Facilitating Student Socialisation at the University of Twente: A Location-Based Gaming Approach

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1   Abstract

The transition to university life presents students with numerous challenges, ranging from the assimilation of large volumes of information to social integration into a new environment. This thesis explores the research question, "In what manner can a location-based game facilitate the socialisation process of (new) students at the University of Twente?". The objective of this thesis was to develop a location-based game that motivates students to explore the campus, interact with their peers, and become familiar with the campus culture. The importance of facilitating a smooth transition for students entering university life was highlighted, given the wealth of new information they encounter and the transformative experiences that await them in this new phase. The game aims to provide a unique approach to student integration. It seeks to foster face-to-face social interactions, promote exploration of the campus, and familiarise students with university culture.

The game's design, usability, and effectiveness in addressing its goals were evaluated through multiple rounds of user testing and interviews. Notably, while the game effectively promoted social interaction and encouraged exploration of the campus, certain design elements, such as the cloud feature, did not function as effectively as expected, indicating areas for improvement. Additionally, the game showed potential in familiarising students with campus culture but still has room for development to fully encapsulate the university's social landscape.

This research illustrates the potential for a location-based game as a tool in facilitating the socialisation process for new students at the University of Twente. These findings offer valuable insights for the design of future location-based games, particularly those intended to foster community and encourage socialisation within higher education environments.

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3   Introduction

Starting university is often a large step in a new direction towards a new life, and Giddan (1988) has argued that starting university is the most difficult time for students when it comes to their academic life [16]. This period involves making friends, exploring a new location such as the city and the campus, sometimes even a new country, whilst becoming familiar with university life and trying to make a good start. This can be quite a stressful process [58], and to help make this transition as smooth as possible, universities often organise an introductory period which can last from 5 to 10 days. The introductory period is often packed with activities and information about the university to allow the students to set expectations and be well-informed about the university and what it offers. An example of this is at the University of Twente is the introductory period is called the Kick-in [55] which lasts around 10 days, and there are activities for the student to try out different activities to see interest in different sports, get to know the campus and meet the professors that they will be seeing in their courses.

Although most universities offer this introductory period, students occasionally need help to process the information and environment. The large amounts of information that is given during the introductory period are often thrown at the students all at once, in such a short period, making it harder for the student to understand the information and remember any of it after university courses start. There are also circumstances where a student may not be able to participate in the introductory period. This could be due to conflicts with their personal schedule, or because their specific academic program operates on a different timetable than the standard university schedule, resulting in a delayed start for these students.

There is a strong interrelationship between academic culture and campus culture. Shen and Tian (2012) discuss how academic culture itself is composed of academic outlook, spirit, ethics and environments, which all play a significant role in the development of campus culture,

emphasising how university life isn't merely about academics [50]. While academic culture refers to the values, norms and attitudes towards academic activities, it also shines importance on values such as cooperation, critical thinking, and innovation, which are all essential for shaping students into individuals and future professionals. Shen and Tian (2012) highlight the characteristics of campus culture such as individuality, academic feature, openness, leadership and creativity, and how the campus culture and experience shape students [50].

Moreover, Pascarella and Terenzini (2005) in their extensive research, indicate that the experiences and skills gained during university education, such as through internships, networking, or involvement in extracurricular activities, can significantly impact students' career options and opportunities post-graduation [39]. The camaraderie of friends also acts as a safety net and is found to help students counteract the issues that come with starting university, through having advice, reassurance, encouragement, and a sense of belonging [52]. Additionally, the sense of belonging is crucial in the transition to university life as it aids with the development of personal identity, and social connections and with the process of growth and change as well as the importance of the feeling of being part of a community, as it enhances the student's engagement and commitment, which not only is vital academically but also professionally [36]. Having a form of introduction to university is important in managing expectations and aids with behavioural changes students may be having from experiencing independence for the first time [35].

This is why it's vital to make the transition into university as seamless as possible for incoming students. It should be accessible and provide sufficient time for them to understand all the necessary information. Instead of having just a week to absorb everything, students need the opportunity to process and revisit the information as needed. Providing this flexible timeline can help prevent information overload and ensure that important details aren't forgotten.

3.1 Goal

The goal of this graduation project is to develop a location-based game that encourages students to explore the university campus and interact with other students on campus. My research question will be "In what manner can a location-based game facilitate the socialisation process of (new) students at the University of Twente?".

The sub-questions are:

- How can a location-based game encourage students to integrate on a social level?

- How can a location-based game encourage students in wayfinding?

- How can a location-based game provide students with information about the campus

culture?

3.2   Overview of the Structure

This thesis will investigate, design, implement, and evaluate a location-based game that supports new students at the University of Twente in their socialisation process. The subsequent chapter, Chapter 2, presents an in-depth introduction to the topic, laying out the goals and research questions. This sets the stage for Chapter 3, which delves into the background information, contributing to the first two research sub-questions, and providing essential knowledge for the game design.

This is followed by Chapter 4, which outlines the design process of the location-based game. It details the approach taken to ideate and specify the system's requirements and provides insights into the creation of the optimal prototype. It then describes how this prototype was implemented, giving rise to a working version of the game.

In Chapter 5, the focus shifts to the testing methodology. This chapter sheds light on how the game was evaluated for usability and effectiveness, from the ethical considerations and participant selection process to the interview questions and the testing procedure itself.

The outcomes from this methodology are presented in Chapter 6, which evaluates the results of usability testing and interviews. The game's success in achieving its goals is then assessed using the feedback gathered from the participant interviews. This is followed by the limitations encountered during the research, and potential areas for further work.

Chapter 7 offers a conclusion, summarising the overall findings and reflections on how a location-based game can facilitate the socialisation process of new students at the University of Twente.

4 Background

4.1 Introduction

Current literature offers a great abundance of insights on how to facilitate the transition of new students into university life. It has been observed by several studies that a well-designed onboarding experience for new students can significantly improve new students' academic performance, social integration, and university life [30, 25]. One effective approach that stands out in achieving these outcomes is through gamification, a technique that integrates game design elements in non-game contexts [7].

Gamification can create a more engaging onboarding experience for new students by making it more engaging. Specifically, Games that incorporate elements of exploration and social interaction, have proven to be effective in engaging students and fostering a sense of belonging [17, 12]. Consequently, designing a location-based game that incorporates the best practices from existing solutions and theories can be a promising approach to helping new students adapt to their new environment and build meaningful connections with their peers. This chapter seeks to review the existing literature and theories on student engagement, game mechanics, aesthetics, and immersive experiences to understand how a location-based game can be designed effectively to address the challenges faced by new university students.

4.2 Understanding Game Engagement

4.2.1 The Role of Engagement in Games

Understanding the elements that drive engagement in games is pivotal in creating a successful location-based game for new students. Engagement is usually depicted as a combination of behavioural, emotional, and cognitive involvement in an activity [11]. Fundamental elements that contribute to engagement in games include challenge, feedback, autonomy, and social interaction [43, 6]. As previously noted, gamification - the use and application of game mechanics and elements to non-game contexts to motivate and engage users - enhances their experiences, and promotes desired behaviours [7]. In an educational context, gamification boosts student motivation, engagement, and learning outcomes [27]. By integrating game elements like points, badges, leader boards, challenges, and narratives, into learning environments engagement can be increased [7]. Furthermore, in order for students to grasp the impact of their actions, a safe and controlled environment is a perfect scenario to do so [15].

A study conducted by Hanus and Fox (2015) showed the potential of gamification and the ability to use gamification to improve student motivation, engagement, effort, and academic

performance in the classroom [18]. Additionally, gamification has been identified as an effective tool for fostering collaboration, problem-solving, and critical-thinking skills [27]. When combined with real-world locations and contexts, as in location games, gamification can significantly enhance students' connection to the game and their learning experiences [48].

In designing a location-based game for new students, it is essential to create meaningful challenges that stimulate exploration and interaction. These challenges should align with the game's objectives - acquainting students with the campus, promoting social interaction, and fostering a sense of belonging to the university and the campus [27]. To bolster student engagement, the game should provide clear feedback on their progress enabling them to track their achievements and adjust their strategy accordingly [19]. Autonomy in the game - allowing students to make their choices and actions within the game - boosts motivation and engagement [42]. Incorporating social interaction in the game, either through teamwork such as collaborative tasks or competition which can be students against students or teams against teams, can foster a sense of belonging and connection among new students [29]. A case in point is the "Orientation Passport" mobile application. By using gamified elements, this application managed to effectively introduce new university students to the campus and promote social interaction. This was done through the use of elements such as challenges, feedback, autonomy and social interaction in the game's design [10]].

Incorporating the importance of socialization and campus culture in higher education cannot be understated. They are vital for a successful time at university as they impact both the academic and personal development of students [25]. Gamification has the potential to incorporate elements that can foster these factors, thus enhancing student engagement and the learning experience. Social interactions in games can serve as a tool for fostering a sense of belonging and connection among new students [29]. This is particularly significant in higher education, where building a strong social network is crucial for academic success and overall student well-being. Bürgisser et al.(2018), have shown that location-based games can provide an opportunity to incorporate campus culture into gameplay, enhancing students' familiarity with their university [5]. The "Orientation Passport" application, for example, successfully introduced new students to the campus culture by gamifying university traditions and social events [10]. Integrating elements of the campus culture into a location-based game can stimulate exploration and interaction, thereby promoting social integration. This integration is especially important as higher education's expert on student retention, Vincent Tinto, asserts the need for institutional action in creating environments conducive to student success. He emphasises a holistic approach to student retention, stressing the institution's role in fostering an environment that encourages

students to stay and excel [25]. Kuh and Whitt (1988) explore the concept of colleges and universities as "cultural enterprises," pointing out that institutional culture significantly influences the college experience [30]. They propose that understanding this culture can offer insights into how the institution relates to its students and manages conflicts among different interest groups. This aligns with the use of gamified elements in creating a welcoming and engaging environment for new students. Therefore, when creating a location-based game that effectively engages new students, these key elements should be considered.

4.2.2 The importance of Rules in Games

Rules form the backbone of any game, establishing the structure and boundaries within how players interact and make choices [44]. Clear and engaging rules in a location-based game for new students shape the game's purpose and influence the player experience. The design of these rules should account for three aspects: guiding exploration, balancing aspects of freedom and structure, and accommodating diverse player needs.

Rules can help guide players through the game world, encouraging exploration and interaction, and fostering a sense of discovery and engagement among players [1]. Simultaneously, a balance between freedom and structure is crucial for creating an enjoyable game experience. Overly liberal games that provide too much freedom, can lead to confusion among players and disengagement as they find it unappealing due to the lack of structure, while overly restrictive games can feel suffocating and uninviting, and may limit the ability to explore and stifle the user's need for autonomy [13]. Therefore, game rules should provide players with enough freedom to explore and make meaningful choices while maintaining a clear sense of purpose and direction.

Considering the different playing styles and preferences when designing rules ensures that the game remains engaging and accessible to a diverse student population [59]. This may involve incorporating a variety of game mechanics, objectives, and difficulty levels to cater to individual player needs and interests. Different player types can be identified through the player's strategy or their motivations to play the game. This is a crucial factor to a game's success as there is not just a single demographic with the same personalities that need to be considered, they are individual people with their own preferences.

4.3   Freedom and Exploration in Game Design

4.3.1   Freedom in the Game Environment

Freedom within a game environment significantly influences an engaging and satisfying player experience [43]. In a location-based game designed for new students, the level of freedom within the game world can enhance the overall experience in terms of exploration, choice and achievement.

Encouraging exploration and discovery by providing an open and free environment allows students to uncover points of interest and engage in social opportunities throughout the campus through challenges or events [37]. Additionally, a sense of autonomy is still important for a player to enjoy their gameplay at their own pace. Freedom within the game environment can encourage students to make meaningful choices and shape their own experiences, which can lead to increased engagement and satisfaction [41]. Incorporating various challenges and growth opportunities within the game environment, tailored to different player types, can foster a sense of mastery and achievement among players, thereby enhancing the game experience [6]. Recognition of achievements in the form of badges, awards, and more can fortify players' connection with the game, further boosting engagement.

4.3.2   Exploration in a Game Context

Exploration is a crucial facet of location-based games, inspiring players to uncover new environments and interact with their surroundings. Specifically, in the context of a game designed to guide students through their onboarding period, exploration works to familiarise them with the campus and stimulate interaction with peers [48]. Key considerations in designing an exploration-centric game include the game environment, players' ability to make impactful decisions, and opportunities for exploration.

A visually appealing and immersive game world can foster a connection and spark curiosity among students towards their campus [13]. By incorporating real-world locations and landmarks within the game, a sense of familiarity can be created, encouraging students to explore their new surroundings [33].

Meaningful choices form a significant part of the game exploration. This grants opportunities for players to make decisions with consequential implications [45]. The game can incorporate diverse quests or challenges that players can choose to pursue based on their interests and goals as these choices can help create a sense of autonomy and ownership over the gameplay experience, further fostering engagement [43].

As mentioned previously, incentives for exploration can be provided through rewards, such

as points/ XP to level up, badges that can be shown on the players profile, or in-game items such as unique clothing or accessories for the avatar, that students can earn by discovering new locations or completing challenges [7]. These rewards can serve as motivators for students to continue exploring the campus and interacting with fellow students, ultimately enhancing their overall game experience [17].

By creating a location-based game that encourages exploration through a compelling game world, meaningful choices, and incentives, the game can effectively introduce new students to their campus and foster interactions among students, ultimately creating a more engaging and immersive experience.

4.4 Game Mechanics and Character Design

4.4.1 Game Mechanics and Fullerton's Frameworks

Understanding and implementing effective game mechanics is essential for designing any game. Through analysing different games already on the market, different mechanics can be found that show signs of success in fostering social interaction, exploration, and immersion [60].

One mechanic used in games is the use of quests or challenges that require players to visit specific locations on campus and complete tasks, similar to the structure found in Pokémon GO or Ingress [26]. Pokémon GO requires players to explore their surroundings to find different types of Pokémon or to walk a certain distance to hatch an egg. Ingress uses this mechanic to make players look for portals to hack or reclaim. These quests can be tailored to the university setting, incorporating academic and social elements that are relevant to new students, through guest lectures or leading students towards an event on campus.

Another mechanic is the use of leaderboards and competitive elements that encourage social interaction and collaboration among students [17]. Games such as Pokémon GO and Ingress have fractions/teams that players are able to join, which allows for team-on-team competition. By incorporating these elements, the game can foster a sense of community and belonging among players, making the game more engaging and enjoyable.

In addition to identifying and implementing effective game mechanics, Fullerton's (2014) game design frameworks can be considered [13], as they can provide valuable insights into the underlying structure and design choices of the game. Some of the relevant frameworks to consider include:

- The Elemental Tetrad: This framework consists of four elements: aesthetics, mechanics, story, and technology. These elements should remain balanced and complementary, to create a cohesive and engaging game experience for players.

- The Player Experience: Fullerton emphasises the importance of understanding the player's perspective, such as their emotions, motivations, and desires. By focusing on the player experience, the game can create an experience that is tailored to the needs and preferences of users, which in this case are new students.

- Iterative Design: This framework encourages game developers to refine and improve their games through playtesting and feedback, constantly until satisfied. By adopting an iterative design process, game developers can ensure that their game remains engaging and effective in achieving its intended goals and making sure the player is connecting with the game.

4.4.2 Avatars and Immersion

Avatars, or digital representations of players within a game, are a crucial element in creating an immersive experience and encouraging connections between the player and the game world [3]. By allowing players to be able to customise their avatars, games can improve player identification and investment in the game, leading to increased engagement and satisfaction [53]. This would lead to players spending more time playing the game, feeling engaged and connected to the game.

Avatars can enhance the gaming experience through several elements. Allowing players to customise their avatars allows them to be able to express their individuality and create a sense of ownership within the game world [28]. By representing players in the game world in the same aesthetic, avatars can enhance the feeling of presence and immersion, making the game experience more enjoyable and memorable, increasing playing time and connections between players and their game [51].

4.5 Visual Design in Games

4.5.1 Pixel Art and its role in the industry

Aesthetics play a significant role in the overall game experience, as it influences a player's view and engagement with the game [45]. In the context of a location-based game for new students, choosing an aesthetic that is visually appealing and accessible [13]. This is because it must be inviting to every student as it will determine how many people will download the app, and it is important to have as many players as possible.

Pixel art has been seen in the gaming industry and is a popular aesthetic choice, due to its nostalgic charm and simplicity [14]. Pixel art is a digital art form that employs limited colour

palettes and low-resolution images. There are advantages to using pixel art in games such as its accessibility, scalability, and nostalgic aspect.

Pixel art is widely appreciated by players in any gaming context, regardless of their previous gaming experience or familiarity with different digital art styles. This allows for pixel art to be an inclusive and inviting aesthetic choice for any diverse population. This is applicable to a large student population with diverse backgrounds, personalities, and preferences. Pixel art started to be used around the 1970s and grew its popularity in the early 1980s through Pacman and space invaders. The retro feel of pixel art can evoke feelings of nostalgia, especially among players who grew up with classic video games[14]. Through the lens of procedural rhetoric, as presented by Bogost (2007), the nostalgic appeal of elements such as pixel art in games can be seen to foster a sense of connection and shared history among players, contributing to a community and sense of belonging [4]. Despite pixel art being created around the 1970s, it is still used today in games such as Minecraft, Terraria and FEZ. Thus, it can still feel nostalgic for players who grew up playing these games. The visual simplicity of pixel art can make it easier for players to understand the game world and its elements [9]. Pixel art is also able to be easily scaled to different screen sizes and resolutions, which makes it an adaptable and versatile choice for a game that may be played on a variety of devices and platforms, such as phones or tablets.

By incorporating pixel art as the game's aesthetic, a visually appealing and engaging experience can be created for new students, enhancing their exploration of the campus and interaction with their peers.

4.6   State of the Art and Related work

This part of the chapter delves into the rapidly evolving market of location-based games both in commercial and academic settings.

4.6.1   Location-based games on the market

1. Pokémon GO - 2016 [24]

   This was one of the first location-based games to catch the general public's attention and became one of the most recognisable location-based (video) games. Pokémon GO was one of the first introductions of augmented reality in households where it can seem like you are catching Pokémon in your own house or right in front of you. Pokémon GO allowed players to explore the outside world, collect items and battle other players. This was one of the bigger waves of social exercise that encouraged people to leave their houses and go

outside and explore [56]. Since Pokémon GO was one of the first location-based games to reach a large amount of young audience, there were quite a few incidents where players have not paid attention to their surroundings and Niantic labs [22] have been criticised for the danger that the game created around safety in public spaces [49].

2. Ingress Prime - 2012 [21]

One of the first mobile location-based games was released in 2012. It consists of two factions, the Enlightened and the Resistance, battling for ownership of virtual portals, which are located at landmarks in the real world. This leads to players joining a faction where they can interact with the portals and link them together to create 'control fields'. It is now no longer played as much as it was initially when released and re-released as Ingress Prime, but still receives updates. Ingress Prime's game structure allows for multiple different player types, which means that there are multiple different ways to play the game. This includes owning as many portals as possible, creating the largest control fields, earning as many points for your faction, and many more. Ingress Prime has been instrumental in fostering large, dedicated communities of players around the world, this is due to the game's emphasis on real-world exploration and team-based gameplay [46]. The social nature of the game is so that the players are required to work together to complete the larger tasks, leading to players coordinating through social media groups and sometimes dedicated websites[32].

3. Pikmin Bloom - 2021 [23]

Pikmin Bloom follows the same concept as Pokémon GO but is more heavily oriented on walking and completing daily goals and challenges. The player's goal is to collect seeds, walk to grow them, and then get to keep a Pikmin. Growing an army of Pikmin, players can collect resources whilst going on walks such as fruit or other seeds to later plant or feed to the other Pikmin allowing for the player to receive flowers. These are the flowers which will be then planted on your walk and the goal is to plant flowers all over the place, creating a lovely path. You are also able to see other players' flowers that they have planted, creating a more social environment. Unlike Pokémon GO, Pikmin Bloom strives to help players relax and encourage mindfulness through guided meditation and gardening. Location-based games are characterised by the blending of boundaries between play and serious life, Low and Turner (2022) describe it as 'hybrid realities'. This is achieved in the game through an 'ambient' style of gameplay where the player is able to play the game throughout their everyday activities, as opposed to confined specific sessions [31].

4.6.2 University context location-based games

1. Orientation Passport, University of New South Wales [10]

   Orientation Passport [10] was an app initially created to help students through orientation week, but later incorporated gamification techniques and game mechanics to engage students more effectively and efficiently. There were several mechanics that this game implemented such as puzzles, scavenger hunts and check-ins to motivate students to attend events and claim rewards, potentially leading to new experiences and social encounters. The app also featured increasingly difficult challenges to promote teamwork and group participation among students. The goals for the app were to encourage exploration of the campus and services, encourage participation in the events and encourage socialising. Functions built into the app to support these goals included an event scheduler, a contacts page for adding new friends, and a location-aware map showing campus buildings.

2. Campus Explorer, University of Zurich [5]

   The University of Zurich's Campus Explorer [5] was designed in 2018 as a pilot project and thesis by three students to address insufficient socialisation between different studies and buildings. Core mechanics implemented in Campus Explorer include building check-ins, meeting other students, campus expeditions, and campus events. The game implements these as Points of Interest (PoIs) on a virtual map, which the player explores by moving in the real world. The game can be played between lectures, during commutes, or during breaks, thus fitting into the student's routine. Campus Explorer also featured leader boards which fostered competition and active participation as socialisation and Interaction stimulate cooperation and collaboration.

3. Campus Explorer, Université de Poitiers [40]

   This was a game developed for new students to 'visit the campus in a fun way,' guiding them through enrolment steps, key collection, and schedule acquisition while imparting fun facts about the university and its history. The game is available in two formats: digital, where it functions as a click-and-read game, and physical, where students navigate the campus searching for instructions and activities on papers posted on building walls. It follows a narrative that leads you to different puzzles to find out the history of the university. The map is based on the real-world campus and the puzzles are linked with each location.

4. Uni Explorer, Southern Universities Network 2017 [38]

"[SUN wanted] to create an interactive campus map to enable students [aged 14-16] to explore what life in higher education is like, through teacher-led sessions and individual study. The app was also to include an element of gamification, as well as enabling users to access video content. " - [8]. This was done through pixel art and storyline gameplay that was a quest to complete graduation at a university starting from the first steps of enrolling on classes, to "studying". The game also featured a vague generalised idea of university in order to be able to relate the experience to any university. The game featured a progress bar and progressed quickly. Each task such as "Choosing a course" had a pop-up window with information about universities in the United Kingdom, and how to specifically select one, and included a video clip. Other tasks that included getting to know a location had information on what to expect from a university such as reception staff, quiet study zones, study rooms and how some university libraries stay open for 24 hours a day. The game also features helping other students with their studying dilemmas and the text comes up in text chat forms.

4.6.3 Analysing Location-based games mechanics

In this section, the game mechanics of Pokémon GOmon GO, Pikmin Bloom and Ingress Prime will be analysed. The SCVNGR Play Deck features 47 different game mechanics that are typically used to create a foundation for different types of games [47]. The objective of this analysis is to identify which mechanics are present in these 3 individual games, to be able to estimate what the most common mechanics are in a location-based game, and to be able to identify what mechanics should be implemented in the campus exploring game during development. Each game mechanic in the SCVNGR Play Deck was graded on a scale of 0 to 3, where 0 indicates that the mechanic is not present in the game, and 3 indicates that the mechanic is heavily present. This allows for a numeric total of each game as to how many game mechanics were present, and also a numerical value for each game mechanic to identify which mechanics were the most present in location-based games.

The most common mechanics, scoring 3 in all three games, grouped by topic include:

- Reward and Progression Systems

    Achievement

    Fixed Ratio Reward Schedules

    Ratio Reward schedules

    Variable Ratio Reward Schedules

mechanic/game	ingress	pokemon go	pikmin bloom	mechanic/game	ingress	pokemon go	pikmin bloom
achievement	3	3	3	lottery	0	0	2
appointment dynamic	0	3	0	loyalty	3	3	3
avoidance	0	0	0	meta game	0	0	0
behavioral contrast	2	2	2	micro leader boards	0	0	0
behavioral momentum	2	2	2	moral hazard of game play	3	3	3
blissful productivity	1	2	2	ownership	3	3	3
cascading information theory	3	3	3	pide	3	3	3
chain schedules	2	0	0	privacy	0	0	0
communal discovery	3	3	3	progression dynamic	3	3	3
companion gaming	0	0	0	ratio reward schedules	3	3	3
contingency	0	0	0	reinforcer	3	3	3
coutdown	0	3	3	response	3	3	3
cross situational leader boards	0	0	0	reward schedules	3	3	3
discentives	1	0	0	rolling physical goods	0	0	0
endless games	3	3	3	shell game	0	0	0
envy	3	3	3	social fabric of fames	3	3	3
epic meaning	3	2	2	status	3	3	3
extinction	1	1	1	urgent optimism	2	2	2
fixed interval reward schedules	0	3	0	variable interval reward schedules	0	0	0
fixed ratio reward schedules	3	3	3	variable ratio reward schedules	3	3	3
free lunch	1	1	1	viral game mechanics	0	0	0
fun once, fun always	3	3	2	virtual items	3	3	3
interval reward schedules	0	1	0				

Figure 1: Presence of Game Mechaincs in Location Based Games

Reward Schedules

- Information and Discovery

  Cascading Information Theory

  Communal Discovery

- Social Interactions and Competition

  Envy

  Loyalty

  Social Fabric of Games

  Status

- Player Motivation and Engagement

  Endless Game

  Epic Meaning

  Fun Once, Fun Always

  Progression Dynamic

- Player Ownership and Personalisation

  Ownership

  Virtual items

- In-Game Events and Changes

    Modifiers

    Moral hazard of Gameplay

- Player emotions and identity

    Pride

    Reinforcer

    Response

From this, each group can be analysed to see how the game mechanics can be applied to the goal of the game, facilitate social interaction, stimulate campus navigation and encourage campus culture. Rewards and Progression systems play a very big role in providing players with a sense of achievement and progress. This can be ensured by rewarding players for exploring new areas of the campus, participating in campus events, or successfully interacting with other students. Examples of rewards can include points, badges, virtual goods, etc. Additionally, achievements could be tiered to create a larger significance for harder tasks.

Information and discovery can be used to incentivise exploration of the campus. By visiting different parts of the campus, players can unlock information about the campus culture, history or student life. Cascading theory could also be implemented in the game itself, unlocking game features such as adding friends or changing outfits, as the player is walking around and increasing in levels. The communal discovery could be implemented through group tasks where players have to work together to complete a quest and discover information together.

Social interactions and competitions can be implemented through the use of teams or groups within the game, which promotes competition, camaraderie and cooperation. Status and envy mechanics can be applied to leaderboards of the top players or groups. Loyalty mechanics can include granting players bonuses or rewards such as points, for regular logins, or consistent participation in the game, increasing engagement in the game.

Player motivation and engagement can be maintained by ensuring that the game is kept fun at all stages of gameplay. This means that the player is able to come back to the game and find it as entertaining as the last time, which can be attained by updating the quests and keeping information new and exciting. Endless game is the concept of a game having no specific endpoint, to allow the player to be able to decide how long they will play, which is key when the goal of the game is to customise the onboarding experience so that it is perfect for each individual player.

Player ownership and personalisation means letting the players have a sense of ownership through personalisation options such as customising their in-game avatar or personal game space. The concept of virtual items includes collectables such as badges or achievements that are found during campus exploration or rewards during tasks.

In-game events and changes can be events that align with real-world campus events which can include Christmas, Batavieren race [2] and Pandora [57], which fosters a sense of immersion and authenticity. The Moral Hazard of Game Play can be addressed by setting rules and guidelines that ensure fair play and discourage unethical gaming practices.

Player emotions and identity can be considered by designing the game in a way that elicits positive emotions. Rewarding players for the effort, participation and positive behaviours that they are performing, in addition to winning. There should also be room for players to provide opportunities for players to express their identity through customisable avatars and personal profiles.

4.7 Conclusion

In conclusion, when developing a location-based game for new students, it is essential to consider the various aspects mentioned above. Looking at existing research and theories related to game design, student engagement, and game mechanics these theories can help create an immersive and enjoyable experience that sends the game's goals: encouraging exploration, interaction, and adjustment to the campus environment. Combining these elements results in an immersive experience for university students seeking to familiarise themselves with the campus environment and socialise.

5 Design Process

5.1 Design Process Methods

The design approach, albeit not strictly adhering to a specific design method such as the CreaTe design model from Mader Eggink (2014) [34], a prototype was made. The Lo-Fi prototype was designed to effectively demonstrate the game's core objectives:

- Stimulate social interaction among students

- Encourage campus navigation

- Familiarise the user with campus culture and events

The potential platforms for implementing the game were assessed based on their capacity to fulfil these objectives. A multitude of platforms such as Augmented Reality, Virtual Reality, Pen and Paper, and Scavenger hunt styles were considered.

For instance, a pen and paper format, similar to the one employed by looking back at the Université de Poitiers [40], in addition to their online game version, was contemplated but was disregarded due to its susceptibility to the weather, issues with portability and accessibility constraints. Accessibility and portability constraints include players not being able to reach every spot, but also not being able to play the game for short amounts of time when they would like due to the nature of the game. The weather dictates the play-ability of the game due to players being less likely to be willing to go outside during rain, or damage of the game through weather.

Virtual reality (VR) was considered initially due to its immersiveness and engaging qualities, the platform is not very accessible for multiple players at once as VR headsets are hard to come by, and are often used in shorter periods of time. VR is also quite a personal experience, and there is not much room for social interaction as you are placed in a virtual setting with a virtual map of the campus where there are no real human beings to talk to and make friends with. There is also the problem of VR not really being fun to use for a longer amount of time, which means that there is an actual limit as to how often the player is able to come back to play, due to the risk of nausea and dizziness. On the other hand, this allows for players with disabilities, which restrict them from exploring the campus as they desire, to be able to explore the campus first-hand and at their own will.

Augmented reality (AR) cannot hold a game on its own, but can be implemented into games. This is found in Pokémon Go, Pikmin Bloom and ingress prime, and can be a very useful tool to create an engaging and immersive experience. Due to the time limitations and skill restrictions,

it was not feasible to implement AR. Although it would be very interesting to be able to check into locations using AR and get information or unlock frames or accessories that relate to the location in which you can see in 3D or even have your character standing next to the Point of interest and be able to post and share it with other players.

5.2   Ideation

Drawing upon the analysis of the most common game mechanics found in location-based games, each mechanic was examined for its capacity to aid in achieving the game's key objectives.

Due to the time and skill constraints of this project, a small selection of mechanics was selected to be tested in the Lo-Fi prototype.

- Rewards: Virtual rewards will be implemented into the game when the player completes quests, check-ins and level up, in order to motivate the player to keep doing so. As mentioned previously, this will include stickers, XP and accessories for the player to customise their avatar.

- Achievement Badges/stickers: The badges and stickers are used as rewards for the user when they have completed certain tasks. This helps create incentives and motives to complete the tasks such as completing quests and checking in to locations.

- Challenges and Quests: Through creating challenges and quests that are related to the campus and campus life, the player will be motivated to physically visit these locations and increase the chances that they will talk to someone at the event and make friends. This can be done through quests of art walks, and incorporate campus events such as faculty markets and parties.

- Leader boards: This will instigate friendly competition among users and their factions. The users can be ranked on XP (experience), number of events attended or the amount of achievement and badges/stickers they have earned.

- Progress Tracking: A visual progress bar will be displayed so that the player is able to see their progress clearly to encourage levelling up.

- Levels: Users could level up by earning experience (XP) from completing tasks such as checking in, completing quests and levelling up. The motivation of increasing levels could involve special privileges or rewards, to ensure a constant engagement with the game over a longer period of time. The higher the level, the more experience points you will need in order to level up.

Goals/Game Mechanics	Stimulate Social Interaction	Encourage Campus Navigation	Familiarize with Campus Culture and Events
Achievement	X	X	X
Fixed Ratio Reward Schedules		X	X
Ratio Reward Schedules	X		
Cascading Information Theory		X	X
Communal Discovery	X		X
Envy			X
Social Fabric of Games	X		
Status	X		X
Fun Once, Fun Always		X	
Progression Dynamic		X	
Ownership		X	
Virtual Items	X		X
Modifiers	X		
Moral Hazard of Game Play		X	
Pride	X		X
Reinforcer	X		X

Figure 2: Presence of Game Mechanics in Game's Goals

In order to understand a player's perspective of the game, a storyboard, as shown in figure 3, was formed in order to identify any issues in the flow, and see what needs to be thought out.
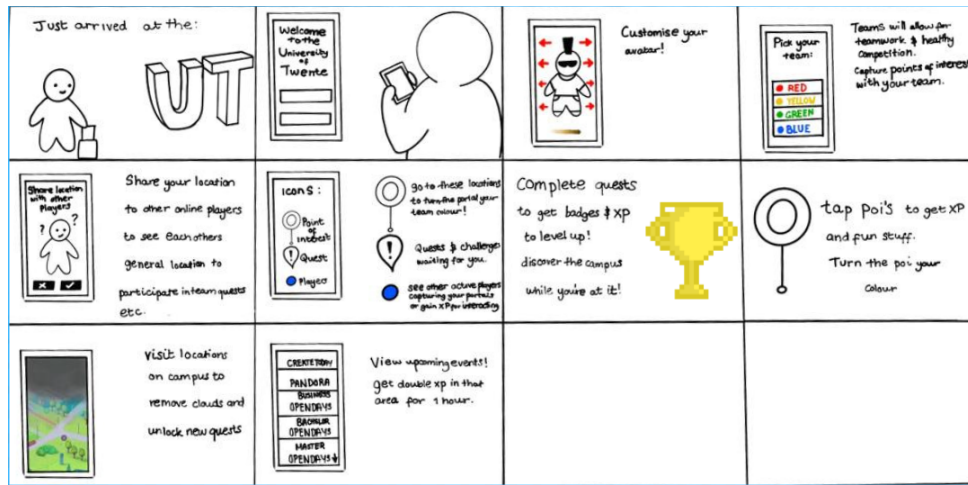

Figure 3: User Interaction Story Board

Additionally, in order to see how a quest would play out, a storyboard of a quest interaction was drawn, as shown in figure 4.

Figure 4: Quest Story Board

5.3   Specification

During the specification phase, the functional and non-functional requirements were determined to understand better what the game needed to do. These requirements were derived from the ideation process.

5.3.1   Functional Requirements

Functional requirements define what the app itself should do:

1. User Account Management: The app should allow users to register and log in to their profile.

2. Social Interaction Facilitation: The app must facilitate communication with other users, through the ability to add friends.

3. Event information: The app should provide information about upcoming and current events on the campus.

4. Map and Navigation: The app should feature a user-friendly map of the campus, and include comprehensive depictions of buildings.

5. Performance: The app should load fairly quickly on all portable devices.

6. Scalability: The app should be designed to handle an influx of users and their data without decreasing performance.

7. Notification System: The app should notify users in time for upcoming events, friend requests and important updates.

5.3.2 Non-Functional Requirements

Non-functional requirements define what the users should experience when playing the game and using the app:

1. User-friendliness: The app must be intuitive and have a visually appealing design.

2. User safety: User data should be securely stored, and adhere to the General Data Protection Regulations (GDPR) and privacy laws.

3. Accessibility: The application should be accessible to players of all types. This includes colour contrast for visually impaired users and is compatible with screen-to-speech.

4. Compatibility: The application should be compatible with as many mobile operating systems to encourage as many users to use the app as possible.

5. Game elements: The app should incorporate elements that foster the three goals of stimulating social interaction among students, encouraging campus exploration and familiarising campus culture and events.

5.4 Optimal Prototype Design

The final prototype's development involved critical deliberation over various elements and details, which are explained in the following subsections:

- Map selection: The visible map within the game is based on the University of Twente's Sustainability Walk map [54]. The map's style is coherent with the game's aesthetics, therefore the remaining game features were designed around its colour palette for convenience and visual coherence, as seen in Appendix - B, figure 8.

- Map location: The chosen location is recognisable and rich in potential points of interest such as the Torentje van Drienerloo, Carillon Veld, and numerous art sculptures. The selection was also influenced by the prototyping software's limitation to display only a fixed portion of the map without scroll and navigation capabilities.

- Art quest: The 'Art Quest' was selected as the primary quest type for the prototype. Its recognition and anytime-playability provided a versatile choice, in contrast to quests linked to real-world, time-bound events, such as a Christmas-related quest.

- Faculty event: The prototype originally featured a Christmas lunch hosted by the ATLAS student association. However, this was replaced by a faculty market event – a common and inclusive occurrence – to enhance the prototype's representativeness and realism.

- Check-in at the Torentje van Drienerloo: The Torentje was chosen as the check-in location due to its recognisability and position along the common commute routes of numerous students.

- Cloud style: The clouds at the map's top aimed to spark player curiosity by obscuring undiscovered areas. However, due to prototyping limitations, the clouds inadvertently concealed an uneventful forest location, neutralizing their intended purpose.

- Sticker achievements: One of the types of rewards that a player can receive from completing the quests or check-ins, is a sticker of the context of the reward. For example, when completing the Torentje quest, one of the rewards received is a sticker of the Torentje, as seen in figure 6. The decision to design the badges in the form of stickers was rooted in their inherent collectable nature. Stickers, as a form of reward, tap into the instinctive human desire to gather and accumulate, thereby promoting active engagement in gameplay. This strategy exploits the player's drive to complete more quests to expand their collection of stickers, incentivising sustained participation in the game and increased interaction with the tasks and challenges. The adoption of a sticker-based badge system hence serves as a strategic motivator, fueling players' ambitions and enhancing their gaming experience.

- Avatar page: The avatar page allows players to edit their username, view their level and progress, manage inventory, and add friends, as seen in figure 5 (c). This enables the players

to flaunt their achievements, fostering a sense of friendly competition and ownership. The colour scheme of the avatar page is the colour of their faction, in this case, the colour is blue.

- Colour Palette: The game's colour palette is consistent with that of the Sustainability Walk map [54], offering visual continuity throughout the gameplay.

5.5 Design Implementation

The selection of an appropriate prototyping tool was a crucial step in this project, with several robust platforms, such as Figma, Unity, and the Marvel app, under consideration. Each platform offered unique benefits but also carried its set of constraints that could potentially influence the prototype's quality and functionality. The Marvel app was chosen in the end due to its intuitive design, which minimised the learning curve. However, deciding to prototype using the Marvel app had some tradeoffs due to its simplicity. The limitations primarily centred around issues of scrolling and non-removable icons. These drawbacks restricted the freedom to fully customize the prototype's interface, which could have affected the gameplay. In terms of scrolling, the Marvel app did not allow for seamless navigation around the game's map. This limitation influenced the map's size and the distribution of elements within it, possibly affecting the user's exploration experience within the game. The non-removable icons issue is related to the quest interface in the prototype. The persistent icons may have interfered with the immersive quality of the game, as players might be distracted or confused by unnecessary or irrelevant icons present on the screen. In retrospect, these constraints did not critically impact the overall game design, but their influence on certain aspects of gameplay is a significant consideration in understanding the resulting prototype's functionality. Future iterations of the prototype might benefit from exploring other prototyping tools that offer more flexibility and customisation options.

5.6 Realisation

The final Lo-Fi prototype uses images that were collected from the University of Twente's Sustainability walk map [54], as well as hand-drawn images using a drawing software called Procreate done by myself. The prototype consists of 15 pages and 3 layered images to create the effect of changing buttons. Figures 5, are the different pages a player would see when playing the game.
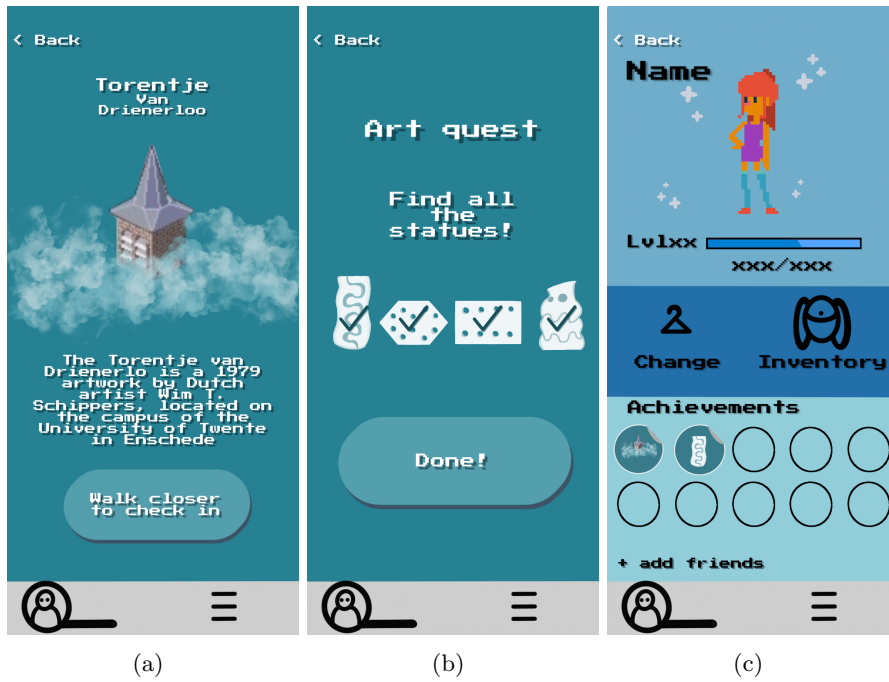
Figure 5: (a) Check-in page Torentje van Drienerloo (b) Art Quest page (c) Avatar Page
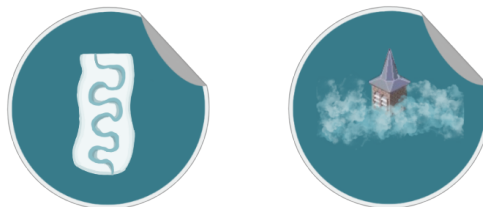

Figure 6: Reward Stickers from Art Quest and Check-in

6 Testing Methodology

6.1 Research Objectives

The goal of this section is to test the usability and functionality of the Lo-Fi prototype app against the goals of the project.

6.2 Ethical Implications

The testing procedure for the location-based game, as part of this research, raises several ethical considerations that need to be addressed. Central to this process was the commitment to respecting the rights and dignity of the participants involved, as outlined in the ethical guidelines approved by the university's ethics committee.

- Informed consent: Before the test started, participants were briefed about the study and what they were going to be doing, as well as their ability to opt-out at any time without any repercussions. By providing this information upfront, it ensured that all participants were able to give informed consent

- Data privacy and confidentiality: Participants were informed that the interview would be recorded to be able to transcribe their answers. In order to follow ethical guidelines, the recordings would then be deleted 2 months from the recording date, when the test would be finished.

The testing procedure and the associated ethical considerations were presented to the University of Twente's ethics committee for review. The committee approved the process, allowing for the test to be conducted, allowing for the research to be credible.

6.3 Participants

The participant selection for this study employed a convenience sampling strategy, focusing on individuals within my social and professional networks. The participants included 10 individuals who are a diverse group of university students that attend the University of Twente. The selection includes students that are aged 18 - 26, different genders, and varying fields of study. The diverse group ensures that the results represent the larger student body. The more diverse the research participants, the more coverage of the general student population that is able to be covered, ensuring that the results are appropriate to deem appropriate for the large variety of new students.

The participants were grouped in different types of groups to see how different groups played together, and whether the number of players affected gameplay. The groups made included groups of 3, 3, 2, 1, 1.

6.4 Interview Questions

The interview questions will be asked after the participants finish the testing phase and use the app. The interview is semi-structured with prepared questions that are mostly open-ended and include questions that are inspired by the Universal Experience Questionnaire (UEQ) [20], as seen in Appendix A. The questions will gauge the participant's normal habits in terms of social behaviour, as well as how familiar they are with the campus which will stand as a basis to see how the game has affected their behaviour and feelings towards these aspects of the game in action. The interview will also target the effectiveness of the game elements that have been incorporated, and how the users feel the elements help realise the goals.

The questions cover the three main goals of promoting social interaction, campus exploration and encouraging campus culture. The first questions in each section help get to know the participant and their views before the app, and their current use, followed by questions that target specific elements that are in the game that are meant to enhance the specific goals. This was done this way to be able to compare the before and after of the app's effect. There are additional questions that cover the art style and the general feel of the app, to help understand how the navigation of the app feels.

6.5 Materials

The materials used in the test included the following:

- Marvel App downloaded on phones after briefing the participants

- Pen and Paper

- Questionnaire printed out

These materials were all organised by me prior to the tests.

6.6 Testing Procedure

1. Brief the participants

2. Download the app on the participants' phone

3. Allow for participants to get familiar with the icons and navigate the app

4. Start at the sardine can on campus which is a middle spot between the 3 locations being tested.

5. The participants decide where to go first

6. Follow the participants as they complete the tasks and check-in

7. Take the participants to a sitting spot and commence the interview

8. Debrief the participants

9. Thank participants for their time

7 Result Evaluation And Discussion

This chapter evaluates the results of the User testing and interviews and discusses the answers.

7.1 Usability Testing Results

The test was performed on multiple separate occasions testing the experience of the gameplay in groups/pairs or individually. This was done to see if participants reacted differently individually or with others. The participants were able to navigate the campus using the map effectively and were able to complete the tasks and check in's with little to no problems. almost all participants decided to go complete the quest first then visit the Torentje, then the Atlas building for the event. This was possibly due to the fact that the participants all came from the opposite direction, and the atlas building and Torentje were closer to where they originally came from before the usability testing. All participants found all four statues very easily, although there were a couple who did not realise the statues were placed there. Almost all the participants found the achievement page charming and a cute idea by audibly saying "Oh yay! I did it!" or "Aw, this is a cute sticker". When at the Torentje, every single participant was unaware of the fun fact that was incorporated into the achievements page and found it extremely exciting and cool. Due to there not being a live event at the Atlas building, more than half of the participants did not fully walk up to the spot to check in but stayed at the Torentje. This showed that participants were likely to press the check-in button if they were in the vicinity and not fully at the event, just for the rewards that they could receive. This may change if, in a real situation, an event was outside and visible to the public, then the players would feel more encouraged to walk up to the actual stands, increasing the chances that they will participate.

7.2 Interview Results

7.2.1 Social Interaction and Friend-making

The first four questions focus on how students interact with their friends, form friendships and how social interactions affect their university experience. All of the participants explained that they prefer casual social interactions which include; grabbing a drink, watching a show or movie, playing games or doing sports. This showed that the participants mostly preferred interacting with their friends face-to-face, rather than online. In terms of making friends, participants mention joining associations and going to events and activities to meet new people and actively try to make friends, despite most mentioning the niceness of organic friendships, "making friends is best when it happens naturally with new people", followed after discussing the ability to

actively make friends. Examples that participants have given of activities and events that have facilitated meeting new people include group activities where you are encouraged to work together for a long duration of time. This includes beginner weekends for most associations, where students go together with the whole association to do team bonding activities to get to know one another. "I went on beginner's weekend for climbing and had to get to know people really quickly and trust them to be able to catch me if I fall off a boulder.", this participant had mentioned that they felt more comfortable going to drinks and events after the beginner's weekend by themselves which was something that was very intimidating initially. When asked about the importance of social interaction in university life, all of the participants shared their gratitude for their friends and how vital they were to their studying experience. "I think being a student can be very isolating if you do not interact with other students because you live by yourself, which can be tough on your mental health.", the participant discussed how having friends kept them going to the lectures and encouraged them to get out of the house as it was the only time they would be outside initially.

The next questions were about how the app affected the friendship and social interaction aspects when in use. The answers to whether the game helped enhance their interaction with other students varied. There was a division between participants about discussing where to go first, as 6 participants found this fun and useful, whilst the other 4 felt that it wasn't extremely important to have discussions with other people to complete simple quests, but enjoyed being with other people whilst performing the tasks. The 2 participants who performed the test alone felt that it was possible to complete it on their own, but felt that they would have more fun doing the quests with a friend present. Participants were asked additionally whether they would approach a stranger nearby the same quest location, and once again, the answers were divided. 7 participants said that they felt that they would be too shy to ask someone if they were uncertain whether they are playing the game, even if they were playing alone. The 2 participants who were playing alone felt that they would go and talk to anyone if they looked like they were playing the game. When asked about the possibility of including factions in the quests and ranks, almost all participants felt that this would be a great way to incorporate a sense of competitiveness but also a possibility of implementing teamwork. Except for 1 participant who claimed that they didn't see the point as they have never played a game that had factions. In terms of joining a faction team by selection or by randomisation, the answers were once again split. 5 participants believed that being randomly allocated a faction would ensure equality and encourage interaction with other factions as your friends could be in the other factions. The other 5 believed that they would be appealed to playing more often if they were in the same

faction as their friends. "I would like to pick myself. This would mean I could pick the same faction as perhaps the few friends I already made. This would strengthen the friendship, as we would have to cooperate more now because we are of the same faction.". In terms of additional features, participants suggested features that would require discussion and interaction with both players from the same faction, and a different faction, encouraging players to talk to one another. The idea of faction battles or meetups between factions was also mentioned a couple of times "It would be nice to meet up to do activities with your own faction or others. Maybe at the Vesting Bar as an event!".

7.2.2 Familiarisation with the campus

The following section covers the campus navigation aspects. Regarding the question about how well they knew the campus, 8 of the participants felt they were very familiar with the overall campus. There were 2 students that enrolled in the university during the coronavirus period which affected how well they knew the campus, "I didn't really know campus very well for the first two years I studied here, probably because of lockdown, and classes being online for half of the first year. I didn't feel the need to go outside as there was nothing that I needed to do outside of my daily circle of coop and home. I still don't feel like I know the layouts of buildings very well right now!". 8 of the participants lived on the campus, therefore are on campus all day, including the 2 students who did not feel so familiar with the campus. A participant admitted to finding the high-pressure lab location challenging, but generally relies on Google Maps and walking the same route multiple times to get to know any new areas such as the new ITC building. Other tactics that were mentioned included using landmarks to pinpoint locations on campus and claiming to just rely on an instinctual sense of direction, admitting to using Google Maps as a backup. A participant mentioned how the Actherhorst and Witbreuksweg were the most difficult places to reach due to it's remoteness and unusual layout. The Cubicus building was mentioned by 4 of the participants as it was a building on campus designed to be confusing for people who enter the building for the first time, to encourage them to ask people in the vicinity for directions.

When asked about the game's effects on campus navigation, participants all said that they felt that the game encouraged them to explore the campus and find hidden Easter eggs that they had not realised were on campus. 9 participants were aware that there were four statues in Carillon Veld but had never gone close to looking at them in detail. When asked specifically about the clouds that were covering a section of the map, 7 of the participants believed that the clouds were not doing a very good job at enticing players to look beneath it, but rather

deterred them from going to those locations. 6 participants were unaware that the clouds were part of the interaction, "The clouds did not intrigue me. I just thought it was a lazy way to cover up part of the campus that was not part of the game. In a way, it actually deterred me from going there. A question mark, or perhaps a story-based blockade instead of just clouds would intrigue me.", this meant that the cloud as one large mass was offering too much coverage which could be solved by creating a quest that introduced the clouds or if the clouds were a smaller and less dense group. 9 participants felt that the quests motivated them to visit different spots on campus and found that it was an effective way to encourage campus navigation. The rewards received from completing the quests and check-ins had a positive reaction as all of the participants felt that the rewards were fun and engaging, "I liked that I could customise my character with the things that I got as a reward for doing the missions. Also the XP, but only if I would get something for levelling up, like a big thing if I reach level 10 or something", whilst other participants mentioned how they enjoyed visiting the different landmarks and locations for the random facts that you could learn about the locations. When asked about whether the game was able to show the participants a location that they were not aware of, all of the participants said not really but believe that there is potential for the hidden spots that fewer students are aware of.

7.2.3   Engagement with the campus culture

The familiarity with the campus culture was evaluated by some questions that quizzed the participants on campus traditions and events, whether they have participated in these activities and how it would impact the campus engagement of a new student. 8 participants claim that they were unaware of any events or activities that the campus hosted, prior to studying at the university, while there were 2 students who came from abroad and had done extensive research before moving countries. Events such as the Kick-in, open days and the Batavieren race [2] were mentioned as easy to find online on the university's website and social media. All participants believe that they learned about campus culture, such as getting cheap drinks at the vesting bar, or the beer mile through other students who were discussing it, or just through living around it and experiencing it. The campus was described as "green", "open", "gezellig" and "comfortable". When asked about events that embody the campus culture the most, the kick-in was mentioned several times, while the 'O&O plein' and Boulevard physically represented campus culture. All participants had mentioned that they had been part of the Kick-in as it felt vital to starting university. "Yes, things like Elfbierentocht or setting couches on fire, through study associations or my house" was another answer from a participant when asked about what

activities they have joined. All participants said that they have joined at least 1 association in their time studying at the university, of which a majority were sports and study related. When asked about how they felt being active in campus events or culture affected their student life, all participants answered yes in one way or another, "I think you can learn a lot from it and it is a great way to meet new people". This shows the importance of experiencing student-like things on campus and how it can positively affect your student life.

All of the participants believed that the app could help them engage more with the campus and what it offers as it used events and could use the event feature to bring more attention to other lesser-known events. "Yes, if the app displays what events are going on where that would be a great way to keep up with the campus calendar. Also maybe keeping refreshing facts about different parts would keep me intrigued; sort of the way Pokémon GO does not have all Pokémon out there at all times, but in seasons", encouraging the idea of constantly updating the events list on the game. The participants believed that the statues or any art installations do not depict the campus culture very well, but the Torentje and faculty market did. The kick-in [55]and Batavieren races [2] were mentioned several times when asked about additional features that could be added to the app to enhance the player's understanding of the campus culture and environment.

7.2.4 Game Design and Visual Style

The participants had mixed feelings about the game's design and visual style. 9 participants said that they appreciated the avatar customisation feature and all 10 participants found the pixel art design visually appealing but there were still participants that had reservations about certain elements of the game. 7 participants were not enthusiastic about the "cloud-covered" area, viewing it as an annoyance rather than an invitation to explore, "I think a change in the visual style of the clouds could be better because it's so dark and gloomy, that might help users understand its a feature and not just art". This shows that the clouds are not doing their intended job of stimulating curiosity and inviting players to explore more. The cloud's failure can also be due to the manner in which the prototype was designed. As mentioned previously in the design chapter, the clouds were placed on the top of the page due to the selection of the screen on the map, which meant that the cloud was not placed in an optimal spot to have any points of interest that could have been used to stimulate curiosity.

7.2.5 Quantifying Key Answers

The interview incorporated a set of open-ended questions which naturally elicit more detailed and varied responses. Although such responses usually resist quantification, it is still possible to identify an overall positive or negative sentiment towards key statements derived from these questions. To this end, 15 pivotal statements were identified from the 35 questions, and were evaluated for the sentiment of each participant's response to these statements on a binary scale - 'positive' or 'negative'.

Figure 7, depicts the graph summarising the count of 'positive' and 'negative' sentiments towards the 15 identified key statements. The count represents the number of participants whose responses were either predominantly positive or negative for each respective statement.

The statements or keywords were formed by selecting questions from the questionnaire, as seen in Appendix A, which were directly related to the app and how the app may change the user's behaviour.

Figure 7: User Test Interview Results

The overall results show that there are an overwhelming amount of participants who have positive sentiments towards the statements. This adds to the conclusion that the game is successfully fostering social interaction, stimulating campus navigation and encouraging campus culture. Out of 150 possible positive connotations, the game showed 104 total positive connotations, which is 69.3%. With small improvements in the placement and design of the cloud, it would increase the results.

7.3 Conclusion

The evaluation of the game's prototype through usability testing and interviews has yielded valuable insights, offering both affirmation and opportunities for enhancement. The game proved

successful in stimulating exploration of the campus, effectively leveraging game mechanics to encourage users to engage with and navigate through different locations. Furthermore, it acted as a means for raising awareness about campus events and fostering familiarity with campus culture, thus fulfilling key goals outlined in the design specification.

Despite the effectiveness in these areas, there's still room for improvement and refinement. Social interaction within the game, while existing, could benefit from a more organic and engaging design to drive meaningful player interactions. The visual aspects of the game, as well as the design of certain interactive components, could also be enhanced to increase player engagement and overall satisfaction. For instance, the 'cloud-covered' area, designed to invoke player curiosity, did not generate the desired effect and should be revisited for optimal impact.

In conclusion, the findings highlight the dynamic and iterative nature of game design. It's clear that the prototype is a significant step forward in the process, effectively marrying elements of location-based gaming with educational and social engagement. However, the testing also highlighted areas where further refinement and development are necessary, which will be discussed in future work.

7.4 Limitations

There were several limitations that affected the user testing and interview results. First, the research was done over a short period of time, which affected the amount of prototyping and testing that could be done. This affected how much feedback could be received from the participants as game elements had to be narrowed down to certain key elements that were being tested. The interview questions, though mostly unbiased, included one that indicated a certain bias. Specifically, question 5, which asked, "Did the game help in enhancing your interaction with other students or making new friends?" implicitly assumed that the game had a positive impact, which may have influenced participants' responses. Further, the prototyping software that was used did not provide the functionality for scrolling around the map, this prevented the cloud mechanic from working as intended due to the fact that it was in one location.

Finally, the skill sets that were offered before making the prototype were limited, due to the lack of experience. This meant that there was a lot of time being spent on figuring out software and getting the hang of the process, which was time taken out of being able to work efficiently on the prototype.

7.5 Future Work

The research undertaken has made a significant contribution to the existing body of knowledge on location-based games. although location-based games have immense potential for facilitating social interactions, the uncertainty and discomfort that players may experience when considering approaching strangers is a hurdle that needs to be surmounted. This insight can inform future work in this area to develop more effective strategies to foster social interaction in location-based games.

If the thesis could be redone, it would be beneficial to use a larger sample group in order to obtain more representative and generalisable results. Additionally, the application of the Create Design Model by Mader and Eggink [34] could improve the design process by making it more iterative, thereby facilitating early detection of design issues and allowing for their resolution in a timely manner.

Additionally, while the prototype showed potential in facilitating social interaction through team-based activities, ensuring these interactions are both rewarding and engaging for users will be a crucial focus moving forward. This could involve further refinement of game mechanics, like factional competition or team quests.

Beyond these immediate improvements, this project has broader implications and potential applications. The research conducted and the insights generated could be used to formulate a framework for developing location-based gaming apps for a range of contexts, that all foster the goal of community, such as tourism. Such apps could gamify the experience of exploring a city, thereby enriching tourists' experiences.

Lastly, it's important to highlight the potential for integrating this work into the orientation period at the University of Twente. Given its success in promoting campus exploration and familiarisation, it could serve as an effective tool for introducing new students to the campus and its culture, whether they're participating in the Kick-In orientation period in person, or remotely.

This study serves as a stepping stone, showing the potential of location-based games in fostering social interaction and encouraging campus exploration.

8   Conclusion

This thesis aimed to answer the research question, "In what manner can a location-based game facilitate the socialisation process of (new) students at the University of Twente?". The goal of the project was to develop a location-based game that encouraged students to explore the campus, interact with other students and become familiar with the campus culture.

Based on the results of the user testing and the interviews, it can be deduced that a location-based game can indeed serve as a promoter of social interaction among students and help them in their onboarding process for the University of Twente. This was evident in the game's ability to encourage and stimulate conversation among players and foster teamwork.

In terms of campus exploration, the game successfully encouraged students to visit different parts of the campus and discover parts of the campus that they have never thought about visiting before. However, certain mechanics such as the cloud, did not function effectively as planned, highlighting the need for future work and iterations of the game.

Finally, in terms of familiarising students with the campus culture, the game showed great potential in educating players about events, traditions and landmarks that played a role in the university's community. There are still areas that still need to be developed as there are other mechanics that have not been explored that could bring a larger input in bringing students closer to the campus and its culture.

In summary, this thesis has shown that a location-based game can be a valuable tool for facilitating the socialisation process of new students at the University of Twente. The findings from this thesis offer valuable insights for the design of location-based games in the future, particularly ones that are focused on fostering community and encouraging socialisation in higher education. Through the lessons learned from the thesis, a strong foundation for future work is built.

9 Citation

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10 Appendix

10.1 Appendix A - Interview Questions

1. How do you interact with your friends? What are things you do together when hanging out?

2. How do you make friends?

3. What activities or events have helped you meet other students?

4. How important is social interaction in your university experience?

5. Did the game help in enhancing your interaction with other students or making new friends?

6. What are your thoughts on the event feature, such as the study market event? Would the "check in" feature encourage you to participate?

7. Do you think the faction feature could help facilitate social interactions and team building among students?

8. Did you feel more inclined to join a faction of your own choice, or would you prefer to be assigned to a faction randomly? Why?

9. Are there any additional features or changes you would like to see in the future development of the app to improve social interaction?

10. How well do you feel you know the campus?

11. How often are you on campus?

12. What strategies did you use to familiarize yourself with the campus?

13. Are there any areas on campus that you find difficult to locate or navigate to?

14. How do you normally find your way around new places?

15. Did you feel the game encouraged you to explore the campus?

16. Did the "cloud-covered" area on the campus map intrigue you? Would you be motivated to uncover it if this was a real-life feature?

17. Did the quests motivate you to visit spots on the campus?

18. Do you feel the rewards that you receive from the quests and check in's motivate you to visit more spots?

19. Were there any areas on the campus that you found because of the game that you might not have discovered otherwise?

20. What aspects of the campus culture were you aware of before arriving?

21. How did you learn about campus traditions and events?

22. How would you describe the campus environment?

23. Which locations or events on campus do you feel embody the campus culture the most?

24. Have you been able to participate in any campus traditions or cultural events? If so, which ones?

25. Are you in any associations?

26. How do you feel being active in campus events or culture has affected your student life?

27. Do you believe the app could potentially help you engage more with the campus and its offerings? Can you explain?

28. Did the quests or events in the game reflect the actual events or traditions of the campus?

29. Are there any additional features or changes you would like to see in the future development of the app to enhance your understanding of the campus culture and environment?

30. How would you rate your experience with the avatar customization feature? Is it something you would be interested in using?

31. What are your thoughts on the pixel art design used in the app? Do you feel it's suitable for the intended audience?

32. Does the pixel art design enhance or hinder your engagement with the app?

33. Would you change anything about the visual style of the app?

34. Based on your experience with this prototype, would you be interested in using a full version of this app? Why or why not?

35. Are there any additional features or changes you would like to see in the future development of the app?
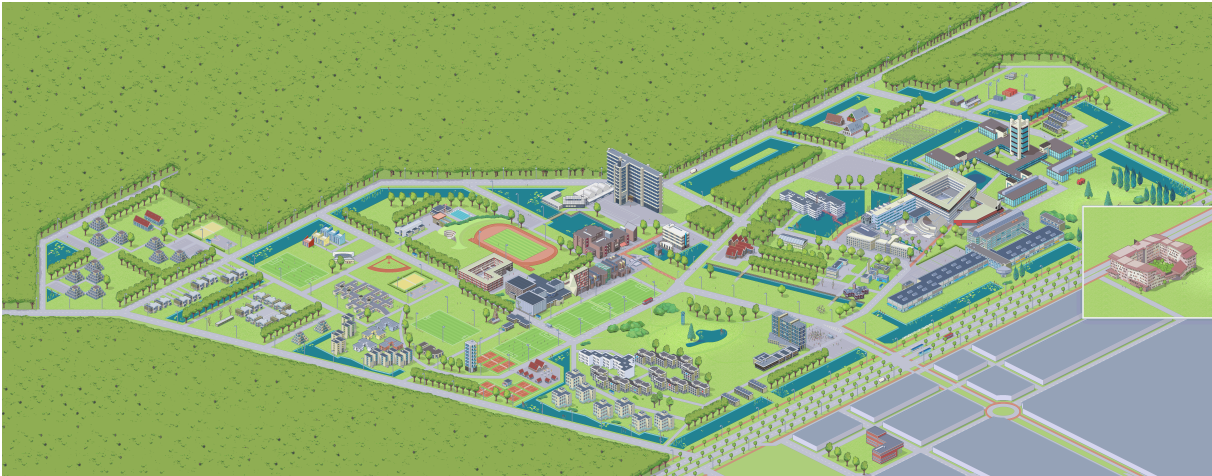
10.2   Appendix B - Large Map of Campus

Figure 8: Large Map of Campus from the Sustainability Walk

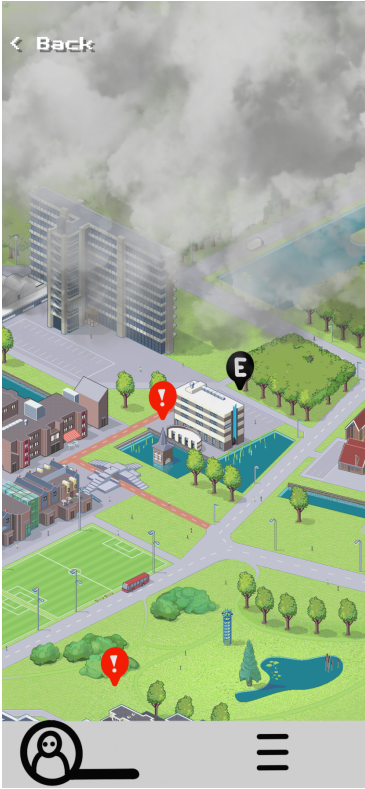## 10.3   Appendix C - Prototype Images
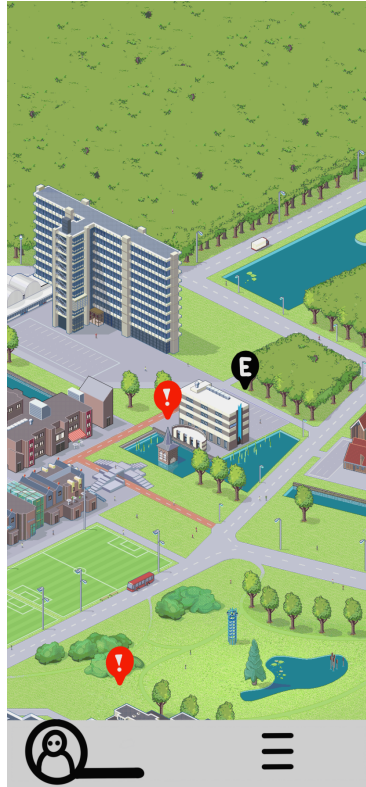

Figure 9: Main screen with the cloud

Figure 10: Main screen without the cloud

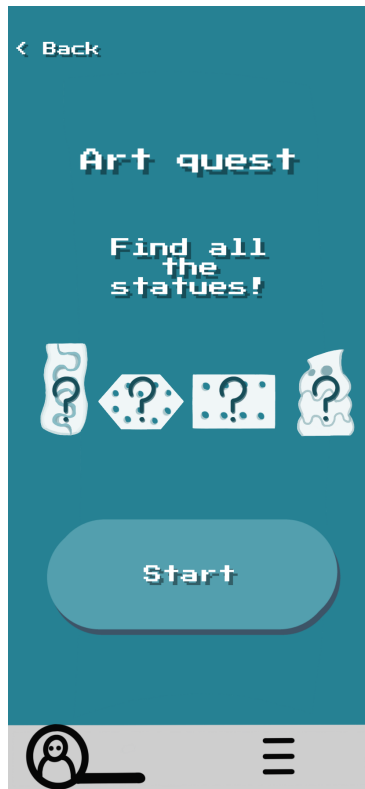Figure 11: Pop up screen with settings, events and quests
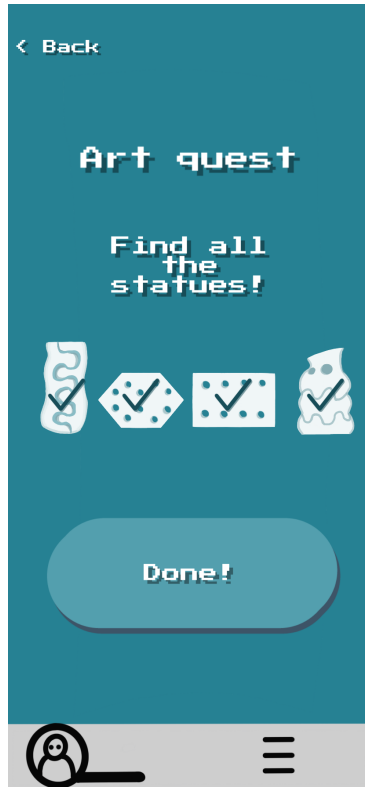
Figure 12: Art Quest page start

Figure 13: Art Quest page end

Figure 14: Art Quest Reward

Figure 15: Check-In at the Torentje van Drienerloo

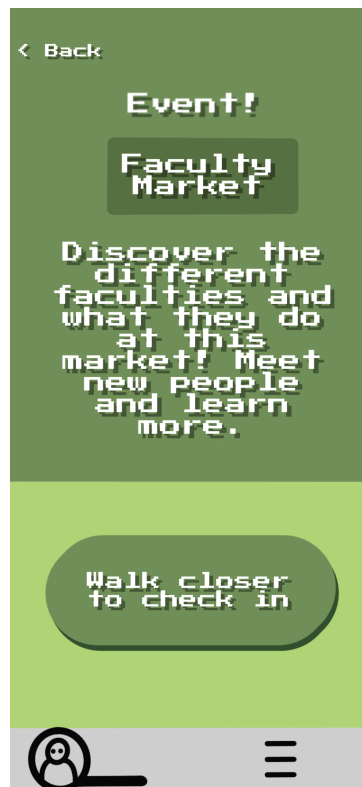Figure 16: Check-In at the Torentje van Drienerloo Reward
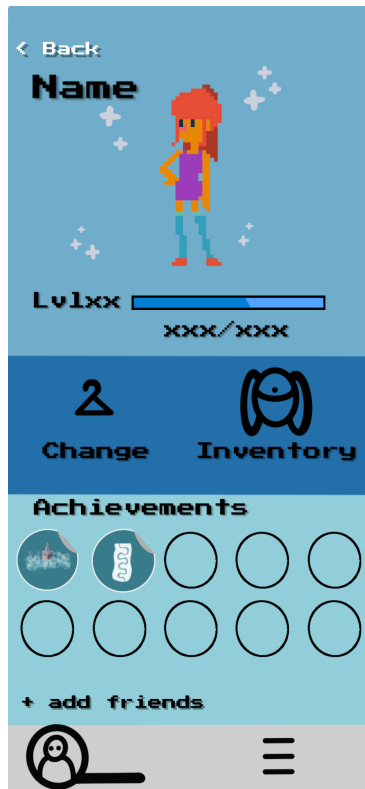

Figure 17: Faculty Market Event Page

Figure 18: Avatar Page