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ELEGANCE: A customizable EducationaL gamE for for-eiGn guArdians to understand japaNese sChool culturE

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Abstract

Aiming to address challenges faced by foreign guardians in Japan regarding language barriers and unfamiliarity with local educational practices, this study designed and developed an educational game, named ELEGANCE. The game features two customised, user-friendly learning modes: Exploring Mode, which provides guardians with detailed information about Japanese school activities and highlights essential information through multisensory interactions, and Quiz Mode, which enables guardians to access their understanding of the explored school culture content. A pilot study involving 16 foreign guardians demonstrated the game's effectiveness, with a significant improvement in comprehension scores in the post-test, compared to the pre-test. Participants reported a low mental load and positively rated the game's immediate feedback and detailed explanation functions, indicating a well-balanced integration of educational content and gameplay. These findings highlight the potential of educational games like ELEGANCE in facilitating multicultural education, especially in effectively enhancing guardians' understanding of school-related cultural practices and knowledge.

Keywords: Educational games, Customizable game design, Game-based learning, Cross-cultural education, Japanese elementary school culture.

1 Introduction

Japanese elementary schools host numerous pivotal activities for students and often require parental involvement. These activities, ranging from sports days to learning presentations, necessitate specific preparations, such as understanding the event's significance and knowing what to bring. According to the Ministry of Education, Culture, Sports, Science, and Technology (MEXT), these school events are vital in promoting community collaboration and instilling cultural values in students and guardians alike [1].

While these events foster meaningful cultural engagement, research indicates that foreign guardians often face difficulties navigating these expectations due to the intricate cultural and logistical requirements embedded in Japanese school practices [2]. Foreign guardians, even those with high Japanese language proficiency, frequently struggle with implicit cultural expectations communicated via school newsletters. This issue is sometimes called the "hidden curriculum" [3], a term adapted directly from Japanese educational discourse to describe unspoken norms—such as appropriate parental involvement and behavioural expectations at school events—that are not explicitly taught yet significantly shape participants' experiences. However, there is a lack of

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tailored educational support which can greatly enhance foreign guardians' ability to navigate Japanese school culture more effectively. Therefore, cross-cultural educational support is urgently needed to bridge these gaps and facilitate smoother cultural integration [4][5]. Studies have shown that when newcomers receive culturally responsive guidance and resources, it significantly enhances both their sense of belonging and their children's academic success [6]. However, there remains a lack of readily accessible, tailored materials that can effectively support guardians in understanding the "why" and "how" behind Japanese school activities.

Therefore, to address these challenges, this research proposes to leverage game-based learning which fosters user engagement and facilitates deeper understanding through interactive and adaptive experiences [7]. A well-designed serious game tailored to the needs of ex-patriate guardians may consolidate all essential information about Japanese school culture and events into an engaging, interactive format. Additionally, by integrating real-life scenarios and cultural nuances into the gameplay, serious games can effectively bridge cultural gaps and enhance learners' comprehension of context-specific norms [8]. This approach is expected to support guardians to better understand the significance of various school events, the required preparations, and their roles in these activities.

Upon the development of the educational game, an experimental study was conducted with foreign guardians residing in Japan to investigate two research questions:

(1) How effective is the educational game in enhancing foreign guardians' understanding of Japanese cultural practices and school-related knowledge?

(2) What specific design improvements can optimize the balance between educational content and engaging gameplay?

This work contributes to the design and implementation of the first educational game of Japanese school culture ***--ELEGANCE*** (A customizable EducationaL gamE for foreiGn guArdians to understand japaNese sChool culture). ***ELEGANCE*** is designed to enhance cultural understanding through interactive learning environment and ensures adaptability by delivering educational content tailored to different learning needs, in contrast to traditional educational games that typically target a single, fixed demographic. By leveraging customizable frameworks and interactive elements, ELEGANCE accommodates a diverse range of users, including guardians from various cultural and linguistic backgrounds. Furthermore, the integration of real-life scenarios and cultural nuances enhances its effectiveness in bridging knowledge gaps, fostering deeper engagement, and promoting a better understanding of Japanese educational practices.

2 Related work

2.1 Educational Game Theory and Advantages over Traditional Methods

The creation of educational games (often referred to as "serious games") is grounded in theoretical frameworks suggesting that digital game-based instruction can outperform traditional teacher-led models in engagement, motivation, and adaptability [9][10]. Foundational work by Malone and Lepper [11] indicates that weaving elements like challenge, curiosity, and control into learning scenarios fosters intrinsic motivation, prompting learners to explore and apply new knowledge. Likewise, Kapp [12] posits that game-oriented techniques embed rapid feedback, clearly defined goals, and meaningful interactivity—factors that promote deeper cognitive

processing compared to passive methods of instruction.

Unlike conventional classrooms, which rely on synchronous and often lengthy sessions, educational games provide a more flexible, modular structure that adapts easily to varied timetables and learning preferences [13]. This flexibility holds particular importance for parental guardians, whose limited study time competes with work, household duties, and childcare. By breaking down content into smaller, standalone segments, these guardians can harness short windows of availability—during commutes, breaks, or after children's bedtime—to steadily progress through the material at a manageable pace [14]. Such a micro-learning approach, augmented by game mechanics, not only lowers barriers to access but also supports repeated practice and stronger retention, as participants can return to game-based activities whenever a brief opportunity arises.

In addition, many game-based solutions feature adaptive difficulty, avatar customization, and real-time analytics to sustain learners' motivation over more extended periods [10][15]. This adaptability is especially beneficial for adult learners, who often have heterogeneous backgrounds, aspirations, and proficiency levels. Furthermore, it aligns with emerging research highlighting autonomy, relevance, and prompt feedback as key contributors to effective adult education [16]. By fulfilling these criteria, educational games offer a compelling substitute for conventional lectures or textbook-led instruction, closing the gap between rigorous teaching objectives and on-demand, practical engagement.

2.2 Customizable Game Design Principles

Customization increases a sense of control and identity for the user, heightening immersion and subsequently increasing engagement and motivation [17]. Two types of customizations were highlighted in serious games for learners: aesthetic customization (such as avatar creation), and functional customization(such as allowing players to adjust the difficulty of the game or choose different abilities to use). In addition to the customizations for learners, some game framework encourages instructors to customize learning content following a fine-granularity approach for game element placement[18], ensuring that the serious game remains relevant, up to date, and engaging for a diverse range of players. A game was built on this framework for teaching cybersecurity in an accessible and engaging manner and evaluated by 30 undergraduate students and two academic professors, with feedback indicating that customizable content significantly enhanced learning outcomes and motivation. Building on these findings, our game ELEGANCE prioritizes personalization, allowing users to tailor their experience to their preferences and interests.

3 A customizable EducationaL gamE for foreiGn guArdians to understand japaNese sChool culturE

To assist acquaint foreign guardians in Japan, an educational game named "ELEGANCE" has been developed using Unity engine.

3.1 The Customizable Game Settings

3.1.1 Multiple language support

To accommodate the diverse linguistic backgrounds of foreign parents residing in Japan, our

game provides four language options: Simplified Chinese, English, Malay, and Vietnamese. This multilingual approach seeks to enhance accessibility and inclusivity, ensuring that participants can engage with learning content in a language they are most comfortable with. Research has indicated that offering instruction in one's preferred or native language can significantly boost motivation, comprehension, and overall learning efficacy [19]. Upon logging in, users may select their desired language from the main menu, granting them immediate access to all core functionalities.

All four language versions have been fully developed and tested by native speaker of each language. By integrating multiple language options, the game appeals to a broader range of cultural and linguistic backgrounds, reducing potential language barriers and enabling users to optimise their learning process. This design is particularly beneficial for busy parents, who can focus on the educational content itself rather than navigating additional linguistic challenges.

To further enrich the learning experience, in all these four-language version, the game includes an interactive feature that allow players access the pronunciation of activities or items in Japanese. By clicking the voice button, users can listen to the correct pronunciation, enhancing auditory learning alongside visual and textual information. This is especially beneficial for guardians looking to improve their Japanese skills, making it easier to engage in conversations during school events.

Figure 1: Multiple language Support

3.1.2 Customizable Main Menu Wallpaper

Fig 2(a)(b) shows that the game enables the user to create a visual ambience that resonates with their preferences by allowing the change of the wallpaper of the main menu. This feature aligns with findings that personalized interfaces can significantly enhance user satisfaction and engagement [20]. By adding a touch of personalization to the game's interface, this feature improves the overall user experience.

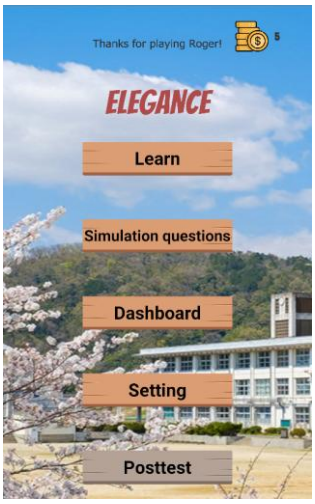
3.1.3 User Dashboard

Our game incorporates a dashboard as shown in Fig 2(c) to demonstrate users' progress and accomplishments. Gamified achievement systems have been proven to effectively boost

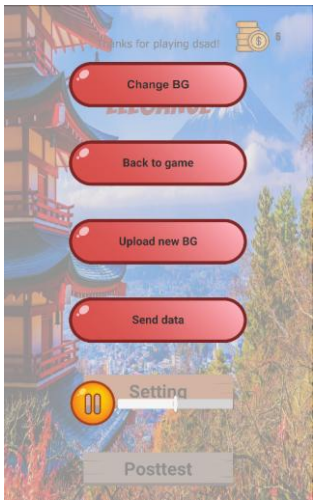
motivation and long-term user engagement [21]. Each user has a dedicated profile where they can track achievements, view in-game statistics, and monitor performance, fostering a sense of achievement and self-efficacy. Additionally, users can personalize their gaming experience further by uploading and updating the profile photo of their avatars. Whether it is a custom illustration, a favourite photo, or a unique digital creation, this feature allows users to express their identity and style, which consistent with the findings that self-expression enhances user satisfaction [20].

3.1.4 Gender-Specific Pronunciation

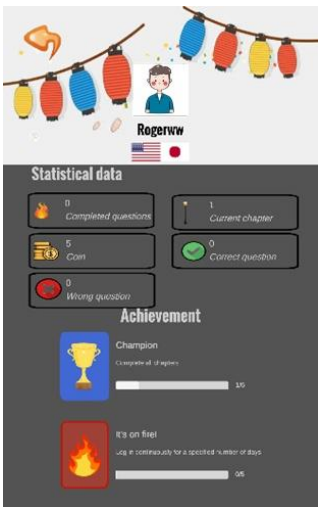
Studies indicate that providing users with voice options tailored to their preferences can enhance learning engagement and comfort in interactive settings [22]. In both the learning modes described in section 3.2 and 3.3, users can select their preferred gender-specific pronunciation for vocabulary, audio prompts and instructions, as shown in Fig 2(d). This feature ensures an engaging and personalized learning experience, enhancing overall effectiveness.



(a) Main Menu



(b) Setting Panel



(c) User Dashboard

(d) Gender-specific pronunciation

Figure 2: The customizable game settings of ELEGANCE

3.2 School Culture Exploring Mode

This research implemented an exploring mode which allow the users to access to all the events of Japanese school organized by term periods (3 terms: spring/autumn/winter, in total 26 events). Fig.3(a) displays the main interfaces of the exploring mode.

(a) Main interfaces (b) School activity (c) Items to Bring Notes

Figure 3: An example of the culture exploring mode

Activity Pronunciation and Background Explanation: When users click on a specific school activity in one term, they are presented with comprehensive information with a visual list of corresponding items to ensure their understanding and preparedness for the event as demonstrated in Fig.3(b). The detailed background explanation of the activity offers contextual information about its significance within the Japanese educational system. Meanwhile, users are greeted with an audio pronunciation of the activity's name in Japanese (as shown in the top of Fig. 3(b)), allowing them to familiarize themselves with its correct pronunciation. This dual approach to auditory and textual learning aids in language acquisition and cultural understanding.

Special Instructions: Beneath the activity description, any special instructions or noteworthy points related to the event are highlighted in red. These instructions may include cultural customs, expected behaviours, or specific protocols to be followed during the activity. By providing this information upfront, users can better prepare for the event and avoid potential misunderstandings or faux pas.

Items to Bring and Attention Notes: In the bottom of Fig.3(b) shows that the system lists the items that participants need to bring to a specific. Clicking on any listed visual item expands the display to reveal a larger image of the item as shown in Fig.3(c), accompanied by its name in Japanese and Romanized characters. In additional, its translation in the user's preferred language and a brief explanation is provided, detailing the item's purpose or significance in the activity's context. This feature enables users to understand what to bring and why each item is necessary or advisable.

All the above features are designed to offer practical guidance and cultural insights, enhancing the user's engagement and confidence in navigating Japanese school activities effectively.

3.3 Quiz Mode

To provide a "learning by doing" environment [23] for foreign guardians in understanding the intricacies of the Japanese educational system, we have implemented an innovative quiz mode tailored to enhance learning through direct interaction and visual aids. The quiz mode features two primary types of questions aimed at preparing guardians for their active participation in school events. The first type focuses on identifying the items necessary for various school activities as shown in Figure 4(a). The second type in Figure 4(b) concentrates on the expected actions and behaviours during these events. Each question is presented with a set of four picture options, among which only one is correct. Beneath each question, an image of the activity is displayed, accompanied by the activity's name in Japanese (together with the pronunciation in Japanese) and English translations. This feature is designed to familiarize users with the visual and linguistic aspects of the events, aiding in both language acquisition and cultural comprehension. All these features not only make the game accessible but also engaging, helping them visually connect with the material. Immediate feedback (Fig.5(a) and (b)) is provided after the submission of each question, providing information on whether it is correct or not. If the submission is wrong, in additional to the correct answer, a button as shown in the right bottom of Fig.5(a) is provided to access to the detailed explanation in the exploring mode as shown in Fig3.(b).

(a) Question example (b) Question example

Figure 4: The examples of Questions in quiz mode

(a) Wrong answer (b) Correct answer

Figure 5: The examples of the feedback in quiz mode

3.4 Function for Materials Editing.

ELEGANCE also provide a Materials Editing Function (as shown in Fig.6) which enables instructors to directly modify each type of the learning content within the game through an administrator account. This system empowers instructors to customise in-game learning materials without submitting requests to technical staff, significantly streamlining the editing process.

Figure 6: An example of materials editing

4 Results

4.1 Experimental Setup

To evaluate the effectiveness of ELEGANCE, an experiment was conducted in Japan, targeting foreign guardians who are not familiar with Japanese school culture. Given the niche demographic, recruiting volunteers posed some challenges. Eventually, a total of 16 participants (aged 30 to 50, 62.5% hold a postgraduate degree and 18.75% hold a bachelor's degree, 56% female) enrolled in this study and all of them signed the consent form approved by the ethical committee before the experiment. Two participants were native English speakers, while the remainder were native Chinese speakers. Thirteen of them indicated that they had not actively sought understand Japanese elementary school culture before.

To gauge the participants' understanding and knowledge acquisition, a pretest was arranged before the gaming session, followed by a post-test upon completion. The pretest aimed to establish a baseline understanding, while the post-test assessed any improvements in knowledge and skills after engaging with the game. Both tests consisted of questions designed to evaluate the participants' understanding of the Japanese element school culture. On the other hand, we also assessed the frequency and patterns of vocabulary-related errors by aggregating data on each player's responses to individual questions. Our analysis involves identifying commonly misunderstood words or phrases and determining whether vocabulary items consistently pose challenges for

players.

Each participant was required to allocate approximately 30 minutes for the gaming session. After the gaming session, participants were asked to complete a questionnaire amended based on the one used in [24, 25] to provide feedback on their experience. The questionnaire comprised three scales of questions (**Cognitive load, The helpfulness of Game functions, Technology Acceptance, and General satisfaction,** the reliability of each scale was described in [25]), each utilizing a seven-point Likert scale (1-3: strongly to slightly disagree, 4: neutral, 5-7: slightly to strongly agree).

4.2 Experiment Result

The results from the pretest and post-test (pre-test: Mean =68, S.D.= 13.6; post-test: Mean =90, S.D.= 8.45) indicate a significant improvement in participants' understanding after engaging with the educational game. A paired sample t-test was conducted to assess whether this improvement was statistically significant and whether the observed increase was due to random chance. The result ($T=5.50$, $p < 0.001$) suggests that ELEGANCE had a meaningful impact on participants' knowledge acquisition and comprehension. The reduced standard deviation in the post-test also indicates that learning outcomes became more consistent across participants, implying that the game helped bridge initial knowledge gaps among users.

The analysis result of the response to the questionnaire are shown in Table 1. The average rating of "effort for understanding the activity purpose" (4: neutral) is 2.56 (S.D.=1,17), suggesting that most participants could clearly grasp the goals and instructions of the educational game with moderate effort. Similarly, the average rating for "effort for understanding the target content" is 2.88 (S.D.=1.32), indicating that the participants perceive low mental effort while learning with the game. In terms of mental load, the average ratings for "distraction" and "pressure" are both less than 2, indicating that participants experienced very low levels of distraction and stress during the gaming activity. These results suggest that the game design successfully minimized unnecessary mental load, allowing participants to focus on the learning content in a relaxed environment.

For game functionality, participants highly rated the "feedback provided by the quiz", with an average score of 6.56 (S.D.=0.50). This implies that most participants found the immediate feedback from the game to be highly effective in aiding their learning. Similarly, the feature of "detailed explanation" button provided when a wrong answer is submitted (as shown in Fig.5(a)) was rated an average of 6.50 (S.D.=0.70), indicating that a correct detailed information provided immediately after a misunderstanding happens was well-received and considered as helpful feedback for Japanese school culture learning. For the technology acceptance, most of the participants agreed that ELEGANCE generally is easy to play (Mean=6.56, S.D.=0.60) and useful for school culture learning (Mean=6.50, S.D.=0.61).

For general satisfaction (8 questions), the average rating for the gameplay is 6.09 (S.D.=1.21). While most participants were satisfied with the game, a small proportion of users may have had reservations or encountered challenges during gameplay. The relatively higher standard deviation further highlights this variability, indicating that user experiences were not entirely consistent across the participant group. These differences may stem from individual preferences, prior

experience with similar tools, or specific aspects of the game design that could be improved. Some participants suggested that more engaging gameplay is needed for the future version. The response to "satisfaction with the learning environment" received a slightly higher average score of 6.38 (S.D.=0.81). This suggests that the game was highly effective in achieving its educational objectives, even for participants who were less satisfied with the gameplay.

Table 1: The analysis results of learning perception

	Mental Effort		Mental Load		Helpfulness		Technology acceptance		Satisfaction
	Understand purpose	Learn the culture	Distraction	Pressure	Feedback of the quiz	Display more details	Easiness	Usefulness	
Mean	2.56	2.88	1.81	1.81	6.56	6.50	6.56	6.50	6.09
S.D.	1.17	1.32	1.18	1.55	0.50	0.71	0.60	0.61	1.12

5 Discussion and Conclusions

In this paper, we designed and implemented an educational game ELEGANCE and explored how ELEGANCE can enhance the understanding of the Japanese elementary school education system and various culture related activities among foreign guardians in Japan. Customized and user-friendly design has been integrated within two learning modes (***Exploring Mode and Quiz Mode***), ensuring that foreign guardians can easily navigate ELEGANCE while gaining practical knowledge that will be essential during their children's school activities. The ability to interact with the game through multiple senses—sight, touch, and hearing—ensures a comprehensive learning experience that caters to different learning styles and preferences.

For our first research question, results from the pre-and post-test show a statistically significant gain in foreign guardians' understanding of Japanese cultural practices and school-related knowledge. Participants reported low mental effort and mental load, suggesting that the game effectively conveys essential information in a user-friendly manner. As for the second research question, high ratings regarding to quiz feedback and the feature of "detailed explanation" button provided when a wrong answer is submitted (as shown in Fig.5(a)) indicates that immediate feedback and clear guidance helped maintain engagement while still promoting in-deep learning. These design features, coupled with the multisensory interaction, helped strike a balance between educational content and interactive gameplay, underscoring the game's potential for enhancing user motivation and comprehension. In summary, "ELEGANCE" facilitates the understanding of Japanese education through learning about the year-round activities in Japanese elementary schools, thereby reducing cognitive stress and misunderstandings of foreign guardians and ensuring that their children receive quality education in Japan.

One limitation of this study is the relatively small sample size, which may not fully capture the diversity of foreign guardians' experiences. Future studies should incorporate larger, more representative samples. For future work, we aim to refine the game mechanics to make it more engaging. This may involve introducing additional learning modes to increase the game's appeal and minimize the monotony of the learning process.

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