified environments. Game mechanics define how players would interact with the game system through different levels or challenges in the game. Then, the players would earn in-game rewards for completing the missions or tasks given. The immediate responses to the player's actions on the incorrect answers would improve their motivation to answer correctly. In fact, by implementing the game dynamics would describe the emotion and experiential effects that focus on how the players feel and act while in the gameplay.

Innovative Game Design

Game design is the process of creating the game contents, gameplay, game rules and game mechanics to ensure the engaging experience and through interactive learning for the players. The continuation in playing games absolutely affects the user experience during the gameplay by providing instructional contents that can enhance the learning performances. As the role of game design in education is crucial in enhancing the learning experience, digital learning game often promotes critical thinking and problem-solving among the players, specifically for students (Kristensen et al., 2024; Wiboolyasarin & Jinowat, 2024). Based on the combination of creativity, research study and revolution of technologies nowadays, game elements emphasize on the effective learning experiences. Thus, game design impacts the art style, technology usage, game storytelling, emotions and user experience of the players.

One of the main components of game design is creating a game concept with a theme. The idea of creating digital learning game that aligned to the learning objectives were needed to improve language literacy. Besides, in a way to improve, the research study should be focusing on the fundamental of game genres that are suitable for different age and learning techniques. In order to create an engaging learning experience, choosing the game genre with an effective theme that specified towards users' needs and preferences should be highlighted in the contextual learning (Jawad, 2025; Peng & Bai, 2025). For example, role-playing, adventure, strategy and puzzle games might influence the development of educational games by adding the sense of a gamified environment, game concept and theme as the backbone.

Additionally, themes that incorporated familiar cultural aspects and fantastical elements can enhance the students' motivation to learn. The cultural environment inspired by the traditional anthropomorphic characters and folklore might not only focus on language literacy skills but also foster cultural preservation from such a young age. Therefore, the storyline and narrative are the main components of game design. Through the ideation of storyline, it provided the imaginative thinking of the players on how the gameplay could be accomplished (Yodovich et al., 2025; Bayrak, 2025; Pratiwi et al., 2025; Sinaga et al., 2023). In fact, the narrative served as a guidance in structuring the gameplay to help the players in understanding the game flow throughout the plot twist and revelations while maintaining their interests and engagement of playing. Hence, by creating memorable experiences through captivating narrative with a story rooted in cultural themes can enhance the emotional impact on the digital learning game development.

As game challenges require few strategies and skills to solve the tasks given, providing the obstacles are needed in the digital learning game. Adding layers to complexity might encourage the motivation towards the gameplay for language literacy, which the players could experience learning within a gamified environment. In educational game structures, the challenges were often aligned to the learning objectives, which encouraged the players to apply their cognitive skills actively (Nisa', 2025; Prastiyo et al., 2026; Sukamto et al., 2025). Obstacles to be solved could take many forms such as puzzles, quizzes and navigating mazes to encourage players in thinking critically and solving those problems in the fun and engaging ways of learning.

Moreover, game design provided the reward system in the game development. As it is defined as the earning points that involve badges, unlocking new levels and obtaining new items after completing tasks or reaching the milestones in the games. By recognizing the specific accomplishments in the games, the badges served as visible benchmark of progress and expertise for the players to aim mastery, specifically in improving the language literacy skills (Özdemir, 2025; Lashari et al., 2024; Rahmadani et al., 2024). The digital learning game created the opportunity for the students to learn effectively through interactivity within a gamified environment where they could participate actively.

Thus, game design is crucial to be discussed in the research study as it integrates the game contents, gameplay, rules and game mechanics. A well-designed game offers an immersive gamified environment that captivates, engages and motivates the students to participate in the learning process. Through structured challenges that align to the learning objectives, the digital learning game can reinforce knowledge and develop critical thinking skills among the students.

Cultural User Interface (UI) Design Through Anthropomorphism

Based on the game design, the UI design has been highlighted in the research study as the main element to attract learners in encouraging the learning language. As language and culture are closely connected, understanding the culture can help people communicate and understand the language more effectively. Therefore, by incorporating the cultural elements into developing the UI design might help the students to connect with the linguistic skills in their cultural environment.

In addition, the cultural immersion within a gamified environment might simulate learning in the classroom environment to be digitalized. Through the implementation of digital learning game, teaching and learning could be transformed to be more interactive and provided active participation among the students. For example, with the use of traditional art forms, colours, patterns and imagery that could reflect the symbols and traditions (Ekawardhani et al., 2025; Husain & Prentice, 2025; Rahman et al., 2025; Yang & Hong, 2025). As the Sarawak State of Malaysia has such a lot of unique cultural aspects and dialects, creating the interface to be visually appealing should be discussed in the research study. The adaptation of cultural contexts into digital learning game suited the cultural norms. Moreover, by reflecting the relevant folklore, stories or legends into the game

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narrative could enhance the immersion and engage them to learn language literacy. It was not limited to language learning only, but it might improve the knowledge on cultural aspects as well.

Therefore, character design as one of the game elements that represented the cultural aspects of ethnicity or places could be implemented in the game design. The character design itself influenced the player's connection to the game world. A lot of character designs such as stylized art style, western art style, cyberpunk art style and anthropomorphic style could be implemented in the game design that suited with the players' ages and learning styles (Fu et al., 2025; Karaman, 2025).

As this research focused on anthropomorphic character design, Sarawak state of Malaysia has the cultural representative of animals in every district or city. Anthropomorphic character design referred to the attribution of human characteristics such as emotions, behaviors, roles and communication styles that were related to non-human entities, particularly for animals (Yang & Hong, 2025). In designing the UI, these anthropomorphic characters represented the guides, narrators, avatars or symbols that connected the interaction between the system and players. In Sarawak state, animals held a strong cultural and symbolic influence across different districts and communities. For example, the hornbill was widely recognized as a state of symbol associated with prestige, protection and unity. Thus, incorporating the animals into anthropomorphic character design allowed the game developers to anchor the UI elements in familiar cultural references.

When an animal associated with a specific Sarawak district, it communicated the local identity where the players intuitively associated the characters with places, values and narratives. From the UI design perspective, anthropomorphic characters might improve approachability for the younger users especially children as the novice game players (Rahman et al., 2025; Yang & Hong, 2025). These kinds of animal characters reflected familiarity in local symbolism by merging local identity with human characteristics.

Learnability of Design Principle

Learnability in design principles refers to how easily new users can understand and use a system during their initial interactions. It focuses on reducing the cognitive effort needed to interpret UI design with functionalities by emphasizing clarity, logical organization, and intuitive interaction. By minimizing confusion and uncertainty, a learnable design allows users to begin tasks efficiently without the need for extensive training or additional guidance (Badkook et al., 2025; Lee et al., 2025; van Rozen, 2025).

Learnability contributed to maintaining engagement by enabling users to quickly grasp the system's functionalities. The features provided in the developed system encouraged them to be more familiarized, in which they could perform tasks efficiently and focus on achieving their goals rather than navigating or figuring out the system (Gulzar & Ansari, 2025). This interaction enhanced the overall user experience for the users to operate the system continuously.

The development of the system helped users to build clear expectations about how the UI design would respond to their actions. This factor might increase the confidence and reduce the multiple errors. Timely and informative feedback further supported this process by showing users what was happening in the system, confirming their actions, and guiding them when mistakes occurred.

User Experience of Digital Learning Game

The development of digital learning game is required to validate the framework where the users will experiment the interaction of the game system. In order to validate the user experience, every aspect of digital learning game should be implemented to fulfil the users' needs. For instance, the user interaction, usage of technology, engaging UI design, the gameplay, learning contents, game mechanics and game dynamics would be the main focus in the research study.

In the game development process, various 2D and 3D objects are used to support the game mechanics and game environments. These objects enable the players to interact and conduct the gaming experience while playing and learning both at the same time. As the menu design shows the importance of functionality to be performed by the players, they are able to explore the game by transitioning between game levels, adjusting the game settings and customizing the options based on their preferences (Peng & Bai, 2025).

Therefore, factors to be considered in the game menu design and principles of good design have been emphasized where the menu itself should be user-friendly and visually appealing. Thus, these factors are able to guide the users and provide them with easy access to other layouts within the game. The effective use of menu design could significantly enhance the game accessibility and user experience as well. Especially, since the vast majority of users were focusing on children, the challenges on system interaction should be easy for them to operate (Gulzar & Ansari, 2025; Qi & Xu, 2024). Complex system interaction might cause them to suspend the gameplay and affect their learning performances through the use of digital learning. The integration of gamified components could be visually presented to enhance their interests in learning while playing in the virtual world.

Beforehand, previous studies on the feedback of users have been conducted for self-paced learning contents based on their preferences. Hence, these preferences would serve as a reference to develop the digital learning game and provide them information on learning contents. Through the challenges and activities provided for the learners, these could enhance their cognitive skills by encouraging them to explore and solve the tasks within the game (Cai et al., 2024; Parthasarathy et al., 2023).

Self-Paced Learning

Learning approaches have moved towards self-paced learning, which allows learners to manage their own study based on their abilities, schedules, and learning preferences. With the increasing use of digital technology, learners can have more flexibility in managing their learning at their own pace. Therefore, self-paced learning can be useful when learners have different abilities, needs, and ways of learning (Fernando et al., 2025; Shalini Roy & Gandhimathi, 2024).

Digital technology has also made self-paced learning easier to use in education. Through digital learning platforms, learners can access learning materials, activities, and assessments at a time and pace that works for them. They can also go back to previous content when they need more time to understand a topic or practice a particular skill. This flexibility allows learning to take place beyond the traditional classroom and gives learners more control over how they learn (Siregar & Winarsih, 2025). Therefore, self-paced learning can be a useful approach in digital learning environments. Learners can repeat questions, review the content, and move to the next activity at their own pace. This is particularly useful for language learning, as some learners may need more time to learn vocabulary, understand sentence structures, and practice using the language.

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As learners have diverse learning styles where some of them learn through visuals, auditory and hands-on activities, self-paced learning game could be developed. The integration of interactive animations, voice input and usage of technology enable the students to experience the various activities (Fu et al., 2025; Gulzar & Ansari, 2025; Hasna et al., 2025; Hemraj, 2025). For self-paced learning to be effectively implemented, the main considerations of their learning styles, user interaction, usage of technology, visually appealing UI design, learning contents that aligned to the Malay language and gamified environments that provided animation, anthropomorphic character design with cultural aspects could make the learning experience more relatable.

METHODOLOGY

This study emphasizes the use of a user-centred design approach in developing a framework for digital learning game in language literacy, comprising the four phases that consisted of i) analysis, ii) design, iii) implementation and iv) evaluation. The framework would be developed with a primary focus on two phases of analysis and design.

Analysis and Design Phase

The initial phase involved in assessing the users which were the primary school students as the respondents at the age of seven to nine years old. These students were familiar with the use of touchscreen technologies such as tablets, iPads and smartphones to learn and interact with the learning systems developed. This study focused on the 30 primary students from Sarawak State of Malaysia that involved private school located at Sibu to acquire the user requirements. Most of the students were tech-savvy where they used to play the 3D games. The experiments were conducted in private school where parental consent forms were obtained before the experiments began.

Before analyzing the user requirements, by highlighting the elements on the development of the framework based on the previous studies could provide understanding on the main elements. These main elements influenced the design and development of digital learning game for enhancing language proficiency. Prior research has explored various aspects, such as digital learning game, innovative game design, cultural UI design with anthropomorphism, user experience, self-paced learning and learnability. By synthesizing these findings, this research study could identify the essential components that should be implemented into the development of a framework. Hence, by examining the elements allowed the research to identify the highlighted perspectives through the gamified environments for the primary students.

Therefore, two experiments were conducted to identify the user requirements and design specifications for young learners, as illustrated in Figure 1. Qualitative data were collected through observation and ideation sketching. In the first experiment, participants interacted with existing digital game-based learning applications for Malay language literacy. In the second experiment, participants sketched and described their preferences for the proposed learning game, including character design, environment design, colours, and reward systems. All sessions were recorded to document the participants' interactions, ideas, and preferences for self-paced learning through digital games. Each experiment session lasted 30 minutes, and the findings were used to inform the development of the proposed framework.

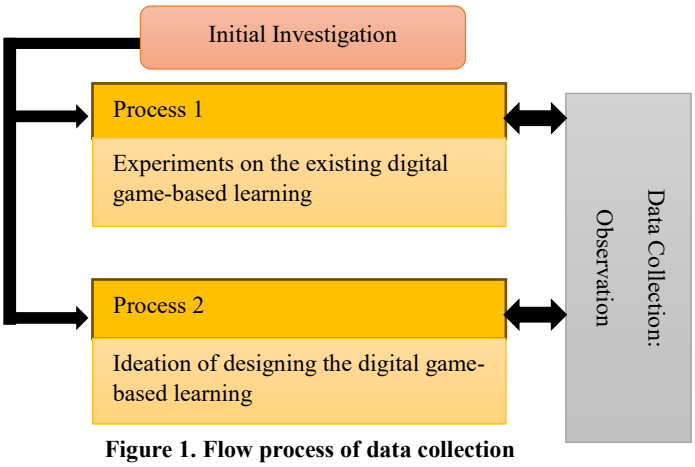


Figure 1. Flow process of data collection

RESULTS AND FINDINGS

Firstly, the participants were involved in an experiment by operating the existing digital game-based learning applications designed to support language literacy. Three types of learning games were being tested as shown in Table 1 where the checklists were provided to identify the specific game elements that aligned to the users' needs. In the first experiment, participants interacted with three existing digital game-based learning applications for Malay language literacy, as listed in Table 1. A checklist was used to examine selected game elements, including character design, environment design, instant feedback, user interface (UI) design, user interaction, rewards, game activities, and device usage. The checklist findings were recorded as percentages to summarize the results for each game element across the three applications. These results were used to identify existing design features that were relevant to the needs and preferences of the young learners and to highlight areas for improvement in the proposed learning game.

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Table 1. Analysis of user testing through existing digital games.

Elements of Digital Games	Belajar Menulis ABC (%)	MyLatihan – BM T1: Suku Kata 1 (%)	Belajar Mengeja ABC (%)
Character Design	50	43	50
Environment Design	77	40	40
Instant Feedback	100	100	100
UI Design	80	40	57
User Interaction	60	43	50
Rewards	100	100	100
Game Activities	67	50	67
Device Used	100	100	100

Based on the analysis of the results, the findings showed that the needs of character design and environment design development in the digital game-based learning. In fact, both of the game elements, character design and environment design showed less than 80% of the results due to the lack of animation contents to be integrated in the games. Hence, static visuals reduced the excitement and engagement for the respondents to play continuously. Without animations, the games lacked of dynamic visual feedback that might lead to less visual stimulation in providing the engagement among the respondents. As the respondents are children whose learning experiences are closely associated with play, they are likely to prefer games that feature good graphics that involve both character and environmental design elements. The integration of appealing character designs with environmental visuals can strengthen narrative immersion, which allow children to form emotional connections with the game world. These elements might improve their excitement within the gameplay. Therefore, the respondents suggested choosing the animal characters with human features to be implemented in the game design.

Moreover, the implementation of the good UI design emphasized on the engagement of the respondents toward gameplay. However, some of them had difficulties in using the games. These happened due to the confusion of the UI design that lack of clarity, inconsistency of navigations, icons and buttons designed and also lack of game instructions. The percentage showed that 80%, 40%, and 57% where the respondents could understand the game flow although they faced some difficulties that might lead to frustration while learning through games. In addition, the findings of implementing the rewards, instant feedback and device used indicated 100% where the respondents agreed that these elements of operating touchscreen technologies such as tablet and smartphone helped them to engage in improving the language literacy.

In addition, game activities should be designed in accordance with the curriculum and educational standards to help improve students' language literacy skills. However, the findings indicated less than 67%, where the respondents lost their interest in playing the games. These might happen due to the fact that the game levels were designed either too easy or too difficult for them to understand, compounded by insufficient instructional guidance provided in the gameplay. Secondly, the initial investigation proceeds by exploring ideas for designing digital game-based learning that can support language proficiency. The participants were given 30 minutes to sketch and describe their ideas based on the requirements needed. For example, the game elements needed such as character design, environment design, type of colours and reward system. All of the sessions were being recorded as well during the experiment based on the procedures provided to them.

The data was collected through the technique to identify the users' needs for the digital learning game development to enhance the language literacy. Table 2 indicated the ideation processes to acquire the game elements for the design and development. The respondents preferred more to designing the characters as animals, which represent the anthropomorphic characters. Some of the participants verbalized their thoughts on the type of animals that they would prefer more. They were clarifying their thinking, which helped to provide the perspectives into describing the character design. Therefore, they also stated that the animation of the animals should be included as well in the game development where static images might cause them to lose interest while playing.

Next, the conceptualization of the environment design emphasized on forestry concepts for the game development. In order to establish the engaging gamified environments, it is essential to integrate the immersive visuals with the user preferences. In fact, the game needs to be developed with immersive visuals that align to the user preferences. Thus, the vibrant colours would be added in the game design. Meanwhile, the reward system basically served as one of the game mechanics that stimulate the engagement continuously towards gameplay. The players are more likely to participate in the games when rewards are involved by adding badges or winning points for them. This may create a sense of accomplishment to achieve the goals.

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Table 2. Game ideation process.

Game Elements	Sketching
Character Design	
Environment Design	
Colours	
Reward System	

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As the research study focuses on the cultural UI design, it aims to integrate local cultural elements into the design. Thus, by identifying the animals as the mascots of district areas as the anthropomorphic characters in Sarawak State of Malaysia will be emphasized in this research study to promote the cultural aspects and learning language too. Meanwhile, the game activities or game contents should be designed and aligned to the Malay language in achieving the learning objectives for language proficiency. Hence, based on the game elements that acquired during the ideation processes, the final user specifications are listed as shown in Table 3.

3D anthropomorphic characters and 3D forestry design concept were selected by the students as they were familiarized with 3D games for smartphone or tablet. As the research study was focusing on urban areas only, these user specifications of character and environment design was based on the students' preferences. Through the analysis of idea of sketching, most of the students chose anthropomorphic characters to be designed in the form of 3D due to the visual appealing criteria. Meanwhile, instant feedback will be implemented in the game prototype development with the vibrant colours added as well. Game activities will be aligned to the Malay language on spelling, rearrange the sentence, classifiers, sentence completion.

Data from the two experiments were analysed to identify the design requirements for the proposed digital learning game framework. In the first experiment, checklist results were summarized using percentages to examine the selected game elements across the three existing digital learning games. The findings were used to identify relevant features and areas for improvement in the design of the proposed game.

For the second experiment, thematic analysis was used to examine the participants' ideation sketches and recorded verbal responses. The data were reviewed and organized according to four main themes: character design, environment design, colours, and reward system. Within these themes, recurring preferences expressed through the sketches and verbal responses were identified. Anthropomorphic animal characters and a forestry-themed environment emerged as the most frequently expressed design preferences. These findings, together with the results from the first experiment and relevant literature, informed the formulation of the final user specifications presented in Table 3.

Table 3. Final user specifications.

Specifications	Descriptions
Character Design	3D anthropomorphic characters
Environment Design	3D forestry design concept
Feedback Mechanism	Instant feedback
Type of Colours	Vibrant colours
Reward System	Badges
User Interaction	Touchscreen interaction
Device Used	Smartphone or Tablet
User Experience	Engagement
Game Activities	Multiple Quizzes
Game Mechanics	Instructional design
Design Principle	Learnability

Proposed Gamified Design of Framework Development

This research study aims to propose a framework for digital learning game in enhancing language literacy. By integrating the highlighted main elements and user specifications that contribute to the effective development of digital learning game, this framework provides a foundation of practical implementation to engage the students in improving the language proficiency. The design and development of the framework will be discussed further in detail.

The integration of digital learning game in education has transformed conventional learning by enhancing the educational system and strategies through gamified environments. This gaming approach improves the students' engagement and cognitive development with the rapid advancement of digital technology, particularly the touchscreen devices. Therefore, the research study indicates significantly improving the language literacy where the highlighted elements should be integrated to develop the framework. Hence, the emphasis on the language learning domain contributes to the development of the framework, in which the target design should be engaging and adaptable to learners' needs.

Additionally, the highlighted elements contribute to effective learning through the implementation of digital game-based learning, innovative game design, cultural UI design through anthropomorphism, user experience, self-paced learning, and learnability. By incorporating these elements, the framework will be systematically structured to be mapped to the learning strategies and user specifications in improving the language proficiency. The design and development of a proposed framework for digital learning games may contribute to improving students' language literacy skills. Through gamified experiences, students are able to learn and explore a diversity of learning approaches. By providing the digital learning tool, educational games can offer the dynamic learning that allows the students to acquire knowledge beyond conventional paper-based approaches through digital environments.

Self-paced learning is one of the fundamental pillars of the proposed framework because students learn at different speeds and may require different levels of support when learning a language. For example, some students may need more time to understand syllables, spelling, or sentence structures, while others may be ready to move on to the next activity. Allowing students to learn at their own pace gives them the opportunity to

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practice challenging topics, review their answers, and continue learning when they feel ready. In Malay language literacy, this flexibility is important because students need sufficient opportunities to practice and strengthen their understanding of language concepts. Clear instructions, instant feedback, and simple controls can further support this process by allowing students to focus on learning rather than figuring out how to use the game.

Self-paced learning also works alongside the other components of the proposed framework. Game mechanics and gameplay structure the activities and guide students through the learning process, while game content ensures that the activities remain aligned with the Malay language quizzes. Cultural UI design, through the use of anthropomorphic characters and a forestry-inspired environment, helps create a learning experience that reflects the local context. Meanwhile, user experience, user interaction, and learnability influence how easily students can navigate the game and participate in its activities. Feedback mechanisms also help students understand their answers and recognize which areas may require further practice. These components work together to support a learning environment that considers both students' needs and the intended learning objectives. Figure 2 illustrates the framework development of digital learning game that integrates the highlighted elements for language literacy.

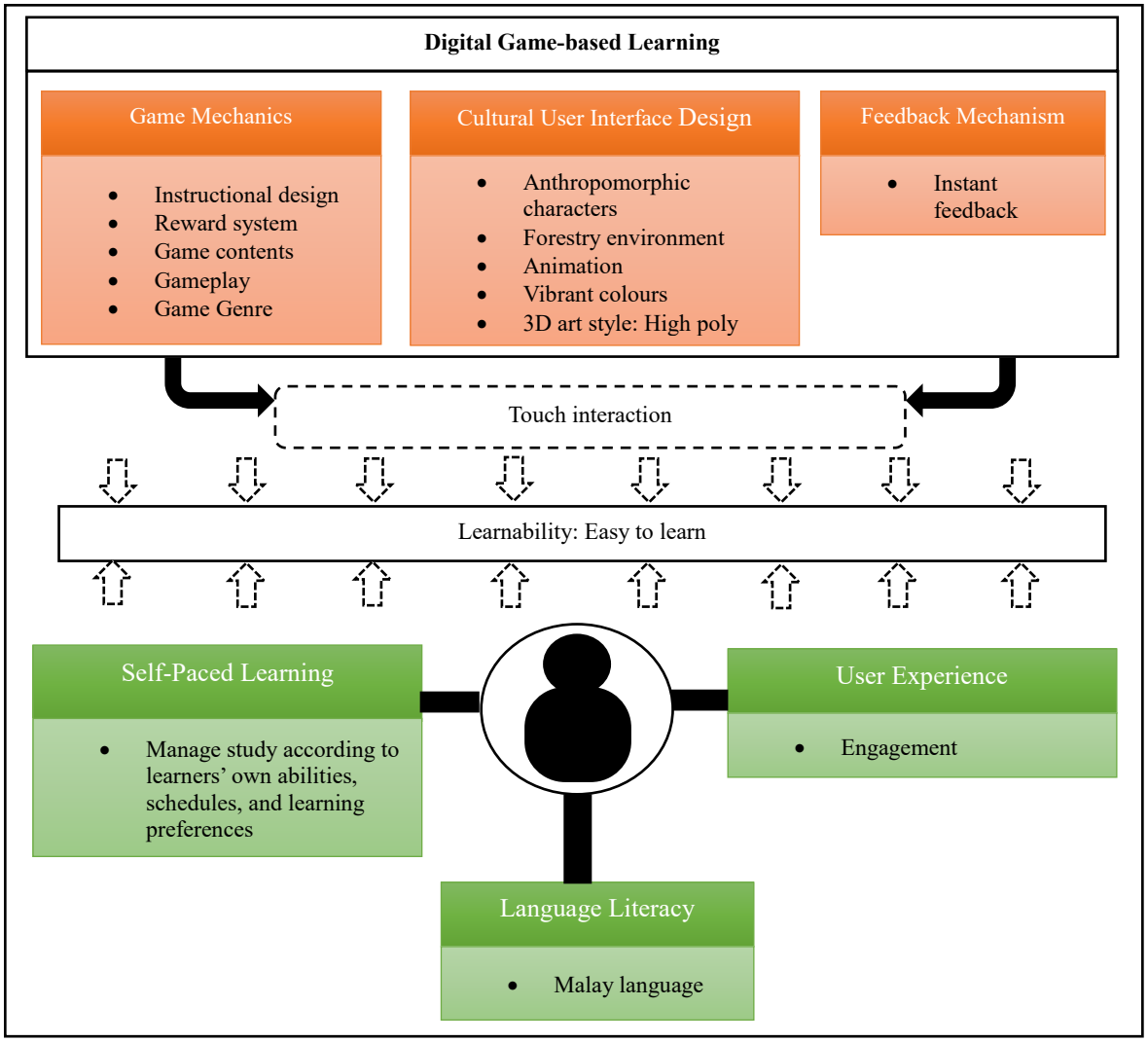


Figure 2. Game design framework development

The digital learning game involves the game design and cultural UI design through anthropomorphism to develop the framework. Meanwhile, an innovative game design such as game mechanics, gameplay and game contents is being implemented in the game development as these are the foundation of the game itself. On the other hand, user experience, self-paced learning and technology used should be emphasized in the framework development. As these elements are being focused in the research study, the details are as shown in Table 4.

Table 4. Descriptions of game framework development.

Game Design	Descriptions
Game Mechanics	Instructional design will be provided through the text input for the players to understand the gameplay. The reward system will also being implemented as the fundamental aspect of game mechanics that influences engagement towards learning.
Gameplay	Central experience that encompassess the way of players interacting within the immersive game environment, accomplishing the mission and progress through the levels.

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Game Contents	Referring to the contextual learning that includes text, voice input, characters, environment, animation, game activities and audio will be integrated in the game design. Then, the learning contents should align to the Malay language quizzes.
Cultural UI Design	The integration of cultural elements that can reinforce learning and incorporate the anthropomorphic character design and forestry environment design. These cultural aspects are based on the Sarawak State of Malaysia by implementing the animal mascots of district and city areas with a forestry environment.
User Experience	Engage the players to navigate the 3D immersive game to enhance the language proficiency by providing enjoyable and interactive activities.
Self-paced Learning	Self-paced learning allows learners to control how quickly they learn by adjusting their learning activities according to their abilities, available time, and learning preferences. This gives learners the flexibility to spend more time on difficult topics and move forward when they are ready.
User Interaction	Focuses on the touchscreen technology that allows active interaction such as tapping with drag and drop features. These interactions are aligned closely to their psychomotor skills and cognitive processes involved in learning. So, these enable the players to navigate easily without the need for complex controls and interaction.
Design Principle	Learnability is a core principle of design that allows the users to easily understand and use the system when they encounter it. By using consistent UI design, layouts, colours and minimize complexities help the users to understand clearly on how the system works.

DISCUSSION

The development of framework emphasizes on the significant role of cultural UI design in digital game-based learning to enhance the language proficiency. Within the proposed framework, cultural UI elements in the form of anthropomorphic animal mascots representing Sarawak's districts and cities are incorporated to enhance cultural exposure and learner engagement. The integration of forestry elements in the game environment design contributes to an authentic representation of Sarawak's natural environment. Meanwhile, the game contents and activities encourage the students to understand the language learning through a gamified environment. This gamified environment may foster the learning experiences of them by aligning with the students' cognitive and linguistic background. As digital learning game emerges as a cornerstone in education that has evolved for learning advancement, it requires advanced skills in terms of their digital literacy, problem solving and critical thinking to improve their language literacy skills.

Despite its importance, improving language proficiency remains a challenge for a lot of students due to the factors of diverse linguistics and environmental factors. Given that Sarawak, Malaysia, adopts both Malay and English as formal languages across education, administration, and public services, strong communication skills are crucial for effective interaction within society. Nevertheless, Sarawak, Malaysia is home to diverse ethnic communities with rich cultural heritage, where daily communication is predominantly conducted through distinct local dialects (Banseng et al., 2023). In fact, the fundamental communication skills to improve formal language literacy, particularly in Malay language is the rising issue addressed in the research study. Lack of fundamental skills may lead to difficulties in conveying the information, misunderstanding and facing challenges in building professional relationships (Othman et al., 2022). Addressing these issues, these deficiencies may limit access to various opportunities and hinder effective communication.

As a result, the pursuit of language proficiency among students has led to the evolution of learning experiences that reflect modern techniques and evolving educational strategies. Hence, the learning processes involved the effective and engaging resources to ensure the practical language usage among the students. Digital game-based learning, in particular has gained attention for its visibility and ability to improve the learning experiences through engaging gamified environments effectively (Ng et al., 2025; Ong Long et al., 2025). The beneficial impact to foster interactivity would provide the immersive learning experiences by engaging students with virtual worlds and simulations while learning at the same time.

Digital learning game offers a compelling solution by creating virtual worlds that represent classroom environments in a digitalized form. It enables the students to learn virtually aside from joining the classroom learning session. Thus, the growth of the gaming industry in cultivating the interest to learn through gamified environments increase the number of research on the game development processes (Reer et al., 2025; Tan et al., 2025). The massive use of games in education could determine the children's learning style and behaviour towards virtual learning. In response to the digitalization emphasized on online interaction and social connectivity, learning through digital games has emerged as a growing focus in improving educational strategies.

Considering the potential of gaming implementation in educational strategies, there is a need to summarize the framework development to examine the role of gaming elements towards learning and students' needs. These gaming elements such as the game mechanics, feedback mechanism, UI design, gameplay, user experience, self-paced learning and user interaction help to foster their interests in learning, specifically in improving the language proficiency. In fact, these elements may contribute to enhancing the learning approaches in gamified environments that align to the pedagogical practices and strategies. Self-paced learning is a fundamental component of the proposed framework, as it allows students to progress through learning activities according to their individual pace and needs. In Malay language learning, students may require different amounts of time to understand syllables, practise spelling, or complete sentence-based activities.

Additionally, the implementation of the gaming environment offers an effective learning approach by enhancing the learning experiences from conventional methods that shifts to immersive learning. By learning through a virtual environment that provides interactivity, innovative game design and cultural UI design through anthropomorphism within the curricular educational system can be more effectively promoting edutainment to enhance the language literacy skills. This shift in perspective of learning strategies to be more digitized inspires researchers to explore new

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approaches for teaching and learning methods. By acquiring the essential communication skills among the students in language learning, the needs in preparing them for the complexities of fluent communication should be taken into consideration.

The findings highlight the importance of cultural UI design in developing digital learning games for language literacy. Through ideation and sketching activities, students expressed a preference for 3D anthropomorphic characters and a 3D forestry environment, which informed the visual direction of the proposed game. The use of animal mascots representing Sarawak's districts and cities, together with a forestry-inspired environment, incorporates local cultural and environmental elements into the learning experience. Students also preferred instant feedback, vibrant colours, badges, and touchscreen interaction, which informed the selection of game features within the framework. These findings demonstrate how students' preferences can be translated into practical design requirements. Furthermore, the proposed framework emphasizes the alignment of game activities with the Malay language standard, including spelling, sentence rearrangement, classifiers, and sentence completion. By integrating game mechanics, cultural UI design, user experience, self-paced learning, and learnability, the framework connects students' needs with educational objectives. Unlike approaches that primarily emphasize gameplay and engagement, the proposed framework brings together cultural elements, user specifications, and activities to guide the development of digital learning games for Malay language literacy. However, further comparison with existing frameworks is needed to establish its contribution to previous research.

Despite its potential contribution, several limitations should be considered. As the study focused on students from urban areas, the identified preferences may not fully represent those of students from rural communities or different cultural backgrounds in Sarawak. Furthermore, although the findings provide insights into students' preferred game features, their effectiveness in improving engagement and language proficiency has yet to be established. Future research should focus on implementing the proposed framework in a functional digital learning game and evaluating its usability, learnability, learner engagement, and language-learning outcomes. Further investigation is also needed to examine how cultural UI design and anthropomorphic characters influence students' learning experiences through a gamified environment. Overall, the proposed framework provides a foundation for developing culturally contextualized digital learning games that consider students' preferences and curriculum requirements. Further empirical evaluation will help validate the framework and determine its effectiveness in supporting Malay language literacy development.

CONCLUSION

The rapid advancement of digital technologies has evolved the education that supports diverse teaching and learning styles. The technologies offer to connect and access the information easily at users' fingertips that become more efficient and dynamic. By acquiring the needs of students in learning through effective edutainment methods and approaches through digital learning game, the main focus of research study should be emphasized on immersive learning. Therefore, an immersive learning that provides a 3D virtual gaming world leads them to explore the importances of language literacy. Addressing the needs, the importance of integrating digitalization in educational strategies could determine the teaching and learning styles to improve the language proficiency.

Therefore, the difficulties in communicating because of the variety of dialects of language were the rising issues among the students of Sarawak, Malaysia. The extensive range of dialects spoken in Sarawak, Malaysia has complicated the effective use of the Malay language in daily communication. The students might find the language learning to be quite challenging, specifically in Malay language. Hence, effective strategies to solve these challenges are needed to master language proficiency. Throughout the years, the implementation of digital learning game in education has undergone a significant transformation with the primary aim of improving the user experience from digitalization.

The idea of creating the game design is not just emphasizing for learning but also providing the activities with interactivity that are more enjoyable to be explored by the students. Numerous concepts of edutainment, learning games, serious games and gamification share the same fundamental objectives to facilitate the learning in a playful manner where the use of game elements such as badges, instant feedback and gameplay can enhance their learning interests.

Thus, the proposed framework development of digital learning game seeks to overcome the challenges that the students may encounter throughout the learning activities. On the other hand, students can develop communication, critical thinking, and creative thinking skills through the integration of gamified environments into language learning. Additionally, with an adequate fundamental of language skills, the students are able to acquire the necessary knowledge conveniently. Through self-paced learning, students are able to navigate their activities with more flexible learning experience without requiring all students to complete activities at the same pace.

Nevertheless, the proposed framework requires further validation to determine its effectiveness in supporting language literacy. Although the identified user specifications provide a foundation for game design, students' preferences alone cannot establish whether the selected elements improve their learning outcomes. Future research will focus on implementing the framework in a functional digital learning game and evaluating its usability, learnability, engagement, and contribution to students' Malay language proficiency. Further investigation could also examine how cultural UI design and anthropomorphic characters influence students' learning experiences across different contexts. This will help determine the framework's strengths, identify areas for improvement, and establish its potential to support language learning through culturally relevant and engaging digital experiences.

In conclusion, digital learning game offers the potential to revolutionize and significantly improve the fundamentals of language learning effectively. The transformation of digitized learning encourages the students to actively participate and enjoy the learning process through gamified environments. Future research will further explore the design and development of the digital learning game to validate the proposed framework for language literacy learning. Future research will further explore the design and development of the digital learning game to validate the finalized framework.

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