

PAPER

Navigating Academic Horizons: The Role of Location-Based Games in Multidisciplinary University Transition

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ABSTRACT

The study focuses on the development and evaluation of a location-based game called CMU Journey, which is aimed at helping first-year students become acquainted with their new university setting during the phase of transition. The study's three primary goals are to: (1) create a location-based game to improve knowledge acquisition related to university transition for freshmen; (2) evaluate the performance of the developed location-based game in supporting knowledge acquisition relevant to university transition; and (3) explore students' experiences and perspectives with the location-based game designed for university transition. Using a mixed-methods approach, the study collects quantitative data through pre-post measures as well as qualitative data synthesis using an online open-ended questionnaire. Participants in the study are from Chiang Mai University's Humanities and Social Sciences (N = 434), Technology and Science (N = 341), and Medical and Health (N = 256) programs. The findings show that students who finished the program learned considerable information about starting university, had a favorable attitude regarding studying due to the location-based game, and experienced motivation. An examination of both quantitative data from surveys and qualitative feedback from utilized data found a mix of both positive and negative comments from users. The results presented indicate the potential of location-based games as a beneficial tool for assisting with university transition, along with opportunities for future game design and implementation improvements.

KEYWORDS

location-based game, university transition, university orientation, freshmen, humanities and social sciences, technology and science, medical and health

1 INTRODUCTION

Transitioning from high school to university is a big step for students, bringing along many new challenges and changes. One important challenge is that sometimes

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what high school students are good at doesn't match up with what the university expects from them academically, including deficits in social and emotional acclimatization. The misalignment between the academic demands and the competencies of first-year university students has the potential to diminish their confidence in their learning abilities. This difference can also affect how students see themselves and whether they want to keep studying in the following years [1]. This gap highlights a fundamental problem in the traditional approach to teaching classroom instruction, which may not adequately cater to the diverse learning styles and needs of first-year university students. This shows how important it is for first-year students to get extra help with their learning, which can make their move into university studies easier [2]. With the advances in technology, many teachers are using a way of teaching called game-based learning, which is becoming widely utilized in education [43]. This way of teaching attempts to make learning more interesting and engaging by creating an environment where students are involved. The goal is to help students achieve what they are supposed to learn more easily. In this context, the incorporation of game-based education into technology emerges as a promising solution. Using interactive and immersive learning experiences such as games can help first-year students get used to their new academic environment better [44]. This way of learning fits well with how good students are with technology, and it also gives them chances to solve problems and deal with tough tasks. These elements are crucial in fostering a sense of achievement and engagement. They help with the first challenges of starting university and get students ready for the hard work that is coming up [3]. Game-based learning includes pictures and designs that students can see, and it gives them problems that change to match how well they are doing. This helps students get certainly involved in what they are learning. This approach serves to enhance their enthusiasm for learning, consequently elevating educational outcomes and cultivating a sense of enjoyment within an engaging environment [4]. Likewise, learning outside of the classroom and putting it in its actual place can be done through the use of location-based games. They have many advantages, such as letting students learn in real situations, gather information outside, understand learning better, and use their mobile phones for educational purposes [5].

According to location-based education's potential, along with the significant adjustment for high school students to their new college environment in enhancing academic performance. Nevertheless, there is a noticeable gap in the study, particularly on the usage of such technologies throughout the important transition period from high school to university. While several studies have researched common orientation programs, there has been little study into interactive, location-based mobile applications aimed at assisting with this transition. The study aims to fill this gap by exploring the location-based mobile game application's potential, which was specifically developed to assist high school students at Chiang Mai University in their new academic environment. The game is developed to assist students in dealing with the challenges of starting university during the university transition phase. The primary aim is to familiarize new students comprehensively with all aspects of their university life, creating an immersive and interactive learning experience. Additionally, the study seeks to gain insights into the students' perceptions of this novel pedagogical method. A key objective is to achieve a deep understanding of the overall learning experience facilitated by this approach. Lastly, the study aims to explore the development process of a location-based game tailored for university transition, assessing its effectiveness in aiding students in acclimatizing to university life.

The university orientation initiative has been affected by the COVID-19 pandemic, compelling higher education institutions to modify and devise alternative tools and methodologies tailored to students amidst the pandemic [38]. Due to the

limitations of meeting in person and the requirement to maintain physical distance, conventional events for orientation have been minimized or switched out for virtual choices. Recognizing these obstacles, the university recognizes the significance of delivering first-year students with worthwhile orientation experiences. The first steps included providing virtual tours of the university along with virtual events with college advisors.

This study aimed to create a location-based game with the purpose of assisting newcomer students to acknowledge the services, policies, and significant areas of the university. In the game, students must locate specific places and then respond to quizzes while getting acquainted with the college. The major objective of the study was to deliver an alternate strategy to facilitate the transition to college for a huge number of first-year students, approximately 7,000 annually, and to evaluate the location-based game learning's effectiveness. Consequently, four research questions were developed to guide this investigation:

- (RQ1) How can we design and create a game that uses locations to enhance knowledge acquisition related to university transition for college students?
- (RQ2) How much does the location-based game developed in this study support the acquisition of knowledge related to university transition?
- (RQ3) What are the students' experiences and perspectives with the location-based game designed for transitioning to university?

This investigation focuses on how helpful a tool for university orientation is for educational institutions and researchers. These questions give important perspectives about how well the location-based game helps students learn about transitioning to university. They also investigate how learning outcomes might be different depending on what subjects' students are studying and collect helpful experiences from the learners that completed the game. Researchers and educational institutions can use discoveries in formulating efficacious orientation initiatives, tailoring interventions to particular areas, enhancing incitement, and obtaining a more understandable comprehension of how comparable game-based techniques influence learning settings.

2 LITERATURE REVIEW

2.1 The transition challenge encountered by students moving from high school to college

Transitional phase means an occurrence, whether intentional or unintentional, resulting in the alteration of relationships, routines, ideologies, and responsibilities, encompassing the shift to a novel academic atmosphere replete with distinct academic challenges [6]. Students undergo an adaptation process while transferring from secondary school to their new university, wherein they encounter a more demanding knowledge framework [7]. [8] underscore the significance of priming high school learners for moving to a new university by accustoming them to the particular teaching and learning methodologies prevalent at the university level [8]. This preliminary stage encompasses aiding students in navigating the urban landscape surrounding universities and cultivating a thorough comprehension of the array of course options available. Essentially, before students move from high school to university, the time leading up to this change aims to give them the important knowledge and skills they need to be able to learn on their own during their time in college.

The programs have a lot of different activities to help students and their parents get to know the college campus. These include organized tours of the campus, letting students experience living there before they start college, and giving important information to educators, advisors, and parents. Collectively, these endeavors deliver an integrated assistance system developed to serve the necessities of learners and the main stakeholders in the university transition procedure [8]. Furthermore, an all-encompassing assistance system serves as crucial for learners at both ends of the transitional spectrum, enhancing getting accustomed to academic life and promoting the development of their identity as learners and self-reliance. A change from secondary to college school obliges a crucial reorientation in their views of themselves as both students and citizens of society. Students in their first year at college face the challenging task of reconstructing how they think about things and getting adjusted to the unfamiliar university and social atmospheres they confront. This changing stage emphasizes the absolute necessity of solid structures of support that assist undergraduates in acquiring a strong sense of self as individuals who learn and are a part of their college community [9]. Nevertheless, the majority of learners regard their transition to college as a significant hardship. Starting new relationships, changing how they interact with family, and learning how to do well in a new kind of school all make first-year college students anxious about higher education. Further, learners are anticipated to have the competence to carry out responsibilities as adults, such as efficiently managing their time and finances [10]. Students face a variety of hurdles while transferring to a new school, including adjusting to the foreign school environment, overcoming physical and geographical limitations, and negotiating organizational complexity [6]. According to the insights provided by [11], pre-entry concerns among students stem from challenges in school transition and a sense of bewilderment in their foreign surroundings [11]. Concerns may arise among students, particularly regarding their capacity to adapt to novel regulations and norms or navigate unfamiliar architectural structures, as indicated by [12]. With the purpose of addressing these issues, how well students grasp their homework when they study with friends and receive assistance from their teachers is critical to their success in the transition to college [13]. The primary purpose of creating information through mediation is to help freshmen at universities achieve their academic objectives by aligning what they are learning with what they already know and how they desire to advance their knowledge [1]. Despite the principal allocation of time that newly enrolled undergraduates dedicate to contact with their professors and classmates within the limits of the classroom, it may overcome other barriers impeding learners from gaining crucial knowledge for the school transition [14].

2.2 The game-based education approach and the design of the game

Games constitute a significant facet of human civilization and culture, serving as sources of inspiration and engagement for individuals [15]. Using game features in different places, such as elementary and secondary education [41], adult education, university, sports and wellness, the workplace, and the behavior of consumers, is a strategy employed to attain favorable outcomes in terms of motivation, behavior, and learning [16]. Game-based learning's concept is believed to be related to mid-1950s game research, and a systematic study and implementation of integrating games into the context of education took place in the 1980s [17]. The term "game-based learning" refers to teaching students about a particular topic utilizing various technologies and platforms, as well as game characteristics, rules, mechanical work, or concepts [18].

Game-based learning offers immersive experiences for gaining knowledge and skills [42]. It improves analytical thinking, learning through self-directed working in teams, and group problem-solving ability [19]. [20] suggest a simulation game, particularly for showing scientific events and solving scientific problems [20]. Before commencing the game creation procedure, game designers need to understand that all ages of learners have diverse inclinations for games. Preschoolers, for example, may be engaged by basic and quick exploration activities involving clicking, but children in elementary school may receive a sense of accomplishment from games that incorporate reward systems, allowing them to take control of the activities. It proves advantageous for preteens to gradually unveil who they are and comprehend the game's content over time [6]. In addition, important factors in the game's conceptual structure consist of characters, plots, realism, functionality, and technology [21]. Character design, for instance, plays an essential role in development, and a well-crafted narrative is necessary to provide the characters with an intriguing motive that draws them into the gameplay [14]. [22] launched City Jam, a mobile game to help Flemish teenagers aged 15 to 18 learn about driving safety. The game takes place in a virtual representation of Ghent City and features several mini-games that use real places in the city. Furthermore, the game featured sections for touring and virtual object collection to pique the learners' interest while also teaching them about road safety. A smartphone app, Trilho Verde, improves field trip learning experiences by utilizing location-based technologies [23]. The mobile app suggests a list of interesting places for learners to visit. During a field trip with Trilho Verde, learners are directed through the list in two ways. If they are far from the next destination, a map appears showing their location and guiding them on the journey. Additionally, the Reflect UP mobile application was designed to examine its effectiveness in promoting students' thoughts and perceptions about their skills in a university environment. The emphasis centered on how the app affected students' comprehension and the development of skills in a variety of academic circumstances. Reflect. UP significantly improved students' awareness of their skills. Most learners reported gaining a greater understanding of their abilities and possibilities for growth. Learners responded positively to the app, enjoying its ability to provide organized and meaningful comments on their educational experiences. Instructors and institutions are urged to explore using such programs to help students' overall development [45].

2.3 Learning approaches to location-based gaming

Niantic's launch of Pokémon GO in July 2016 led to a significant spike in the acceptance of location-based games. Such games are distinguished by gameplay focusing primarily on the player or, in exceptional instances, the physical position of another item [24]. A significant number of location-based games are included in the classification of universal games, which have been equipped with or smoothly connected with the real world [25]. Furthermore, they received considerable prominence as viable methods of teaching for the future of education, given their proven record of positive learning outcomes [26]. An instance illustrating the utilization of location-based technology for instructional purposes through narrative-driven content is a historical game set in medieval Amsterdam [27]. According to [26], the following three variables shape users' engagement in location-based games: (1) engaging in outdoor activities; (2) exploring novel areas in their immediate surroundings; and (3) attending social activities with friends [26]. In essence, location-based games leverage game rules that motivate players to explore the outside and spend time with

other players [51]. In addition, the central emphasis in the development and research of location-based games is immersion. Immersion evaluation is difficult since it relies on players' subjective experiences within the game and is influenced by a wide range of factors [28].

2.4 Educational transition game

Based on Wang, the study aims to develop methods for using game-based learning outside of official educational settings, as well as to make a role-playing game (RPG) that can help students adjust to an unfamiliar learning atmosphere. The game produced for this research features four major objectives: realism, storytelling, mechanics, and the incorporation of technology [6]. The objective of providing learners with detailed and accurate representations of activities, the learning environment layout, floor plan, and building location were thoroughly replicated from the chosen school. The developing story is about a purposely spread virus that brings devastating damage to a town. In this narrative, police enforcement endeavors to figure out where the crime commenced, resulting in them investigating a high school as the beginning of the virus. Subsequently, a detective is assigned to undertake an in-depth investigation. In the game, the player has the task of being a detective in charge of investigating a mystery at the school. The game's main aim is to enable high school students to become acquainted with their school's surroundings, regulations, and events. The educational goals covered the following: (1) comprehension of the layout of classrooms and administrative offices; (2) becoming acquainted with and conforming to the activities of school; (3) gaining an understanding of and adherence to the responsibilities of essential offices; (4) comprehending and conforming to library rules; and (5) comprehending and adhering to recycling rules and knowing where to recycle. The study found that the peer version of the game considerably boosted the involvement and inspiration of students as compared to the independent version. Students reported greater engagement and involvement when playing with classmates, resulting in a more fun and engaging learning experience [6]. Also, the study discovered that the peer version resulted in more effective learning results. Students in the peer version displayed a deeper comprehension of the content and scored better on exams than those in the independent version. This improvement is a consequence of the peer mode's interactive and collaborative element, which enabled knowledge exchange and resolution of problems [6]. Moreover, the browser-based educational game "FreshUP" was developed to assess the usage and impact of assisting university newcomers with initial difficulties such as campus orientation and course arrangement. It helped learners successfully navigate their new surroundings and organize their learning tasks. The game concept proved encouraging, giving an enjoyable and efficient approach to imparting crucial knowledge. It also highlighted the power of current technology in educational settings by utilizing mobile devices and gaming. This approach can help newcomers adjust to campus life easier and enjoy it more [46].

2.5 Challenges of the technology for university orientation

This study focuses on how to create a location-based game and its impact as a new method in a university transition program. It aims to help freshmen get to know the campus better and looks into their experiences while playing the game. The results showed that students who finished the program learned a lot about starting university. They liked learning through the location-based game and felt motivated.

Finally, looking at both numbers and comments from questionnaires and usage data, we found both good and bad feedback. However, many researchers have also studied many technologies and approaches adopted in university orientation or college learning, as summarized in Table 1.

Table 1. The summarization of the studies about university orientation or college learning

Researcher	Name (Type of Methods)	Country	Participants	Type of Orientation	Results
Tüzün & Özdiñ [36]	3D multi-user virtual environments (MUVES)	Turkey	55	Onsite	Students in the virtual orientation remembered route details better than those in the real-life orientation, although both groups were similar in recalling landmarks and overall spatial knowledge. The virtual orientation scored higher in general learning and ease of use, but both types were similar in effectiveness and entertainment. Participants felt a strong sense of presence in the virtual orientation.
Wang [6]	Game-based learning and a role-playing game (RPG)	Taiwan	110	Onsite	Most students appreciated the game's design and found it engaging and user-friendly. Solo players outperformed those in group play in post-tests. RPGole-playing games in casual learning effectively simulates among students a campus environment, enhancing learning through problem-solving.
Elsom et al. [37]	The Universal Student (Alternate reality games (ARG))	Australia	13	Onsite	Participants who played the game experienced better emotions, knew the campus better, and interacted more socially than those who only attended orientation without playing. This indicates that such a game can foster positive feelings and friendships among new university students.

When reviewing the study findings shown above, it is evident that each technique has advantages in assisting first-year students with their university transition. According to [36], their research focused on a virtual orientation program. It showed that students in this program remembered route details better than those in real-life orientation. Additionally, it scored higher in general learning and ease of use. In terms of overall spatial knowledge, usefulness, and enjoyment, it was comparable to real-life orientation [36]. Nevertheless, unlike the location-based game, the virtual orientation might offer less physical engagement, which can be a crucial factor in familiarizing students with the actual campus environment. Compared to the location-based game, virtual orientation may not provide the same level of real-world familiarity and hands-on experience as physically being in university. Conversely, the location-based game was more engaging and interactive, which could be more appealing to students who prefer active learning. Wang showed that the design of role-playing games for learning in the university environment was appreciated, as it was engaging and user-friendly. Solo players outperformed group players in post-tests, and the game effectively simulated a campus environment, aiding in problem-solving skills [6]. However, group play might be less effective compared to solo play, and the gaming experience of students might lack the depth of real-world interactions. RPGs could be less appealing to students who prefer traditional or less technology-centric learning methods. On the other hand, our location-based gaming approach engages students in an interactive and motivational way and helps to familiarize them with the campus through active participation. It focuses more on physical interaction with the campus, aiming to provide a comprehensive understanding of the university environment. Another approach for university orientation is from [37]. The Universal Student, based on the concept

of ARG, emphasizes emotional well-being, social interaction, fostering friendships, and a more immersive experience that enhances familiarity with the campus. Nonetheless, convincing students to play ARGs is a challenge to their use for learning and engagement. Students may view games as fun rather than a purposeful application of their restrained time, and they may be unconvinced of their effectiveness for learning. On the contrary, the CMU Journey game developed with the location-based gaming approach is more focused on educational content, helping students learn about university life in an engaging manner. Besides, it increases motivation and engagement in learning through the game.

3 CMU JOURNEY

The CMU Journey is an innovative location-based game developed jointly by the Student Development Division University Office of Chiang Mai University in collaboration with researchers from the College of Art, Media, and Technology and the Faculty of Humanities, specifically for student orientation at Chiang Mai University. The game was created to address the issues that new university students encounter. Traditional orientation approaches, while instructive, sometimes fail to truly engage students or present a thorough grasp of their new surroundings. The location-based mobile game was designed to provide an immersive and dynamic learning experience that surpasses traditional approaches. This approach utilizes the familiarity of mobile technology and the captivating nature of games to make the orientation process more interesting and pleasant. The game's design emphasizes helping students get acquainted with important university places, services, and resources, making it simpler for them to discover and adapt to their new academic environment. This game utilizes real-world locations on campus to engage students in interactive learning experiences. Through the CMU Journey, students can explore various campus landmarks, learn about university services and regulations, and participate in fun challenges designed to enhance their understanding of university life. The importance and selection of specific locations at the university were carefully chosen by the Student Development Division University Office based on their significance to a student's everyday life and educational experience. These locations comprise critical amenities such as the library, health center, and registration office, which are required for academic and administrative purposes.

University orientation programs and the overall health and safety of individuals have been impacted by the COVID-19 pandemic. With the need to adhere to public health guidelines and minimize the risk of virus transmission, traditional in-person orientation activities have been curtailed or modified to comply with physical distancing measures. Many universities have transitioned to virtual orientation sessions and online resources to ensure that new students still receive important information about campus facilities, academic programs, and support services. Additionally, enhanced health and safety protocols have been implemented across university campuses, including increased sanitation measures, mandatory mask-wearing policies, and restrictions on large gatherings. These measures aim to protect the health and well-being of students, faculty, staff, and visitors and to mitigate the spread of COVID-19 within the university community. To prevent the COVID-19 pandemic from spreading, which has led to restrictions on in-person meetings and events on university campuses [39], universities have implemented strict policies requiring masks and enforcing social distancing in all public spaces. In response to these challenges, some universities are incorporating location-based

games into their orientation activities [52, 53]. These games provide an interactive and engaging way for new students to learn about campus resources and facilities while maintaining physical distance. By using mobile devices to navigate virtual campus tours and complete orientation tasks, students can familiarize themselves with their new environment while adhering to COVID-19 safety measures.

The CMU Journey mobile app, which can be accessed through <https://lis.human.cmu.ac.th/cmujourney/>, implemented the game design principle of location-based games, a concept popularized by games such as Pokémon Go. In games, the real-life location of players is employed to support the gaming experience. These fundamental game mechanics employ augmented reality and geolocation to engage with real-world elements, offering benefits including heightened immersion, stimulation of touring, and distinctive gameplay tailored to the surroundings [29] [30]. The inherent game mechanics establish precise rules and procedures constituting a location-based game, as depicted in Figure 1. The fundamental game mechanics encompass activities such as exploring the designated location, capturing monsters situated there, and responding to challenge questions presented by these monsters. A more comprehensive elucidation of these mechanics is provided below:

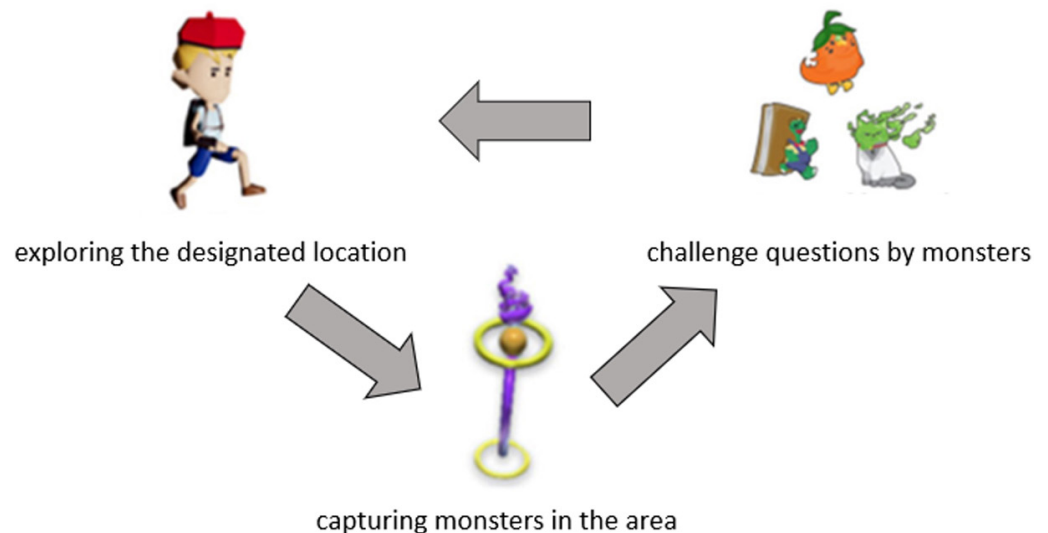


Fig. 1. Game mechanics present in CMU Journey

We developed the first core gameplay, which entails exploring seven important locations at the university. This design attempts to acquaint first-year learners with the important areas outlined in Table 2. Upon entering the game, participants are provided with a concise mini-map derived from geolocation data, featuring a student icon to aid in navigating the university, as depicted in Figure 2. While students have the liberty to choose their initial and final exploration points, it is mandatory for them to traverse the entirety of the campus to successfully conclude the game. This gaming mechanism imparts a feeling of adventure and enthusiasm by integrating actual locations into the game, contributing to a more enjoyable and motivating learning experience. Moreover, it aids students in familiarizing themselves with their new university environment, facilitating their adjustment to college life [31]. Simultaneously, it fosters a sense of community and assists students in establishing a support network within the university. By navigating the campus and interacting with peers through the game, students can start forming connections and feel more integrated into the university environment. According to Strayhorn (2018), the game

lowers feelings of disorientation and isolation by familiarizing students with the campus layout and important places. Students who are comfortable in their surroundings are more inclined to participate in university activities and social gatherings, which strengthens a sense of community among students [47].

“Campus Quest: Monster Capture,” a location-based game designed to help freshmen become acquainted with their university campus enjoyably and engagingly. In this game, students set out on a journey to catch monsters spread over the university’s mini-map, as depicted in Figure 2. Each monster represents a significant location on campus, including academic buildings, libraries, cafeterias, and recreational areas. As students stroll the campus in the game, they come across numerous monsters and learn about the history of each significant landmark and leaderboard [32]. While enjoying an immersive game experience, students learn about their new school environment by capturing monsters and visiting various locations on campus.

In “Answer Quest: Challenging Questions from Monsters,” once a student captures a monster, they are presented with challenging questions related to the knowledge associated with the location on campus where the monster was found. These questions cover a variety of subjects, including history, geography, and other relevant topics pertinent to particular places and landmarks on campus. Students have ten minutes to answer the question, which they might do by asking others or investigating their surroundings. By successfully answering these questions, students not only acquire knowledge about their university campus but also deepen their understanding of the significance of each location. Moreover, this game element provides an interactive and educational way for students to navigate their campus, learn about its history and geography, and challenge themselves with trivia related to their surroundings [33]. Furthermore, this technique was created to offer a platform for peer participation and cooperation with university authorities.

Table 2. Place, learning objective, and mission explanation for the game

Place	Learning Objective	Mission Explanation
1. Sala Dham Hall	To acquaint themselves with the primary public gathering space and significant symbolic location of the university	<ul style="list-style-type: none"> – Acquire knowledge of the university’s significant symbols. – Familiarize oneself with the designated location for public assemblies.
2. University library	To study the services and rules of the main library	<ul style="list-style-type: none"> – Acquire an understanding of library services, including circulation and reference. – Familiarize oneself with the regulations governing library usage. – Engage with the librarian to seek assistance with research inquiries.
3. Building of Majesty Birthday Anniversary	To study about the celebrate the king of Thailand and royal duties	<ul style="list-style-type: none"> – Gain knowledge of the historical background concerning King Bhumibol Adulyadej, who inaugurated Chiang Mai University in 1965. – Acquire insights into the notable accomplishments of the king.
4. The Historical Development Hall of the university	To explore the university’s cultural legacy and history	<ul style="list-style-type: none"> – Acquire an understanding of the university’s history. – Familiarize oneself with notable figures associated with the university. – Identify significant locations within the university campus.
5. CMU health center	To understand the healthcare options available to college students	<ul style="list-style-type: none"> – Comprehend the healthcare entitlements for students. – Engage with the pharmacy services. – Advocate for the well-being of students in terms of healthcare.
6. The Ang Kaew Reservoir	To identify the main tourist spots and important landmarks on the university campus	<ul style="list-style-type: none"> – Acquire knowledge about exercise and rest guidelines. – Understand the significance of water and its associated ecosystem. – Familiarize oneself with recycling regulations.
7. Registration Office and public building	To acquire information about student services and familiarize oneself with the layout of public/classroom buildings	<ul style="list-style-type: none"> – Familiarize yourself with the registration office – Acquaint yourself with key classroom buildings. – Understand fundamental university student regulations.

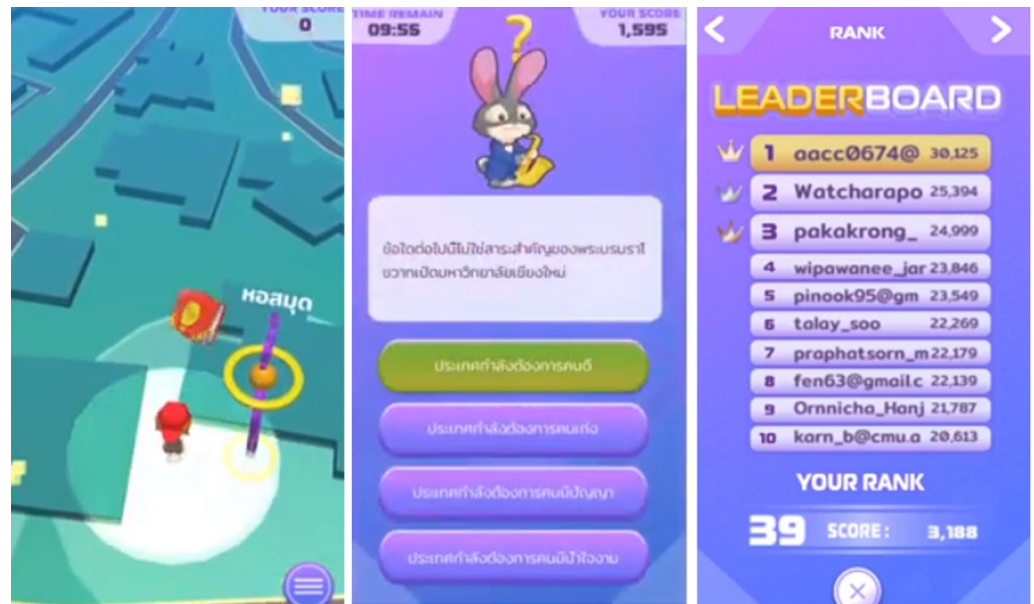


Fig. 2. The gaming experience at main hall library of the university

4 RESEARCH METHODOLOGY

The study employs a mixed-methods approach, with an explanatory sequential design divided into two main stages: quantitative data collection and qualitative data synthesis.

Study design: This study employs a one-group pretest-posttest design, measuring a single group of participants before and after exposure to the CMU Journey game. This approach allows for a comparison of participants' knowledge levels prior to and following the intervention, offering insights into the game's effectiveness.

Stage 1 Quantitative data collection: Quantitative data will be gathered with the use of pre-post measurements. The questionnaire will be administered to participants before and after engaging in the CMU Journey game. Additionally, data analytics will be conducted using a statistical platform to analyze changes in participants' knowledge acquisition levels over time.

Stage 2 Qualitative data synthesis: Following the quantitative phase, qualitative data, such as thematic analysis [48], will be utilized to synthesize and analyze the qualitative results, with data obtained through an online open-ended questionnaire. Learners who have played the CMU Journey game will be invited to share their experiences and insights. The quantitative and qualitative data will be combined throughout the interpretation phase to offer an entire overview of the CMU Journey game's impact on participants' knowledge and experiences.

The study adopts a mixed-methods technique following the guidelines suggested by [34]. Mixed-methods outlines offer advantages when an academic seeks to inquire at links and patterns through quantitative data and explore underlying processes or reasons through qualitative inquiry at the same time. The explanatory sequential approach, as described, combines both qualitative and quantitative phases to offer a thorough understanding of the research phenomena. In the quantitative part, we collected and analyzed numerical data systematically to identify differences among groups, particularly looking at knowledge acquisition levels.

To obtain a deeper understanding of the results obtained from the quantitative section and to go through the experiences of students with the CMU Journey, our location-based game, we collected and examined qualitative data using questionnaires embedded within CMU Journey. This method helped us gather detailed feedback for the qualitative analysis.

The sampling approach used to select participants is purposive sampling with quota sampling components. Integrating these methods ensures that the sample is both relevant to the objectives of the study and varied enough to provide significant information across different subgroups within the population. For example, it includes first-year students willing to complete the online content, fill out the questionnaire, and participate in the activity for at least 30 minutes. The research was carried out over the course of three months, from the start of the academic semester until the end of the first term. To understand what people thought about the CMU Journey game, we looked at the answers they gave in the questionnaire after they finished playing. The questionnaire had a part where participants could share their thoughts freely. After they filled it out, we translated the comments into Thai and analyzed them by identifying common themes and organizing them into categories. We looked at the data using a method explained by [35]. First, we read all the comments to understand the information better. Then, we started coding by matching short transcripts of comments with the relevant parts of the data. A coding unit refers to any portion of text, such as a word, a phrase, a sentence, or a paragraph, that communicates a single idea or concept relevant to the research questions. This definition is widely applied in qualitative data analysis to systematically organize and interpret textual data [49]. The codes were created using the specific words students used and ideas from relevant literature. A team of qualified researchers who are skilled with qualitative data analysis and theme-coding approaches carried out the coding. To eliminate subjectivity, inter-rater agreement was assessed. The coding team coded a part of the data separately, and Cohen's Kappa coefficient was determined to confirm the coding procedure was reliable and consistent [50]. After that, we carefully reviewed all the codes, removing any duplicates. The remaining qualitative data underwent a thorough analysis. We created a preliminary code list to make it easier to study the qualitative data. To make the coding clear and explain each theme, we included quotes that illustrate the points.

4.1 Participants

Newcomer students were assembled using the Facebook page of the university office dedicated to the student development division, wherein notifications were conveyed to every faculty administrator within the university. By employing these methods, a grand total of 2,349 individuals across 21 faculties were registered to utilize the CMU Journey through their university student login accounts. Kindly be advised that we specifically chose first-year students who willingly completed the online content, filled out the questionnaire, and engaged in the activity for a minimum of 30 minutes. Only students who finished the CMU Journey game were requested to answer the posttest questionnaire, ensuring that the data truly reflects the game's experiences and knowledge. The demographic details of the participants are outlined in Table 3.

Table 3. Participant demographic information

Division	Department	Female	Male	Total
1. Medical and health students (f = 170, m = 86)				
	Medicine	43	32	75
	Nursing	51	5	56
	Veterinary Medicine	25	15	40
	Pharmacy	10	21	31
	Associated Medical Sciences	29	3	32
	Dentistry	12	10	22
				256
2. Technology and Science students (f = 128, m = 213)				
	College of Arts, Media and Technology	30	56	86
	Architecture	12	8	20
	Agro-Industry	17	25	42
	Agriculture	14	40	54
	Science	44	32	76
	Engineering	11	52	63
				341
3. Humanities and Social students (f = 261, m = 173)				
	Economics	67	24	91
	Business School	29	26	55
	Education	56	40	96
	Humanities	58	12	70
	Social Sciences	8	15	23
	Political Science and Public Administration	12	27	39
	Law	8	10	18
	Fine Arts	4	16	20
	Mass Communication	19	3	22
				434
Total		559	472	1,031

4.2 Instruments

Knowledge acquisition and open-ended questionnaire. To assess students' knowledge acquisition about the university knowledge in this study, data was obtained through a pre- and post-test questionnaire and an online open-ended questionnaire. The pre- and post-test questionnaire included 30 questions to measure students' understanding of university transition before and after attendance in the gaming orientation, and these questions were designed particularly for this study.

They covered issues such as resources on campus, academic regulations, services for students, and social elements of life at college. In addition, an online open-ended questionnaire was employed to obtain qualitative data regarding the experiences of students and opinions concerning the location-based game, as shown in Appendix.

CMU Journey. Inspired by the famous game Pokémon Go, our location-based mobile phone game, CMU Journey, was created to assist first-year students in adjusting to their new academic environment, meeting new friends, and lowering their anxiety.

4.3 Research procedure

First-year university students will be requested to attend the gaming orientation. The gaming orientation will be communicated through university channels, including social media and campus posters. Throughout the gaming orientation, students will learn how to access and play the CMU Journey location-based game. They will be trained on how to utilize their own devices to move around the game while discovering various areas on campus. Students who have consented to participate in the experimental data collection will be requested to fill out a pre-test questionnaire to evaluate their knowledge and comprehension of university transition topics. After participating in the gaming orientation, students will be requested to fill out a post-test questionnaire to determine if there are any improvements in their knowledge and comprehension. Additionally, students will be invited to provide their feedback and opinion on the gaming orientation using an online open-ended questionnaire. The quantitative data acquired from the pre- and post-test questionnaires will be examined to determine developments in the knowledge that students gain. The qualitative data from the open-ended questionnaire will be evaluated to get a glimpse of students' gaming experiences as well as their perspectives.

5 RESULTS

A mixed-methods approach is employed to determine the results of the research questions discussed in this study. The findings are presented below.

5.1 Results of the quantitative data (pre- and post-tests)

The Wilcoxon signed rank test was used to assess learning performance, as presented in Table 4, due to the data not being normally distributed, a condition confirmed by the Shapiro-Wilk test. As depicted in Table 4, the outcomes of both pre- and post-tests across all three student groups demonstrated that there was a significant improvement between pre- and post-tests, indicating a substantial improvement in learning outcomes following participation in the gaming orientation. In terms of the learning outcome for each academic discipline, the results showed that humanities and social students had a pre-test average score of 10.06 with a standard deviation of 3.03. The post-test indicated improvement, with an average score of 15.26 and a standard deviation of 4.46. The improvement was statistically significant ($Z = -14.711$, $P < .001$). For Technology and Science students, in the post-test, their average score improved significantly from 12.84 with a S.D. of 5.01 to 16.32 with a S.D. of 4.08 ($Z = -8.9338$, $P < .001$). Meanwhile, medical and health students had a pre-test average

of 10.21 with a S.D. of 3.24, which increased to 15.54 with a S.D. of 5.90 on the post-test. The improvement was statistically significant ($Z = -15.211$, $P < .001$).

Table 4. Wilcoxon signed ranks test of pre- and post-tests of all students

Group	Test	Participants	Mean	S.D.	Z	P-Value
All Group	Pre-test	N = 1031 (F = 559, M = 472)	10.50	3.18	-18.690 ^b	<.001
	Post-test	N = 1031 (F = 559, M = 472)	16.04	5.32		
Humanities and Social students	Pre-test	N = 434 (F = 261, M = 173)	10.06	3.03	-14.711 ^b	<.001
	Post-test	N = 434 (F = 261, M = 173)	15.26	4.46		
Technology and Science students	Pre-test	N = 341 (F = 128, M = 213)	12.84	5.01	-8.9338 ^b	<.001
	Post-test	N = 341 (F = 128, M = 213)	16.32	4.08		
Medical and health students	Pre-test	N = 256 (F = 170, M = 86)	10.21	3.24	-15.211 ^b	<.001
	Post-test	N = 256 (F = 170, M = 86)	15.54	5.90		

5.2 Results of the qualitative data

Upon completion of the CMU Journey orientation program, three groups of students were requested to share their feedback and recommendations via an online survey featuring the question, “Do you have any feedback or suggestions for the CMU Journey orientation program?” The qualitative data collected via an online open-ended questionnaire administered via Google Forms aimed to collect students’ perspectives and impressions of the gaming experience. Of the 1,031 students representing 21 faculties, 189 participants responded, with a summary of their feedback presented in Table 5. Comments varied widely, offering insights into students’ perceptions of the program’s effectiveness, strengths, and areas for improvement. This data will guide future enhancements to the CMU Journey orientation program, ensuring it meets the evolving needs of incoming students.

Table 5. Students’ response regarding the transition into a college location-based game

Item	Female	Male	Total
In-person orientation comments	17	12	29
Positive responses	38	53	91
Negative responses	12	18	30
CMU Journey improvement suggestions	16	23	39
Total responses	83	106	189

In-person orientation comments (12 comments): Some students mentioned they would rather have face-to-face orientations instead of online ones. However, one student liked the online option better due to limited time and weather issues. This student said they prefer using online methods for orientation, such as virtual 360 tours, live webinars, or recorded videos.

Positive responses (91 comments): Students gave their opinions on CMU Journey, the orientation program for new college students. We found forty-four positive comments. Many said it was enjoyable, engaging, and a good learning game.

Students expressed enthusiasm for the interactive and engaging nature of the game. Others mentioned it helped them get to know and explore the university. Some students found the trivia questions related to university history and services to be educational and informative. They said it is a good way for first-year students to learn about key places and landmarks and that it lets them find parts of the university they would not have known about before. A few students highlighted the sense of accomplishment they felt when completing challenges and capturing monsters around the campus. Additionally, they got to know other players and made friends with them. That made them feel socially connected while participating in the university orientation. Some positive comments mentioned how the game helped with teamwork and making friends. People said things such as “It is a good game for meeting new friends and finding answers” and they found enjoyment and engagement in the competitive element of the game, “I enjoyed the opportunity to engage in friendly competition with my peer.” Students also highlighted specific educational accomplishments, such as expressing, “The game effectively teaches about university services and regulations; I would suggest it for future use,” and “I gained valuable knowledge about the library, health center, and registration procedures.”

Negative responses (30 comments): Negative comments about CMU Journey highlighted several issues. Some students felt the game was not suitable for their needs, possibly due to its design or content not aligning with their expectations for an academic orientation program. One student said, “The game is fun, but some places, like the Majesty Birthday Anniversary Building, had boring questions. I think not every location needs the game so people can finish it faster.” Others mentioned, “Please balance the questions, some are too easy or too hard.” Besides, a few students felt that the game did not provide enough guidance or instruction, leading to confusion about objectives and tasks. Another feedback was about the game being outdoors, saying it’s not good for students who prefer indoor activities. Additionally, a useful observation was made regarding the game’s potential limitations for certain student populations, such as those with disabilities. A common complaint was that the game was time-consuming, suggesting that students found it to be a significant drain on their schedule, which could interfere with other academic responsibilities or personal time. One individual remarked, “While the game is enjoyable, it requires a significant amount of time to reach each destination.” There were safety concerns, indicating that some aspects of the game might pose risks. This could include physical safety issues due to moving around while playing. One student stated that “I believe the game should only be played in the daytime because some parts of the university are unfamiliar and could be risky at night.” It is important to note that negative feedback was provided exclusively by participants who completed the orientation program; feedback from non-participants was not obtained.

CMU Journey improvement suggestions (39 comments): For suggestions on improving the app, we divided the feedback into three areas: designing the game, using technology better, and suggestions for developing the content.

Designing the game: For game design, the suggestions for improvement included issues with language barriers, time limits, and safety. The language barrier posed a significant challenge due to the presence of both local and international students. Several students suggested that the app include inquiries in both Thai and English, as the game currently offers questions in Thai, which is an inconvenience for international learners. The time it takes to play was also an issue. People suggested that the game should only be available to play on weekdays from 2:30 PM to 7:00 PM and all day on weekends, mainly because it’s not safe to play at night. Since orientation

programs do not last long, the game should be made so it can be finished quickly. If it takes too much time, students might get bored or not be able to finish it before orientation ends.

Using technology better: The biggest issue with using the technology was with different types of Android phones, which have various operating systems and specs. Some students with older versions, such as Android 10.0, said the app crashes at the start. Also, the GPS wasn't always accurate, making it hard for students to find places or showing wrong locations on the map.

Developing the content: Numerous students expressed concerns such as "There is a shortage of questions," "Additional questions should be provided at each location," and "New locations should be introduced." Many helpful ideas were pointed to, including sporting venues, such as the main stadium and fitness facility, as well as a place dedicated to sustainability and environmental initiatives.

6 FINDING AND DISCUSSION

Data was collected and analyzed to respond to the research questions posed. Data was collected and analyzed to address the research inquiries. Scores from assessments conducted before and after the game-based orientation, aimed at evaluating knowledge regarding transitioning into university, were collected and compared. This was done to assess the effectiveness of students in acquiring knowledge about university life. The gaming experiences and comments from students were assessed through questionnaires, and usage data from the game system's cloud was gathered for analysis. This involved analyzing both qualitative and quantitative data using SPSS software. The findings addressing the research questions are presented below.

6.1 Summary of the result of the research question

RQ1: "How can we design and create a game that uses locations to enhance knowledge acquisition related to university transition for college students?" developed CMU Journey to introduce first-year students to Chiang Mai University using a location-based game concept that leverages students' geographical positions to enrich the gaming experience and facilitate interaction with real-world objects. The game includes three core mechanisms: exploring the university, catching monsters, and answering questions. Students can freely roam and explore the campus using a mini-map guided by geolocation. At key locations, they encounter and capture monsters on their mobile devices. After capturing a monster, students answer related questions within 10 minutes, with the option to re-explore or ask peers for help if they fail. These features help students learn about geography, history, and specific locations, while promoting interaction and teamwork with peers and university staff.

However, the development cost of the application is a significant concern. Developing CMU Journey involved substantial expenses in software development, content creation, user interface design, and ongoing maintenance. The initial development required a considerable investment in programming and design to create an engaging and user-friendly experience, necessitating multiple iterations to fix bugs. Based on our experience, covering both Android and iOS mobile operating systems was challenging. We used the Unity game engine, which can export to both

platforms. For the Android version, several adjustments were needed to accommodate the various versions and types of Android devices used by students. For example, we found that the GPS accuracy in low-cost Android mobile phones was less reliable. However, the advantage of the Android version is the relatively fast publishing process on the Google Play Store, with less time required for approval. In terms of iOS, there were fewer issues with iPhone devices, but the main problem we encountered was the lengthy approval process for each update, which could take up to one month, adding to the development cost. Therefore, these factors should be taken into account when considering the overall cost of development.

RQ2: “How much does the location-based game developed in this study support the acquisition of knowledge related to university transition?” Learners were required to complete a pre- and post-test about university knowledge before and after the university orientation. The Wilcoxon signed rank test was used to assess learning performance, as shown in Table 4. The findings revealed that all participants improved their learning. There was a noticeable increase in their scores from before to after the tests. This improvement was seen in all groups: medical and health students, technology and science students, and humanities and social students. These results are consistent with prior works [54] [55], which provided game-based learning for orienting first-year university students. However, when comparing the groups, technology and science students showed less acquisition of knowledge than the other two groups. This may indicate that technology and science students tend to prefer learning through hands-on activities, technology-based methods, experimentation, and visualization, whereas humanities and social students and medical and health students may focus more on outdoor activities, real experimental memory, and reading, writing, and analyzing texts, leading to better average scores [53].

RQ3: “What are the students’ experiences and perspectives with the location-based game designed for transitioning to university?” We gathered students’ opinions on the location-based game by using surveys and open-ended questions. After completing the CMU Journey orientation program, students from three groups shared their thoughts through an online survey. They were asked, “Do you have any feedback or suggestions for the CMU Journey orientation program?” Out of 1,031 students from 21 faculties, 189 responded, and their feedback is summarized in Table 5. The qualitative feedback from students highlighted several key themes. Many students found the game enjoyable and engaging, noting that it made the process of learning about the university more interactive and less intimidating. The game facilitated social interaction, helping students make new friends and feel more connected to the university community. This social aspect is crucial, as forming connections can significantly ease the transition into a new academic environment. Some students appreciated the game’s educational value, mentioning that the trivia questions about university history and services were informative and helped them learn about important campus locations. This suggests that location-based games can be effective tools for delivering educational content in a more engaging format compared to traditional methods, as supported by [56] [57]. However, there were also areas for improvement. Some students felt that the game was time-consuming and suggested that it could be optimized to fit better within the busy schedules of new students. Additionally, there were comments about the difficulty level of the questions, with some students finding them too easy or too hard. This indicates a need for a more balanced approach to question design to cater to a wider range of knowledge levels.

6.2 Implications

The implementation of the CMU Journey application has several significant implications for students, the university, researchers, educators, and other institutions. For students, the game facilitates a smoother transition to university life by providing an engaging and interactive way to learn about their new environment, reducing feelings of disorientation and anxiety that are common during the initial phase of university life. Additionally, the game encourages social interaction and teamwork, helping students build connections and support networks early on, which are crucial for enhancing their sense of belonging and community within the university. For the university, this innovative approach to orientation can enhance its reputation as a forward-thinking institution that leverages technology to improve student experiences. The data collected from the game can provide valuable insights into student engagement and areas that may require further support or improvement, enabling the university to continuously refine and enhance its orientation programs. For researchers, the development and evaluation of the CMU Journey provide a model for integrating technology into educational transitions, highlighting the importance of designing user-centered applications that address specific challenges faced by students.

7 LIMITATION AND FUTURE WORK

According to the findings of this study, the sample size of this study may restrict the findings' generalizability to larger student groups because it focused solely on three academic disciplines: humanities and social students, technology and science, and medical and health students. Likewise, the sample may not accurately reflect the range of student demographics and backgrounds, thereby restricting the application of the findings. Only supporting the Thai language, the game's content, and design may not be inclusive or attentive to all students' different cultural backgrounds and language abilities, thereby alienating particular populations and preventing them from participating in the orientation process. Moreover, the dependence on mobile devices and Internet connectivity could limit students who do not have access to or are inexperienced with such technology, restricting the game's accessibility and performance among particular participant groups. Additionally, the development and execution of a location-based game can be costly in terms of resources necessitating devoted time, skill, and financial commitment that not all educational institutions or departments are capable of offering.

Further research may look at the aspects that influence students' experiences with location-based gaming. To begin with, future versions of the game may contain accessibility features that benefit students with impairments or limits, including alternative input techniques, audio explanations, or tactile feedback alternatives. More study is required to determine how to modify the game to be culturally sensitive while taking into account varying student groups, such as non-native speakers of English and students from other nations. In addition, future research may utilize longitudinal designs to examine the long-term impact of the location-based game on the academic achievement of students, interaction with society, and general well-being during their undergraduate years. In terms of academic curriculum, the game may be effectively associated with the curriculum and lessons to support educational goals and assist students with education transitions and improving their

skills. Further gamification elements, including cooperative challenges, real-time response mechanisms, or reward systems, may improve motivation for students and their involvement in the game [40]. Addressing these barriers and exploring future research components could increase the success of the location-based game and have an impact on helping first-year students in adjust to their new educational environment.

8 CONCLUSION

The development and evaluation of CMU Journey, a location-based game designed to facilitate the transition of first-year students into their new university environment, have shown promising outcomes. The study accomplished its aims of developing a game to improve knowledge acquisition during the transition to a new university, assessing the game's effectiveness, and studying the experiences of the students. A comparison of pre- and post-test data from all student groups through the use of mixed-method approaches demonstrated a substantial increase in academic performance after participating in the gaming orientation. Humanities and social students, in particular, showed significant progress, with both pre-test and post-test scores increasing considerably. Similarly, technology and science students showed significant progress, as did medical and health students. Furthermore, studying and applying this location-based game to teach first-year students about their new university setting has been shown to be a helpful tool in assisting the university transfer in several ways. We summarized the findings to indicate the following:

- The game familiarizes students with important campus areas, facilities, and places of interest, lowering feelings of disorientation and nervousness that are prevalent during the process of adjusting to life at university.
- The game promotes physical engagement and motivation among students by introducing gaming aspects, enabling them to explore and participate in their new surroundings in a fun and dynamic way [50].
- The game is an instructional tool that allows students to learn crucial information about university services, rules, and resources pleasantly and interactively. This improves their grasp of university regulations and processes.
- Participating in the game may motivate students to connect and network with others, allowing them to build new friendships along with assistance networks, which are essential for a smooth transition to university life.
- The game bridges the gap between virtual and physical environments, allowing students to easily transition from online gaming to real-world university exploration, increasing their perception of belonging and connection to their college environment.
- Although the game allows students to explore and connect with their new university environment online, some students who are unfamiliar with or interested in gaming may feel alienated or disconnected from the process of orientation, perhaps resulting in experiences of isolation or discrimination.

In summary, the location-based game provides a comprehensive approach to assisting first-year students with their transition to university journey, encompassing a wide range of educational, social, and emotional requirements. However, when developing a location-based game for university orientation, it is critical to examine and solve possible disadvantages ahead of time to make sure that it is effective and

diverse. Potential disadvantages include technological issues such as compatibility problems with various devices and operating systems, accessibility challenges for students with disabilities, safety concerns related to navigating the campus, and the need to balance game difficulty to accommodate students from diverse backgrounds. By addressing these concerns proactively, the game can be optimized to offer a positive and supportive orientation experience for all students.

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11 APPENDIX

Appendix A: Pre-Post test questionnaire

1. When was the construction of the Sala Dham Hall completed?
2. What purposes was the Sala Dham Hall used for?
3. What was the purpose of using the Dharma Hall in the early stages, particularly for Chiang Mai University students?
4. What is the university’s official color?
5. For undergraduate students, how many days can students borrow books from Chiang Mai University Library?

6. How much is the fine for not returning the book by the due date?
7. What are the opening hours of the Chiang Mai University Library during the semester break and during weekdays?
8. Where can the students pay fines for overdue books?
9. If students have not finished reading the books they had borrowed and want to continue borrowing, how many times can they renew a book (Renew Online)?
10. Which of the following statement is the university's motto?
11. How many activities are documented in Chiang Mai University's Historical Development Hall?
12. What are the three purposes of Historical Development Hall?
13. How many Japanese dolls are exhibited in the Historical Development Hall? And how it is important?
14. What are the opening days for visiting the exhibition in His Majesty the King's 7th Cycle Birthday Anniversary Building?
15. How many years do seven cycles represent at the Majesty Birthday Anniversary Building?
16. How many types of the information resources can be found in the Majesty Birthday Anniversary Building?
17. What is the origin of the name 'Ang Kaew Reservoir'?
18. What Mountain serves as the backdrop of the beautiful scenery of Ang Kaew Reservoir?
19. What is the main purpose of the construction of Ang Kaew Reservoir?
20. What is the capacity of water storage in Ang Kaew Reservoir?
21. Where does the water in Ang Kaew Reservoir come from?
22. What is the cumulative grade point average required to not to be dropped out in the first year and second semester?
23. What is the cumulative grade point average required to not be dropped out in the second year and second semester?
24. What is the meaning of the student identification number at Chiang Mai University, which consists of nine digits and is divided into two parts: digits one-two and digits three-four?
25. What time does the men and women's dormitory close?
26. What is the maximum number of years that undergraduate students can study in a 4-year degree program?
27. What is the purpose of CMU Health Center and ow many services do it have?
28. What are the services of CMU Mental Health Center in CMU Health Center?
29. How many percentages of discount will students receive if they present their student ID card when purchasing medicine at CMU Health Center?
30. How much is the service fee for both students and the general public when requesting a medical certificate?

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