



The Graduation Game: Leveraging Mobile Technologies to Reimagine Academic Advising in Higher Education

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Abstract

Using the augmented reality features of a mobile game development platform, ARIS, the Utah State University's psychology department designed a mobile application called The Graduation Game (TGG). TGG addresses issues with current student advising procedures and aims to make advising information and resources more readily available to students. The game seeks to provide an earlier and more meaningful connection between incoming students and their academic advisors and the institution. This chapter discusses the iterative development cycle of TGG describing a series of game design and play testing over the period of 8 months. We conclude with the affordances and constraints of TGG, lessons learned from using a game design approach for academic advising, and implications for leveraging mobile technologies to improve students' advising experiences.

Introduction

Academic advising in higher education can have a large effect on students' relationship with the institution. The connection students feel toward their school can have significant impacts on retention and students' persistence through their academic career. Scholars have found how students judge the quality of their advising experiences is directly correlated to their loyalty to their school (Vianden and Barlow 2015). Moreover, researchers have demonstrated that students who are contacted earlier by their advisor are much more likely to persist in their education (Heyman 2010). Academic advisors can make a difference in students' higher education experiences; however, forming strong student-advisor relationship is a challenge, especially at larger universities with hundreds of new students enrolling each semester. The National Academic Advising Association found the average case load of a full-time advisor is 1:260 for a public bachelor university (Carlstrom and Miller 2013). Hence, while academic advising can play a crucial role in students' college experience, advisors face an unyielding demand of supporting hundreds of students simultaneously.

In response to this tension, universities have implemented various technological solutions. In the 1980s, institutions began implementing "computer-assisted academic advisement programs" that electronically track student records and align them with degree requirements. These programs fundamentally shifted the burden placed on advisors and improved advising experiences overall (Spencer et al. 1983). In the 1990s, universities began exploring "expert advising systems," computers which mimic the reasoning behavior of a typical human academic advisor. Expert advising systems provide students advisement opportunities anywhere, anytime, while offering more consistent guidance to students than human advisors (Wehrs 1992). Moving into the twenty-first century, these tools have become more commonplace

along with email and telephone, yet there is minimal adoption of newer tools such as mobile technologies into academic advising practices (Steele 2016).

In this chapter, the authors provide an illustrative case how advisors can use new technologies to reimagine academic advising. The authors share how The Graduation Game (TGG) was designed and implemented as a mobile technology advising experience for incoming freshmen at Utah State University (USU). This mobile game introduces students to their advisor and other resources even before stepping foot on campus and provides students just-in-time advising information about graduation requirements throughout their academic career. The overall goal of TGG is to offer accessible advising experiences that build early connections between students and their advisors. Students' perceptions of how TGG impacted their connection with their advisor and the implications TGG design has for transforming academic advising more broadly will be discussed.

Context

Advising in higher education can look different depending on the institution. In general, academic advisors are responsible for helping students decide which classes to take, providing information about registration (major progression, registration deadlines, add/drop dates), and helping students with personal and professional goals (Elizabeth 2009). To receive this help, students are typically required to make a face-to-face appointment with their advisor through an online portal or by calling the advising office. There can be multiple barriers for students when making an appointment such as having to find who to contact and then needing to fit an appointment into an existing schedule. This is where a mobile advising experience can help augment face-to-face meeting with an advisor, when students can access the app irrespective of their physical locations, thus breaking down these barriers (see Characteristics of Mobile Teaching and Learning).

Utilizing mobile technology in higher education advising has great potential, but there is still a need to realize this potential. Findings from the National Academic Advising Association (NACADA) survey show 55.95% never used smartphones in their academic advising practices and 68.97% never used mobile applications in their academic practices (Pasquini and Steele 2016). However, Gonzalez and Perez have begun to explore the space of using mobile technology to provide advising services to their students by creating an advising dashboard, which encourages students to take control of their advising experience by providing them with course suggestions and a course roadmap (Gonzalez and Perez 2015).

In this chapter, the authors explore how mobile technologies can help achieve an active and "intrusive advising" system in higher education by making earlier and more meaningful connections with incoming students, which could lead to higher rates of students completing their degree (Muraskin and Lee 2004). The authors will share findings of the USU psychology department's experiments with integrating an augmented reality mobile advising experience providing students the ability to walk around campus virtually before they arrive physically.

Human-Centered Design

Human-centered design (HCD) was used as the main design approach to develop TGG. In HCD, the designer starts with the users, which in this case are the students. By first focusing on the students and exploring their needs and problems, this mobile advising experience is informed by the people who will eventually be using and benefiting from it (Norman 2013). Students have been the focus throughout the development of TGG, so the mobile advising experience is solving the problems for advisors and the students.

Situative Learning Approach

The design of TGG is grounded in a situative perspective of learning, outlining the significance of learning in context through practice and participation (Brown et al. 1989; Lave and Wenger 1991). Mobile games have emerged as useful tools for situating learning in authentic ways (Gee 2004; Squire 2006, 2011). Mobile technologies bring learning opportunities to people who were previously unreachable because of their location or circumstance. Mobile learning is not a single, solitary, identified activity, but an experience is woven into our everyday activities (Traxler 2011) (see also Characteristics of Mobile Teaching and Learning). TGG leverages the affordances of mobile technologies by situating learning via augmented reality on a mobile device and making this experience more accessible to students at a distance (see Augmented Reality in Education).

ARIS

To create TGG, the authors used augmented reality interactive storytelling (Holden et al. 2014), a platform to create mobile, location-based games and experiences. The ARIS platform has been used in both K-12 and higher education contexts to engage the learner with a place while learning (Dijkers et al. 2012; Holden et al. 2015). For example, designers of learning contexts have used ARIS for a range of goals including second language learning, historical thinking, ecological participation, and science education (Holden and Sykes 2012; Mathews and Squire 2009; Wagler and Mathews 2012; Bressler 2014; Gottlieb 2016; Bressler and Bodzin 2016). This location-based functionality works well with the type of information academic advisors have for their students.

The Graduation Game (TGG)

TGG was designed to (1) acquaint students with the institution (USU) and the psychology department's program requirements and (2) form connection between students and their academic advisor. TGG aims to provide just-in-time resources for

incoming students and a more personal and meaningful initial connection with their advisor. It provides the benefit of working (virtually) with an advisor in planning their coursework.

The entire game experience was designed for USU, with the actual courses and the faculty members who teach them to mimic the real-life experience in graduating with the bachelors in psychology from USU. Players are presented with all the courses (situated on a map of USU's Logan campus) they would need to complete during their freshman year. They can then click on each course and interact with information about the course through text and/or videos. After completing each course, an icon will disappear from the map, and the player will earn credits toward their degree. The goal of the game is for a player to complete all coursework for their freshman year. Since the initial target audience was incoming freshmen, the authors narrowed the scope of the game to cover the first academic year in USU's psychology degree program with the option of expanding the game in the future.

Game Development and Design

Considering the cognitive overload students' typically experience on orientation day, the first author explored designs to make the important information provided on that day more accessible and digestible. Below is the design story including every iteration of TGG and the way it evolved from a low-fidelity paper prototype to high-fidelity mobile application.

Iterations of the Graduation Game (TGG) and Player Feedback

First Phase: Idea Generation and Decision-Making

The initial aim for the game was to have reachable goals en route to "graduation" to inform students of the nuances of degree requirements for the psychology program and provide a connection to their advisor and departmental faculty. The first step was to examine the degree requirements and explore different ways to separate them into a game. The authors attempted several paper prototypes. First, a monopoly-type board was developed, but it did not allow for differences in the successive trips around the board, which is required for each academic year of graduation. Then, wandering path was created with a graduation plaque at the end, but this paper design did not allow for achieving goals along the way. With these prototypes, it became evident the game should distinguish between the different types of courses (e.g., general education, major, minor, etc.) and provide a way to collect credits along the way (Figs. 1 and 2).

Using spreadsheets, campus maps, and a working knowledge of the academic and campus data, two key design decisions were met. First, the game location would be the main campus of USU at Logan rather than drawing on fictional themes or narratives such as a treasure hunt or theme park. Second, ARIS affords both location-dependent (i.e., must be played in the specific physical location at all

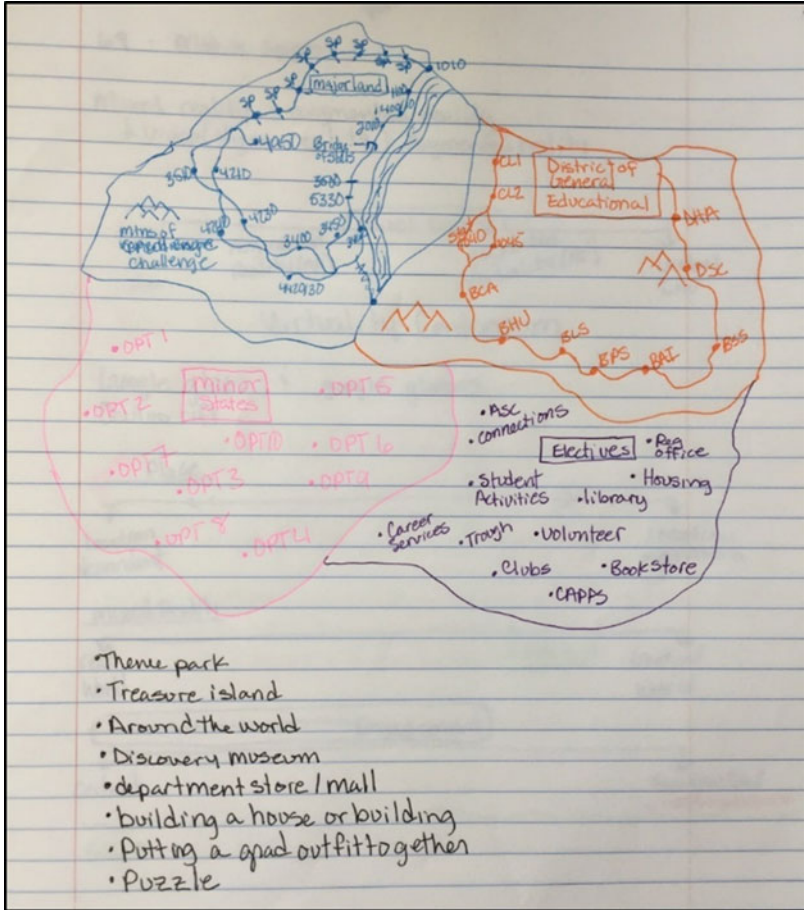


Fig. 1 Theme ideas and map

times) and location-independent options. Since the first advising contact with students happens through email, the authors opted to make TGG location independent so students can visit campus locations virtually. It was expected these decisions would better support students to connect their gameplay with their real-world context.

Taking the psychology department’s current graduation requirements into consideration, we made TGG’s requirements as follows:

Credits required to finish TGG (graduate)	120
Credits from the major	48
Credits from the minor	12
Credits from general education	33
Credits from electives	27

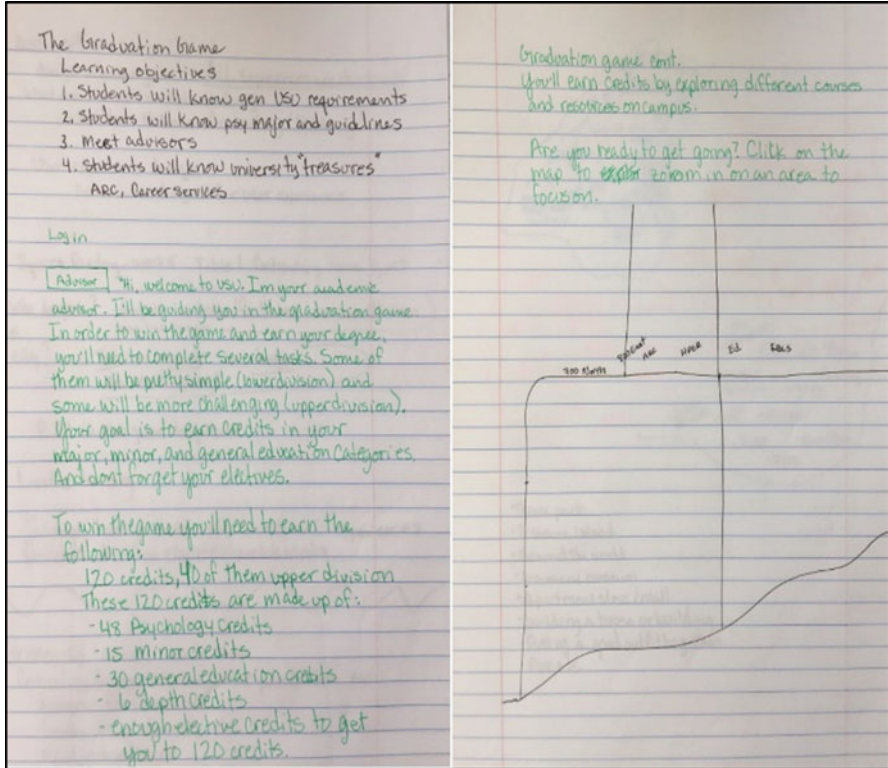


Fig. 2 Theme ideas and map

To “graduate” in 4 years, students must complete 30 credits per year. The traditional class rankings of freshman, sophomore, junior, and senior are achieved after earning 30 more credits: 0–30 = freshman, 31–60 = sophomore, 61–90 = junior, and 91–120 = senior. In the game, we equate each ranking with a new game level unlocking new requirements as well as new course options. The game is designed to follow these guidelines and help students become familiar with the system they will be following in their academic careers.

Freshman Year: Students will complete ten three-credit courses to complete this level. Freshman year will include beginning major coursework (General Psychology, Lifespan Development, Analysis of Behavior and Lab, Orientation to Psychology). Students will begin their general education requirements (English 1010, Stat 1040, Creative Arts, Life Science, Humanities). After successful completion of this year, students will be allowed to continue to the next year with sophomore standing.

Sophomore Year: This level sees students beginning to explore with a minor exploration course and an elective course added to the general education and

major courses. Major courses in this level are (Psychological Statistics and Abnormal Psychology). General requirement courses in this level are English 2010, Physical Science, American Institution, Social Science, Depth Humanities and Arts.

Junior Year: Junior year sees students getting more involved in their minor coursework, with two minor courses included. They will explore more elective courses, three in all. Major coursework in this level are (Research Methods, Tests and Measurement, Neuroscience/Sensation and Perception, Advanced Analysis of Behavior/Cognitive Psychology, Psychology of Gender/Multicultural Psychology).

Senior Year: Senior year will complete the major requirements (Social Psychology/Personality Theory, two Psychology Specialization courses, Undergraduate Apprenticeship). The minor requirements will be completed with two minor courses. Two remaining elective courses and two remaining general courses will round out the credits at 120.

A student as a player “takes a course” in the game, by selecting it, learning about the course, and responding to relevant questions. Each course provides information about its curriculum and the prerequisites, and a player must answer a yes/no or true/false question. If the player answers the question correctly, she/he will earn credit for the course and will be able to move on to another course. If the player answers the question incorrectly, she/he will be shown the correct response.

Second Phase: Low-Fidelity Paper Prototype

In the first paper prototype of the game, players are greeted by their advisor and are given some preliminary guidelines for playing the game. Players then are asked to choose the type of student: first generation, nontraditional, traditional, or high achiever. A first-generation student is a student whose parents did not attend college. A nontraditional student is a student older than a traditional college student or the one entering college after a delay—not straight out of high school. A traditional student is one who graduated from high school up to 1 year ago. A high achiever student is a student with transfer work, advanced placement course(s), and/or concurrent enrollment credits. The game then progresses on the basis of the student type. Afterplay testing this iteration with students, advisors, and faculty, the authors realized tracking students in the game resulted in confusing or ambiguous gameplay and reinforced certain higher education equity issues. Therefore, tracking was removed from the game.

Third Phase: Medium-Fidelity PowerPoint Prototype and Player Testing

The authors created a medium-fidelity version of TGG on Microsoft PowerPoint. This digital prototype of the game allowed the game to be shared electronically through email and play test with a wider audience. Slides were created for the freshmen courses providing a brief introduction for each course (see Fig. 3). With this medium, the authors were not able to ask players questions or record their earned credits, which limited the scope of the prototype.

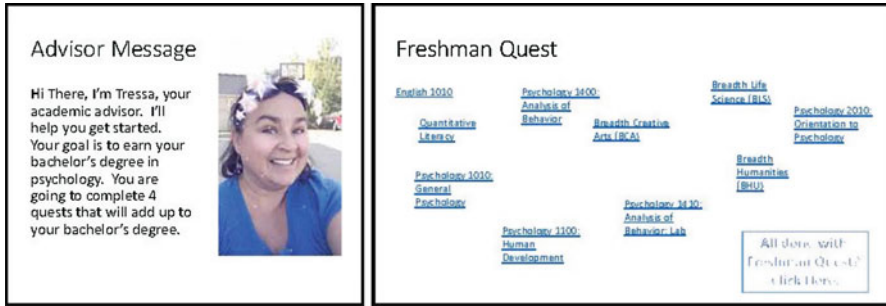


Fig. 3 Screenshots from the PowerPoint version of TGG

Before this prototype development, the authors planned to use grades and overall GPA to determine players' progress through the game. The technological limitations of PowerPoint revealed too much complexity using GPA as a metric, a much more complex formula which was needed to calculate the number of right and wrong answers and number of times each course was "taken." It was decided to use the number of earned credits to measure the players' success in the game.

The authors play tested this version of the game with some of their personal contacts including family members and coworkers they contacted through email or in-person. Two of the students who play tested the game suggested using more graphics and videos to make the game more engaging, instead of relying on text. These suggestions were used to inform TGG's current design, and confirmed by the survey results, video clips are the preferred type of interaction in the game. One of the play testers asked the authors to ensure introductory courses such as Psychology 1010 are listed as a prerequisite for all psychology courses. These nuanced requirements are important for students to understand as they register for courses and prepare their academic schedules. Such a requirement could be easily added into more sophisticated high-fidelity prototype using another platform (i.e., ARIS). Feedback from the other two play testers indicated the questions were appropriate and the concept of The Graduation Game is fantastic.

Fourth Phase: High-Fidelity ARIS Prototype and Player Testing

To make TGG a mobile app, the authors explored different available mobile game platforms such as ARIS, Siftr, TaleBlazer, App Inventor, etc. ARIS was chosen for TGG because it allows both location-dependent and location-independent experiences and offers a range of training materials and tutorials to support non-programmers in their design and development. The training materials on the ARIS website were used, and the authors solicited assistance from other ARIS users to develop the experience as a single scene with several interactions and quests for each academic year. Similar to the first paper prototype, players are greeted by their advisor at the first scene, where she explains the rules and goals of the game.

Advisor: “Hi there! I’ve been waiting to meet you. Are you ready to play the graduation game?”

Student: “No” = Exit Game or “Yes” = Let’s get started.

Advisor: “Great! This game is going to help you understand your requirements and give you an overview of what is required to earn a Bachelor’s degree in Psychology from Utah State University.

The game is made up of four quests – freshman, sophomore, junior, and senior. You will earn three credits for each class you pass. You will need to earn 30 credits per quest to move on to the next quest and to have enough credits to graduate at the end of your senior year.

Each class will teach you a little about the courses you will be taking as part of your degree. After each class review, you will be asked a true or false question to determine if you “pass” the course.

You’ll also meet some different types of students along the way that can help you understand the university requirements better. Have fun!”

In this version of the game, the courses and years are separated into quests, one for each year. After play testing this version of game with students, advisors, and faculty, the authors decided to reorganize the goals of the game. The game was adapted to focus on the course requirements’ quests, which would span across in-game academic years, rather than class ranking, which would become separate levels. Specifically, the authors added four concurrent game quests: major, minor, general education, and electives. For example, if a player completes Psychology 1010 course, she/he will earn three credits toward his/her degree (120 credits are required to graduate) and earn three credits for the major (48 credits from the major are required to graduate). If the player takes another course, an elective, she/he will earn a total of six credits toward his/her degree and get three credits each in the major and the electives (see Fig. 4). With this new structure, players would progress through class ranking by tracking a total number of credits (30 credits per academic year) and meet specific degree program requirements for course types across major, minor, general education, and electives. The aim of the design decision is to teach students it is not just the number of earned credits allowing you to graduate but the type of credits and courses you completed.

For early player testing of the ARIS version, the game was only for the first year and used the basic teaching material from previous iterations. After realizing the scale of the project, the authors decided to focus their development of TGG on freshmen year since their target audience are incoming freshmen.

Implementation

The Graduation Game: Current Design

For implementation, the authors concentrated their development of TGG on completing the freshmen year and improving the app for a more engaging experience for incoming freshmen. To make the game experience more recognizable and connected to the identity of USU, more media was integrated. Icons were prepared for the game using the iconic Old Main building, the first building built on the USU Logan

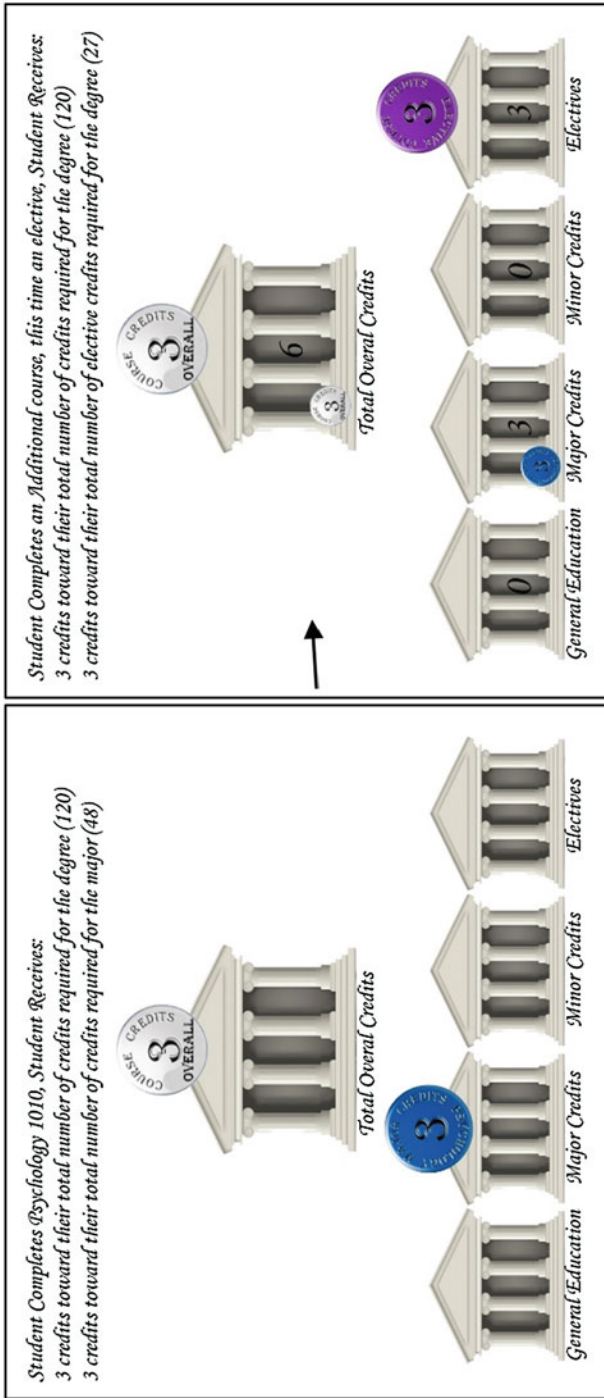


Fig. 4 Student's progress toward his/her graduation

Fig. 5 Program Icon for TGG



campus (see Fig. 5). Second, photos of the buildings were added, where the course is located on campus (see Fig. 7). The authors partnered with the faculty to add course-related media for each course and recorded video clips of all first-level psychology courses being introduced by the professors who teach the course. The professors enjoyed the experience and developed their own dialog for their course. This made each clip unique focusing on diverse course information. The questions varied to make the game more engaging.

Initially players view the image of Old Main building when they enter the game (see Fig. 6). They then are instructed to locate and select the “advisor greeting” on the map. This is the beginning of the game. Players are then prompted to continue to the advisor greeting screen, which explains the process for choosing classes. After completing the advisor greeting, players select any of the course icons located on the campus map and proceed with their courses. Once they select a course, they are prompted to read informational text followed by true/false questions or video clips. After answering a question correctly, players earn three degree credits and three credits in the specific area of the course, i.e., general education, psychology major, or elective. When a player does not answer the question correctly, she/he will have the option to retake the course. When the course is completed, its icon will disappear from the map. When the freshmen year is completed (30 overall credits), players will receive a freshman year certificate (see Fig. 8).

Collecting Evaluation Data

To collect players’ comments and feedback about the content and process of TGG, the authors created a Qualtrics evaluation survey. After 10 minutes of the game, players are prompted to either pick up or complete the survey. If they opt to pick up the survey, they can complete access it later. The survey’s goal is to capture players’

Fig. 6 TGG home page



overall experience of the game and how they perceive their own comfort in contacting their advisor and doing course selection after playing the game.

Aware not all players will complete the survey, the authors wanted to track the players of the game. The authors first attempted to monitor game play using the in-app metrics provided by ARIS, which tracks the popularity of the game. But this did not provide an accurate sense of who was playing the game. The authors added some JavaScript available on the ARIS forum to create a leaderboard to track who played the game. The leaderboard ranks players based on their earned credits as they work their way through the game.



Fig. 7 Buildings for TGG



Fig. 8 TGG screenshots. (From left to right) TGG index, TGG map, TGG zoomed in map, and TGG leaderboard

Final Testing Before Distribution

Before making the game live to incoming freshmen, an additional round of play testing was completed. In this test, authors found several issues related to the media in the game. The game settings were improved so all the content is downloaded on

the front end. Not only did this solve of the slow-loading graphics, but it allowed offline game play which takes significantly longer to download the game. Another issue arose when a play tester completed the entire freshmen level in less than the expected time and was not prompted to take the survey. The authors remedied this by setting the survey to appear after the participant completes 30 credits, eliminating a time requirement to complete the game. However, if the participant chose to delay completing the survey, a survey reminder will trigger every 120 seconds (2 minutes) after its initial introduction to the player.

Email Distribution

A series of email invitations to play TGG were sent to all the incoming pre-psychology major freshmen-level students who were slated to attend USU beginning in Fall 2017. In late March 2016, the authors invited 33 students in early April 2016. In mid-April 2016, another email invitation was sent to 30 new students (not included in previous invitations). A final invitation was sent to 67 (new) students. For a total of 172 email invitations, only five students completed TGG and responded to the survey.

The authors realized access to and on-ramping to the ARIS platform can be limiting. For instance, one student replied to the email asking if the app could be downloaded on Android platform, but ARIS is iOS only. Another student mentioned it would be helpful if the user did not have to download a separate app and then have to set up an ARIS account to play TGG. Some students reported having difficulty accessing the survey. This was remedied by triggering the survey after completion of 21 credits (instead of 30), and if a student chose not to complete the survey, they will be reminded periodically the survey is waiting to be completed.

Orientation Distribution

Due to the low-response rate, the authors decided to use TGG during summer orientations with the incoming pre-psychology majors most of whom had already received the email invitation. Using the iPads from the computer lab in USU College of Education and Human Services, authors pre-installed the ARIS app on the iPads and created generic ARIS accounts for the students beforehand to minimize the on-ramping effort. Implementing TGG in this setting was more efficient for the authors to introduce the game and to observe any problems students faced while using the game.

The first author conducted 11 orientation sessions with a total of 84 students. All the students who attended the orientation were presented with the game and the follow-up survey. The authors received 58 completed survey responses (response rate of nearly 70%). Some of the participants could not finish the game in the given time, so they did not reach the survey.

Evaluative Feedback on TGG

The authors received 63 survey responses from both the email and orientation sessions. The survey responses provide a promising picture of the future for integrating mobile technologies in academic advising.

TGG Improved Comfort with USU

Students were asked whether the authors met the goal in designing TGG, to make them feel more comfortable contacting their advisor. Most (80%) students reported TGG “definitely yes” or “probably yes” achieved this goal, which indicates a mobile app such as this one has potential to cultivate a connection between advisors and their students. Moreover, most (88.3%) students reported definitely or probably felt more comfortable navigating their course schedules after playing TGG. This suggests the mobile app may provide initial training to students to help them understand their program requirements toward graduation.

Game Design Tradeoffs

All responders indicated they spent about 10 minutes playing the game through all of freshmen year. This indicates the mobile game approach appears to be a time-effective method to deliver requirement information to students without an advisor needing to be present or use advising time to accomplish the task. When evaluating within game interactions, most (>50%) students ranked “video clips” as their first choice, followed by “true/false questions” and “text information, no follow-up.” These responses support play test feedback the authors received, players preferred videos as their primary form of interaction, and some students still requested more variety in question and interaction types.

Improving and Expanding the Game

About 71% of students expressed at least moderate interest in completing all levels (i.e., sophomore, junior, and senior years), which suggests it may be worthwhile to complete the game to graduation. In open-ended responses, students offered recommendations such as adding subtitles to videos, providing headphones for gameplay, and diversifying interactions with more decision-making outcomes. Moreover, students expressed interest to know more about the professors including contact information and more information for each course. Two students requested advisors to provide recommendations for course sequencing.

Designing Mobile Technology for Academic Advising in Higher Education

In this section, the authors will discuss the technical considerations encountered during the design of TGG, the lessons learned from the game development process, and the process and importance of data collection.

Technical Considerations

When designing TGG on ARIS, several technical considerations were encountered that inform future iterations of TGG as well as other design of mobile technology for advising. Since ARIS games can only be played on iOS devices, TGG is limited to iOS. While this was a design decision the authors made for this context, it brings up key issues of access and equity in implementing mobile technologies in diverse contexts, which should be considered by designers early in the development process. To play an ARIS game, the player must download the app and create a login, requiring significantly more time and can be a barrier to entry. It was found integrating the game play into student orientations is an effective short-term solution; however, this would not be suitable for distance or online students who may never come to campus. For broader implementations, these particular technical considerations including requiring a mobile device at all are significant obstacles to ensure equitable access and on-ramping.

Lessons Learned

Findings indicate TGG is a promising start for exploring new approaches for establishing early, meaningful connections between students and advisors. Students not only preferred videos of advisors and professors as a virtual introduction but desired more interaction and decision-making to make the game more engaging. This design story provides important context for distribution, and students were much more responsive to orientation distribution rather than email. Though a goal was to engage students as early as possible, the authors encountered a new design challenge for reaching students *before* orientation. In future iterations, the authors will further explore approaches to connect with students earlier, which is especially relevant to the distance and online students.

Future Direction

Academic advising plays a critical role in how a student feels about their school and whether the student decides to persevere through their educational career. Implementing mobile experiences, like The Graduation Game, can potentially assist academic advisors by providing unique ways to build relationships with students and to make early contact with a large number of incoming students. By beginning the exploration of where academic advising and mobile technologies intersect, authors are only beginning the investigation of how and if mobile experiences like TGG can be effective tools for academic advisors to increase student retention helpful for academic advising. In the future, authors expect to extend TGG for graduate students as well.

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