Exploring the Effect of Achievements on Students Attending University Orientation

Zachary Fitz-Walter, Peta Wyeth, Dian Tjondronegoro, Daniel Johnson
Queensland University of Technology
Brisbane, Australia
z.fitz-walter@qut.edu.au, peta.wyeth@qut.edu.au, dian@qut.edu.au, dm.johnson@qut.edu.au

ABSTRACT
University orientation is a key event for new students that aids in the transition from a school to a university environment. A smartphone orientation application was built to aid students attending the event. Achievements were added to the application in an attempt to engage students further with the orientation activities and application. An exploratory field study was undertaken to evaluate the effect of the achievement system on participants attending orientation. Forty-six new students were recruited to test the orientation application. Twenty-six participants used a gamified version of the orientation application and twenty participants used a non-gamified version. While the gamification was generally well received, no impact on user experience was evident. Some effect on engagement with orientation activities was shown. Participants who used the gamified system reported the game elements as fun, but some negative issues arose, such as cheating.

Author Keywords
Gamification; Achievements; Badges; Student Engagement; University Orientation; Smartphone; User Experience

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
A key event for new university students is orientation, which aids in the transition from a school to a university environment and introduces students to many important aspects of university life. In Australia, a weeklong event is often run during orientation with different days and activities tailored for students studying different courses. These events aim to not only introduce students to university life and the services available, but also introduce them to other students in their course. All of these events and activities are aimed at making the student feel like they are part of the university community, which in turn helps to create a comfortable place for learning.

Many universities have started to use smartphone applications to provide information to university students at open day and orientation events. Mobile-delivered event applications can be more convenient and personalised compared to traditional tools, such as paper-based event schedules and physical maps. However, they do not necessarily motivate students to engage with the event. As university orientation is important for new students, there is a need to encourage students to engage with the events and activities as much as possible.

The following research study investigates the use of achievements added to a smartphone university orientation application. We aimed to investigate if the addition of achievements to the application led to a more positive user experience, greater perceived motivation and behaviour change. In addition to these aims we also investigated if the addition of game elements was well received by university students.

Contributions of this research include a procedure for creating achievements based on the goals of an activity and also results that indicate using achievements in this context may affect engagement, without greatly affecting the user experience.

PREVIOUS RESEARCH
Current university students are more than likely to be gamers [4], and orientation games like scavenger hunts have had a history of being used to introduce new students to university [17]. Previous research studies have indicated positive results when combining games and smartphone technologies for orientation events. This includes the *MobiLearn Project*, which was an educational scavenger hunt aimed at introducing new students to a university campus [21]. Another example is *Scavenger Hunt*, a scavenger hunt around campus for new students, delivered on a mobile device [24]. The use of gamification at university has also been explored as a way to engage students with learning [15].

Gamification, or gameful design, is a design strategy where game elements are used in non-game systems to promote engagement with an activity. The idea is that if video games

can create such engaging experiences, then other systems can adopt similar design techniques to engage users as well. This research study adopts the definition of gamification as the use of game design elements in non-game contexts [8]. Where a game design element could include anything from game aesthetics, such as graphics and progress bars, to complete games with an overarching goal, rules, story, levels, quests and achievements.

Achievements and the gamification blueprint

It has been common for gamification implementations in both industry and research to use competitive and reward-based game elements, such as points and leaderboards (e.g., [5]) or achievements (e.g., [18]). Combined with incentives, these elements have been described as the industry blueprint for gamification [7]. Badges, points and social leaderboards have been applied to many different computer applications [1]. These particular elements can be relatively easy and cheap to implement on top of existing systems, such as websites or mobile applications. However, the use of these game elements has been criticised as focusing on rewards and not representing the intrinsically motivating aspects of games [3, 19]. Research has also indicated that intrinsic motivation may be reduced through the use of extrinsic motivators [20].

While some research results indicate that badges can be used to influence user behaviour in different contexts [6, 11] other studies show that the addition of badges does not automatically lead to an increase in use activity [13]. Another study found participants responded differently to the use of achievements in a photo-sharing mobile application [18]. Some users appreciated the achievements, while others were either indifferent to their inclusion or were confused by them. These mixed results, combined with the continued use of badges in industry implementations indicate that further research is needed to investigate the effect of achievements in different contexts.

Investigating the effect of gamification

Previous empirical gamification research has generally investigated the effect of game elements on the construct of engagement. However, adding game elements to a non-game context can affect other aspects of the experience as well. For example, one study [18] found that some users got nothing out of added game elements, and thought they could lead to unwanted patterns of use. Another study [12] found that adding a fantasy roleplaying game to a market research survey led to low completion rate of 58% compared to three other non-gamified surveys that had completion rates of around 94%.

The addition of gamification to some applications can also lead to unwanted, and potentially dangerous, behaviour. Study participants have indicated both considering cheating [10] and also actually cheating when using gamified systems [22]. In the same study [22] participants suggested that the competitive nature of the leaderboard used, although effective, was not entirely comfortable for them. Participants have also been concerned that the use of competitive game elements to encourage exercise in another study [25] may be dangerous, leading to excessive exercise. And finally, a health game intervention deployed at a school led to rivalries forming between schools [26]. One student also admitted to finding and keeping a pedometer from another school until the end of the game to disadvantage them. Further research is needed to explore the effect of gamification on not just behaviour change, but also on other constructs, such as user experience.

USING GAMIFICATION TO ENGAGE NEW STUDENTS

A review of two previous student orientation surveys was undertaken in order to isolate areas of the orientation event where potential improvements could be made. The surveys were from semester 1 and 2 in 2010, with the goal of both being to help determine what students thought of the orientation program in the respective semester. The survey results suggested a number of areas could be improved upon including encouraging attendance, campus exploration and social networking.

A review of current orientation services was also undertaken. The review found that services available for new students include an online event planner, which students are encouraged to print out and bring along to orientation. There are also a number of navigation tools that currently exist for students. Physical maps and signposts have been set up at various locations around the university campus. Online maps of each campus are available, which can be accessed via a web browser or printed if the user requires a physical copy. An iPhone application was also released in December 2010, which provides a location-aware map with campus information.

Interviews and a focus group with orientation staff

Semi-structured interviews were undertaken with two staff members of the orientation engagement team. The orientation event was discussed, including areas of the event that could be improved. The results of the interviews helped support the findings from the surveys, with the staff members agreeing that new students could often feel lost, may have trouble meeting new friends, and may have difficulty finding what events were available. The interviews also revealed that the printed event list could be troublesome for both students and staff. They reported that students could easily forget or lose their printout, which led to confusion and an increase in workload for staff. They would need to handle additional enquiries from students asking about events. Presenting this information to the student via a mobile application could help to improve this situation.

The issues identified in the surveys and interviews were then discussed in a focus group with eight staff members from the orientation-planning group. An affinity diagram exercise was used to establish goals that would address

these issues. These were grouped into three different areas, and were then discussed further. Three different themes emerged: administration, engagement, and information. The results of the focus group suggested that engagement was a key issue, specifically delivering orientation information to students, encouraging them to explore the campus, and encouraging them to meet people.

APPLICATION DESIGN AND DEVELOPMENT

To replace the paper-based event planner a smartphone application was developed. This application provided new students with personal orientation event information, a campus map, and a friend list for storing contact details of other students. The application was developed for the Apple iOS platform, targeting iPhone, iPod Touch and iPad devices. At the time of development this platform was (and still is) popular in Australia [14]. iOS devices were also the most popular mobile devices used to access the university website at the time. To the application achievements were added that aimed to engage students with the issues identified in the focus group and interviews.

An iterative design approach was used to design the gamified application, where three iterations of rapid prototype development and evaluation were undertaken. A paper prototype was first created and presented to orientation staff for feedback. A digital mockup was then designed and created based on the results. The digital prototype was presented to a focus group of staff and after receiving feedback, a working prototype was designed and developed that could run on iPhones and iPod Touches. A usability study was then run with four university students to identify any usability issues with the application. The study tested both technical and usability aspects of the application in a laboratory setting. The users were introduced to the application and had to complete five different achievements. They then could use the application freely and were asked questions about the application design. A number of design changes were made based on the results of the study.

GAMIFICATION DESIGN

Our gamification design was inspired by techniques used in previous research studies [9, 18, 21]. Our study shared a similar context to an earlier study [21], which focused on engaging students with a mobile scavenger hunt. To design achievements a process was used that identified the goals for gamification, explored available mobile sensing options for these goals, and then these were used to design the achievements.

Gamification goals

Three gamification goals were identified:

1. Encourage campus and service exploration
2. Encourage participation at orientation events
3. Encourage social networking between students

With the aid of the orientation engagement team, each goal was broken down into more specific and measurable activities. For example, important university locations were identified that students should explore (e.g., the library for borrowing books and for study spaces, the Information Technology helpdesk for help with any computer related issues), as well as important services (e.g., security phone number for emergencies).

Sensing the activities

Sensing options were explored to determine if these activities could be automatically measured by technology. Location information could be accessed through the use of the iPhone's Global Positioning System (GPS) sensor, cellular and Wi-Fi sensors, or by using the camera to scan a Quick Response (QR) code placed at a specific university location. Barcodes on books and other items can also be read using the camera. Time information could be obtained from the iPhone's internal clock. Movement data could be obtained from the iPhone's accelerometer sensor. Students could also provide input using the phone's keyboard.

Activity	Different sensing cues
Provide information regarding a university service	Keyboard input, list of important university services and details (e.g., campus security phone number).
Scan a collected object with a barcode	Camera input, an object with a barcode (e.g., library book, student card), a list of orientation objects with barcodes and their barcode numbers.
Find a location marker on campus	Camera input, unique QR code placed at the physical, list of QR codes and their locations.
Check-in to a scheduled orientation event	Using location sensor (GPS, Wi-Fi, cellular), internal clock, event schedule with location and time information.
Meet another student	List of contacts where new contacts are added using the Bump API (http://bu.mp - now decommissioned). This API triggered a connection between two users when a "bumping" motion was detected (Uses location, accelerometer and time sensors).

Table 1. Student activities that could be identified using available sensors.

University information was also available for use in the application. This information included details of scheduled orientation events, a list of library books and their barcodes, student identification cards with barcode numbers, university service details, university locations and a list of contacts that the student had added to their contact list. By combining the phone sensors with the university

information, sensing cues could be created to identify if students had completed the desired activities (see Table 1).

Achievement design

Achievements were the primary game design element used in our system to challenge and reward students for completing orientation activities. The achievement design was drawn from industry game and gamification implementations, as well as research into achievements in non-game contexts [18]. A review of achievement systems from two popular game networks was undertaken (Xbox Live Achievements and Steam Achievements) as well as two popular gamified systems at the time (GiantBomb website and Foursquare). An anatomy of an achievement was defined, as well as different types of achievements. Using these findings, challenges were created by picking an orientation goal and choosing an activity that could be identified using the smartphone (see Table 2).

Goal →	Activity →	Challenge
Encourage exploration of the campus and services available	Learn about the free campus shuttle bus	- Find out the bus number of the campus shuttle bus and enter it
	Visit the library	- Find the library and scan the QR code there
Encourage participation in the orientation events	Attend a scheduled orientation event	- Check-in to one scheduled event
	Collect your student ID card	- Scan the barcode on your student ID card
Encourage students to meet other students	Meet people from the same year	- Add your first contact to the contact list from the same year

Table 2. Examples of linking goals to challenges via measurable activities.

These challenges were then used to create a total of 20 achievements. Clues, images, and unlock text were made for each achievement and these achievements were then organised into different sets, which focused on different orientation goals. Consideration was given to the experience of the entire achievement system by drawing on previous research [9, 16, 23]. Immediate feedback was provided via an alert message when an achievement was complete. Some achievements were very easy to complete, aiming to introduce the users to the gameplay. Achievements then became progressively more challenging to complete. This was done by requiring students to complete more activities (e.g., *Attend your third event*), by providing hints instead of giving exact locations (e.g., *this place will fulfill all your sugary desires*), or by having cryptic clues (e.g., *Title: 025.344 15. Clue: ???* - in this case the title was a catalog code of a book in the library which students had to find and scan with the application).

Another feature was added that allowed students to compare the number of achievements they had completed with others when they shared their contact information with another student. This aimed to encourage friendly competition between students. Students were also given a rank ranging from Orientation Newbie to Orientation Master, with each consecutive level requiring more achievements to be completed. This level was displayed in their profile and also shared with friends when they bumped phones.

Final application design

After a number of iterations the design was finalised and ready to be evaluated in a field study. The features of the application included an event list, map, friend list, profile and the list of achievements (see figure 1). The event list provided a personalised list of orientation events that the student had registered for. Students could view their schedule, along with detailed information about each event. Students could also check-in to each event, but only if they were on campus at the time of the event.

The map provided students with an overview of the campus and the locations of all the buildings. It also displayed the student's current location on campus. The friend list allowed students to easily add the contact details of any new friends they made on campus. Students simply pressed the 'add' button and then 'bumped' phones together with another student to share contact details, university course information and number of achievements completed.

The profile view provided the student with an overview of their personal details and the number of achievements they had completed. Students could edit their profile, limiting the information they shared with other students. Finally, the achievements list provided the list of twenty achievements that students could complete while at university orientation.

The achievements were organised into a number of different sets, each with different themes. Clicking on an achievement revealed detailed information about it, such as a clue that hinted at how to complete the achievement, and also an action button if the achievement required active input (e.g., scanning a QR code or barcode). When an achievement was completed, congratulatory text and an image were revealed as a reward. The text provided extra information for students to read which was often humourous, and the image was different for each achievement.

Figure 1. Screens from the final application design from left to right – Events, Map, Achievement List, and Achievement

FIELD STUDY

An exploratory field study was undertaken during university orientation week in order to evaluate the potential effectiveness of the gamified application compared to a non-gamified version.

Study Overview

The aim of the field study was to evaluate the effect the addition of achievements had on user experience, engagement and behaviour change. The study also looked at investigating the reception of the added gamification. Three hypotheses were formed:

1. We predict that participants using the gamified application will have a more positive user experience compared to participants using the non-gamified application.
2. We predict that participants using the gamified application will feel more motivated compared to participants using the non-gamified application.
3. We predict that the gamified application will encourage behaviour change compared to the non-gamified application.

In addition to these three hypotheses, a research question was also investigated:

1. Is the addition of game elements well received by university students?

Study Measures

To measure the constructs usage data was captured during the field study and a questionnaire was administered to participants at the end of the field study. The questionnaire design was informed by questionnaires used in similar studies [9, 21]. Five-point Likert-type questions were used with responses on the following scale (Strongly Disagree (1), Disagree (2), Neither Agree or Disagree (3), Agree (4), and Strongly Agree (5)).

To measure user-experience a four-item Likert-scale was developed ("*I found the application to be overall useful*", "*I found the application easy to use*", "*I enjoyed using the application*", *"The design of the application was attractive"*). To measure the perceived motivation of participants a nine-item Likert-scale was developed (*"The application motivated me to explore more of the campus", "I found and visited new places on campus that I would not have visited without the application", "By using the application I got to know the university campus well", "The application helped me to learn about the different locations on campus", "The application encouraged me to meet new people", "This application would encourage me to meet other students in my faculty and course" ,"The application encouraged me to attend events", "The application encouraged me to check-in to events", "The application helped to engage me in the orientation event"*).

To assess the reliability of the scales, Chronbach's alpha was calculated for both the gamified and non-gamified responses, the two scales were found to have acceptable reliability (alpha 0.768 for the perceived motivation scale and 0.765 for the user-experience scale).

Five-point Likert-type questions were used to measure the usefulness of specific application features with responses on the following scale (Not at all useful (1), Very little use (2), Useful (3), Very Useful (4), and Extremely Useful (5)). Specific features included the campus map (*"How useful was the map of the campus?"*), check-in function (*"How useful was the ability to check into an event?"*) and bump function (*"How useful was adding friends by bumping phones together?*).

The application also captured usage data including number of events checked-in to, the number of friends added to the friend list and if participants were using the gamified version, the total number of achievements completed was also captured. Short answer questions gathered qualitative data to support the quantitative findings.

Also, for those using the gamified application, their subjective gamification experience was measured using Likert-type questions with the same scale as the user experience and perceived motivation questions (e.g., *"The achievement system was fun to use", "The clues in the achievement system were easy to understand", "The achievement system motivated me to explore the campus")*, multiple choice questions (e.g., *"What did you like the most about the design of the achievement system?", "What was your favourite type of achievement to complete?"*) and short answer questions (e.g., *"Of all the achievements you completed pick your two favourite and tell us why you like them", "Do you think the difficulty level of the achievements was appropriate? If no, why not?"*).

Study Procedure

Participants were recruited online via an advertisement and at the event using flyers. They were met by the researcher at the library and provided with a link to download one of two versions of the application onto their smartphone. The non-gamified version provided exactly the same features as the gamified version but had the achievement list removed.

Participants were provided with a customised orientation event list, which listed the events to which they had signed up. The researcher then introduced them to the application features. Participants were asked to use the application while at the orientation event, and then return at the end of the day to provide feedback on their experience. When participants returned they were asked to complete the questionnaire about their use and experience of the application. Usage data was then sent to the researcher via email and each participant was given two movie vouchers at the end of the session to reward them for their participation.

RESULTS

To test the hypotheses and explore the research question, non-parametric methods were used to study the results of the survey and logged usage data. Likert-type and Likert-scale questions were compared using Mann-Whitney U tests. Mann-Whitney U tests were also used to analyse the logged usage data from both groups. As a function of the small sample size it can be expected that the current study had relatively low statistical power. Given this and the exploratory nature of the work we judged the application of a bonferonni correction to be overly conservative. However, given the resulting increase in the experiment-wise error rate and likelihood of Type I errors, these results must be interpreted with caution.

Participant Demographics

Forty-six students were recruited to participate in the field study (male = 31, female = 15). Participants were aged from 17 to 45 (mean = 20.76, SD = 5.824). All the participants were first year students, new to university. Each participant was from one of seven different university faculties, with the majority from three faculties: Business, Built Engineering and Environment, or Science and Technology.

Participants had been using an iPhone from anywhere between 0 to 44 months (mean = 12.5 months, SD = 10.893). Reported iPhone usage varied from 5 minutes to 2 hours a day. Reported video game usage varied widely as well, with participants reporting that on average they played computer and home console games for 4.70 hours a week (SD = 7.738) and mobile games for 3.89 hours (SD = 4.667). Twenty-three of the participants had used a video game achievement system before and all but one of these reported that they enjoyed using it. Only one participant had used an achievement system in a non-game context before (foursquare). This participant reported it as being enjoyable to use.

Participants were randomly divided into two groups to trial the two versions of the orientation application. Twenty-six participants used the gamified application, and 20 participants used the regular, non-gamified version. A series of independent groups t-tests found no statistical difference between the two groups in terms of age, previous number of campus visits, months using a smartphone, hours a day using a smartphone, hours a week playing games and hours a week playing mobile games.

User Experience Results

User Experience Measures	Gam. (n=26)	Non-Gam. (n=20)	*U*	*z*	*p*
User Experience Scale	4.50	4.50	247.5	-.283	.777
Check in feature	3.00	3.00	277.5	.400	.689
Bump feature	4.00	3.00	345.5	1.965	**.049**
Campus map feature	5.00	4.00	350.5	2.168	**.030**

Table 3 – Median User Experience and Usefulness Scores for Gamified and Non-Gamified Versions

A Mann-Whitney U test was run to determine if there were differences in user experience between participants who used the gamified version and participants who used the non-gamified version. The median user experience score was not significantly different between the two groups.

A Mann-Whitney U test was run to determine if there were differences in usefulness of specific features of the gamified version compared to the non-gamified version. The bump feature was statistically significantly different between the two groups (with the gamified version rated as more useful).

The median map feature was statistically significantly different between the two groups (with the gamified version rated as more useful). The median check-in feature was not statistically significantly different between the two groups.

Motivation and Behaviour Change Results

Motivation Measure	**Gam. (n=26)**	**Non-Gam. (n=20)**	***U***	***z***	***p***
Perceived Motivation Scale	3.944	3.944	254.5	-.122	.903
Behaviour Change Measures	**Gam. (n=22)**	**Non-Gam. (n=13)**	***U***	***z***	***p***
Total Check-ins	3.00	0.00	207.5	.023	**.026**
Friends Added	1.00	0.00	217.0	.007	**.011**

Table 4 – Median Motivation and Behaviour Change Scores for Gamified and non-Gamified Versions

A Mann-Whitney U test was run to determine if there were differences in perceived motivation between participants who used the gamified version and participants who used the non-gamified version. The median perceived engagement score was not statistically significantly different between the two groups.

Application usage data was only successfully captured from 13 participants who used the non-gamified application and from 22 participants who used the gamified application. The missing data resulted from participants who did not already have their email client set up on their device (predominantly users of iPod touch devices). None of our key outcome measures were expected to be related to the type of device used, and hence, this issue is unlikely to have introduced any systematic bias. Using the available data, a comparison was made to see if any differences occurred. Both versions of the application captured the number of events each participant checked-in to, as well as the number of friends added to the friend list.

Event check-ins

A Mann-Whitney U test was run to determine if there were differences in the number of event check-ins between participants who used the gamified version and participants who used the non-gamified version. The median number of check-ins was statistically significantly different between the two groups (with more check-ins completed by participants using the gamified version). It is important to note also that both the mode and median number of event check-ins by those using the gamified application was three events – the same number required for the final event related achievement.

Participants who used the gamified version were administered an additional Likert-type question which asked if the achievement system motivated them to attend events. The median response (n = 24) for this question was 3.5 (between the "Neither Agree nor Disagree" and "Agree" responses) and the mode was 3 ("*Neither Agree nor Disagree"*).

Friends added

A Mann-Whitney U test was run to determine if there were differences in the number of friends added to the friend list between participants who used the gamified version and participants who used the non-gamified version. The median number of friends added was statistically significantly different between the two groups (with more friends added by users of the Gamified version). However, the average number of friends added was not particularly high in the gamified version (1.54, SD = 1.103).

Participants who used the gamified version were administered an additional Likert-type question which asked if the achievement system motivated them to add friends. The median and modal response (N=24) for this question was 4 ("Agree").

Campus engagement

An additional Likert-type question asked participants who used the gamified application if the achievement system motivated them to explore the campus. The median and modal response (N=24) for this question was 4 ("Agree"). Representative short answer responses reported that these types of achievements "*made me want to find where things are*", "*led me to places I enjoyed and that I otherwise wouldn't have seen"*, and that they "*were the most motivating part of the application, it caused me to walk all around the university."*

Gamification Experience Results

A multiple-choice question asked participants who used the gamified application to suggest the most motivating aspect of the achievement system. Of the five available options (Completing all the achievements, collecting points, gaining levels, competing with others, or working with others) the two most popular responses were '*completing all the achievements*' (10 responses) and '*gaining levels'* (10 responses). Another multiple-choice question asked the same participants to record what additional elements may have motivated them to complete more achievements. Of the four available options (More competitive elements, time limit to complete achievements within, more game elements, or a physical reward) the most popular response was a '*physical reward'* (11 responses), followed by '*more competitive elements*' (9 responses).

A Likert-type question asked participants if the achievement system was fun to use. The median and modal response for this question was 5 ("Strongly Agree"). Participants reported in representative short answer

responses that the achievements were "*such a fantastic twist*" and "*were genuinely fun*", "*great for killing time productively", "very fun*" and that "*unlocking the achievements made it [the application] interesting*". Participants also reported that they liked the integration of achievements with orientation activities "*because it was simple and part of existing activities*" and because they were "*based on existing activities*" at orientation.

A Likert-type question asked participants if they found the achievement system aesthetically pleasing. The median and modal response for this question was 4 ("Agree"). Thus, participants who used the gamified application generally agreed that the achievement system was aesthetically pleasing. Another Likert-type question asked participants if the achievement system was easy to understand and use. The median and modal response for this question was 5 ("Strongly Agree"). Therefore, participants who used the gamified application generally strongly agreed that the achievement system was easy to understand and use.

A number of participants reported that for achievements that required numerical input (e.g., finding how many levels a building had, or entering the university bus number) they could simply guess the answer. It was also found that because of the large radius compensating for the GPS location sensor limitations, two students admitted in the questionnaire to cheating by checking-in to multiple events at the same time.

Finally, achievement completion data was captured from 24 participants who used the gamified application. Every participant completed at least one achievement. Of an available 20 achievements, the mean number completed by participants was 12.88 achievements (SD = 4.504). Both the modal and mean number of achievements completed were 14. One participant managed to complete all 20 achievements.

DISCUSSION

While acknowledging the need to interpret the results with caution given the small sample size and lack of correction for type I errors, the findings suggest that the achievement system influenced the perceived usefulness of some features, including the map and bumping phones. Results also suggest that the achievements had some influence on the number of check-ins made and friends added, but these could have been influenced as well by cheating. It was also found that those who used the gamified version reported that the achievement system was fun to use. An interesting finding as well was that on average, participants who used the gamified version completed over half of the achievements available. However, the results indicate that adding an achievement system did not have a significant effect on user experience.

There was little effect on user experience

The results suggest that adding an achievement system did not enhance the user experience, but at the same time it also did not negatively affect it.

It was hypothesised that the addition of game elements would enhance user enjoyment, similar to other previous research (E.g., [9]). However, there no difference was found in terms of reported enjoyment between the two groups. The novelty factor of both versions of the application may have contributed to this, especially when compared to the previously available paper-based orientation event planner participants would have received. Mean response values for both groups was high suggesting that a ceiling effect may have occurred, thus making it difficult to compare the two groups. However, the results from this study suggest that the addition of an achievement system did not negatively affect the user experience. Including game elements into a non-game context has the potential to add an extra layer of complexity, which in turn, has the potential to affect user experience (e.g., [12]).

Results also suggest that some application features were considered to be more useful by those participants who used the gamified version. These features included the campus map and the ability to bump phones to add new contacts. This may have been because the map feature helped participants complete the achievements and bumping phones was also necessary to complete some of the social achievements.

There was some effect on orientation behaviour change

There was no difference in reported subjective motivation between the two groups. However, results suggest that participants who tried the gamified version used some features of the application more than the other group, at least until the related achievements were completed.

Participants who used the gamified version did report that the achievement system motivated them to explore the campus and it was found that on average, participants who used the gamified application completed more than half of the achievements available. This suggests that participants using the gamified version were motivated to complete achievements and by completing this number it is possible that the participants would have exposed them to orientation activities and university information.

The results also suggest that participants who used the gamified version used the check-in and add friend functions of the application more than those using the non-gamified version. This is likely to have occurred because some achievements required the use of these functions in order to complete them. For example, an achievement was awarded to participants who checked into three events. However, the majority of participants stopped using the check-in function once this achievement was completed. This suggests that achievements did motivate some participants, but after these achievements were completed the function lost value.

Also a few participants admitted to cheating by checking-in to events they did not attend. Event-related achievements made up three of the 20 available achievements. This may have affected the check-in results.

The gamification experience was positive

The majority of the participants who used the gamified application reported that it was fun to use, aesthetically pleasing, easy to understand and to use. These findings were similar to another study [21] that found most players considered their application fun as well. It was interesting to note that different player preferences emerged and also some design issues arose that need to be considered in future implementations.

When Montola et al. [18] studied the effect of achievements on user experience they found that three different user groups emerged, those that appreciated the achievements, those that did not, and those that were confused by them. These three groups did not appear in this study. This could have been because of the demographic difference between participants in the two studies, or it may be that these groups may have emerged in the current study if a larger sample had been used. Although these groups did not emerge, it was found that different participants did like different aspects of the achievements. Some participants liked challenging achievements, while others preferred simple achievements. Some participants enjoyed achievements that supported orientation tasks, while others thought these were pointless. Different aspects of the achievement system motivated different participants as well. These results indicate that there were different player preferences amongst participants, and these should be considered in future gamification design.

Another notable finding was that very few participants added friends to their contact list. This is likely to have occurred because this feature required participants to 'bump' phones with each other. This meant that participants could only add others who were also taking part in the study, thus reducing the usefulness of this feature until more students started using the application. Allowing participants to add friends without having to bump phones could be more useful. However, this may lead to more cheating if participants could just manually enter a contact to complete an achievement. This balance between usability and enjoyment needs to be considered further.

Cheating can negatively affect the experience for players and a way is needed to address it when designing gamification. The GPS sensor used by the application had accuracy issues, especially when used indoors, and to counter this problem the application increased the location radius needed for a participant to check-in to an event. Because of this some users found they could cheat and complete achievements that required them to check-in to events without having to attend them. Some participants also reported that for achievements that required numerical input (e.g., finding how many levels a building had or entering the university bus number) they could simply *"guess the answer through trial and error*". This ability to guess the answer meant that a number of students thought this activity was *"useful but not fun"*. For these cases, alternate sensing options could be explored, such as placing QR codes at locations. Otherwise these problematic achievements could be removed altogether.

Limitations

There are a number of limitations of the current study. Most notably the small sample size and lack of correction for experiment-wise error rate means that future research should seek to replicate these findings with a larger sample and more conservative statistical analysis. Additionally, it may be that the relatively novelty to students of the applications used in the current study influenced the results. Future research should aim to explore these questions over a longer timeframe. Finally, the current study utilised a number of single-item measures and non-standard scales. Future research should seek to confirm these findings using established and validated scales.

CONCLUSION

This paper outlined the results of a field study that explored the effect of adding achievements to a non-game context. While the gamification was generally well received, no impact on user experience was evident. Some effect on engagement with orientation activities was shown. Similar findings to previous gamification studies were also found, including issues relating to cheating and the emergence of different player preferences.

This study contributed a procedure for creating achievements based on the goals of an activity and also initial evidence that achievements may influence engagement without greatly affecting the user's experience. The results of this study help us better understand the effect of achievement usage and thus, hopefully aid in future gamification design.

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