Gamification In ECS's Route 44 Program: A Needs Analysis

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1. INTRODUCTION

In recent years, there has been a large spike in gaming on all fronts, with the largest being in mobile games. One of the largest challenges of mobile gaming is keeping people playing when there are over a million other apps available to users. Mobile game developers use gamification to achieve this. Gamification is the act of implementing elements of gaming, such as scoring, competition, and incentives to keep using a given application. The Institute of Electrical and Electronics Engineers looks at usability, trust, and motivation of games [1]. When a product is easy to use, people tend to feel comfortable with it and continue to use it. By creating a sense of trust between the user and the platform is essential in making sure users keep coming back to it. Motivation is an essential factor of gamification, as users tend to put considerable effort into gathering information and developing new ways to use the system and complete given tasks. When a platform is easily usable, can create trust between its users, and keeps the users motivated, it makes users keep coming back to use it and lets them get everything out of the platform and more.

The idea of gamification can be used in more than just regular games. One area in particular is higher education. By using gamification, it motivates students to complete tasks and challenges given to them in the classroom. This idea can be seen in various video games as daily and weekly tasks that reward the players with various in-game items for completing them before they expire. These tasks make players return to the game weekly, if not daily, so long as the incentive is good enough, adding to the longevity of the game or service in question. This will ideally increase student involvement and raise student satisfaction in the classroom.

Route 44 is a gamification method in order to increase student involvement and engagement in the Syracuse University's School of Engineering and Computer Science. As a relatively new program, Route 44 is focused on gamifying the vital aspects of the ECS experience, such as advising appointments, career-fair attendance and extracurricular involvement. Students gain points for attending certain events, and these point sare then ranked on a leaderboard. Those ranked highly on Route 44 would be rewarded through a raffles or other prizes. This is a rather new program to the ECS student experience, and

Route 44 is ECS's recreation of the Whitman's Impress Program, a way for Whitman to integrate soft-skills education into their curriculum. Whitman found that, while employers care about school performance, they really care about recruiting people who can "handle multiple responsibilities, who exhibit self-awareness, confidence, resilience, strong communication and social skills, and the ability to synthesize classroom content into the broader global context." Whitman stakeholders developed Impress in order to incorporate soft skills education into the Whitman formal education. Reversed engineered from some corporate partners, Whitman launched Impress in 2014 in order to increase community engagement and majors exploration for students. When speaking with Lindsay Quilty, the Assistant Dean for Undergraduate Programs, she said that Impress wanted to give students, who most likely grew up with a phone or with a game console, a new way to engage with the Whitman Curriculum. Additionally, Impress facilitates a pod of support for each student, and from day one they are knowledgeable of their academic and career advisors. Points are rewarded for attending leadership conferences, gaining relevant industry certifications (SAP, Bloomberg, Excel). While the Impress program was originally using BunchBall, a corporate gamification solution, they have now transitioned to

a custom solution integrated with Salesforce. Whitman assesses Impress annually and they would not disclose how much that it costs annually, except it is funded by a private donor.

ECS must decide what issue Route 44 is attempting to solve. Route 44 is modeled after the Impress program, yet the needs of an engineering student may be completely different than that of a business student. ECS must decide the goal of Route 44 and what methods of gamification will assist in meeting that objective. These are a few problems that Route 44 could address:

1. Freshman are unsure of the ample resources available to ECS students, Route 44 plans to address this need
2. There is a lack of engagement in ECS extracurriculars (speakers, clubs, career services) and the creation/implementation of Route 44 will increase extracurricular engagement in industry-related activities.
3. Route 44 will assist students in gaining the soft-skills they need in order to become successful engineers after they graduate.

1.1 Current Struggle

With current lack of technology Route 44 is lost in the list of student emails. Route 44 provides notification of events, goals and even leaders information via email and stores all data in an excel sheet. The lack of funding has prevented university to have a real time application for much better interaction. This system was designed to enhance student participation in events happening around the campus but clearly is failing to do so. They have tried various external benefits like monetary incentives but it barely helped. According to research conducted by Lori Kay Baranek in 1996 about *THE EFFECT OF REWARDS AND MOTIVATION ON STUDENT ACHIEVEMENT,* the effect was positive and students were motivated by incentives to do a particular task.[2]Route 44 main goal is giving a great educational experience and build a strong profile with a minimal incentive due to limited budget constraint. But this incentive is not known to the students and they think fulfilling the required activities and being active participant of the system is not benefiting them outside their curriculum. As incentive should not be the attracting factor, officials behind the Route 44 wants to focus on educational benefits and are looking to make it education as a primary reason to participate.

2 Use of Gamification in Education and Beyond

IEEE defines various elements of gamification in their documentation. Specifically, they look at feedback, goals, badges, point systems, leaderboards, and user levels. Feedback is notifying users of any progress or setbacks achieved. Goals are challenges set for the user to try to accomplish as they play and are awarded for them. Badges are achievements received by the players for completing set goals assigned to them. A point system gives a point value to each badge awarded to players, which are recorded in a leaderboard, where user's scores can be compared to one another. Lastly, user level is how the experience of the player and how proficient they are at the game or activity.

Figure 1 IEEE's Formal Definition of Gamification

Game element	Definition
Feedback	Immediate notification that keep users constantly aware of progress or failures
Goals	Activity goals that are adapted as challenges for the user
Badges	Optional rewards and goals outside the scope of a service's core activities
Point system	Reward for completing actions (that is, a numeric value that's added to the total points)
Leaderboard	Tracking and displaying desired actions to drive desired behavior through competition
User levels	Indication of the user's proficiency in the overall gaming experience over time

2.1 An Example of Successful Gamification of Education

Elements of gamification can be seen in many modern day services and applications. A prime example of how gamification works in an educational environment is the language learning app "Duolingo"[3]. The application is available on mobile devices and is intended to help people learn languages of their choice. Duolingo features many elements of gamification that turn a relatively serious pursuit into a fun game.

From the menu, users can select which language they wish to pick up. Once the user makes progress, their efforts are visualized in real time with progress bars as well as intermittent badges for achieving certain milestones. After displaying mastery in a level of the language, the user can advance to the next level much like a videogame. The app also incorporates daily streaks where the user is required to obtain a certain amount of XP points by solving challenges; for every 10 days of active streaking, users receive one token of virtual currency called "lingot" which can be used to buy "streak freezes" that enable a user to skip a day and not lose their streak. Although the idea of streaks and streak freezes may seem trivial at first, it soon becomes apparent that the system is ingenious as the streaks play off of human tendency to be loss averse. The higher your streak is, the more motivated you are to continue the streak which in turn forces you to hopefully learn the language daily. Duolingo's user interface is also reminiscent of a videogame or any other "fun" application. The app features friendly, playful design with cartoon characters, sound effects, and animations. All these elements help subconsciously reinforce that the user is not doing something tedious and educational but rather something fun and entertaining. All of these various gamification aspects in Duolingo helped make the app what it is today (one of the most popular language learning apps on the market) by making learning an enjoyable user experience.

3. Route 44's System of Gamification

Before analyzing solutions to improving Route 44, a comprehensive current state analysis is necessary to fully realize the needs of the program. To do so, an interview was conducted with the co-director of the Route 44 program. The information provided by which has been parsed and placed into IEEE gamification format.

Table 1 Gamification Analysis for the Current State of Route 44

Feedback	Attendance at events No qualitative feedback
Goals	Listed online of different goals of varying difficulties
Badges	None
Point System	Points for attendance, but more points don't mean having a better chance at gettings rewards
Leaderboard	Yes, but only the top 5 at a time. Not available real time.
User Levels	None

3.1 Feedback
Currently, the only feedback which Syracuse University's College of Engineering and Computer Science receives on Route 44 is the amount of students which attend it's Route 44 sponsored events.

3.2 Goals
The goals which Route 44 encourages students to achieve are solely listed on the College's website on Route 44's web page.

3.3 Badges
Route 44 has not implemented badges.

3.4 Point System
As listed on the goals page, each event or activity which a student completes or attends earn the student points. However, at this time, earning more points does not equate to a greater chance of winning a prize or award.

3.5 Leaderboard
On a weekly basis, a leaderboard of the top 5 highest point earners as well as the total score of the 4 teams are released through a weekly email and displayed on a poster board.

3.6 User levels
Route 44 has not implemented user levels.

4. Challenges Associated with Implementing Gamification in Higher Education
Due to the complex nature surround psychology and technology, theoretical applications of gamification can fail to accomplish their intended effect. In the proceeding report, the analysis is scoped to include challenges which are predicted to be prevalent in the higher education context. Though these challenges cover a wide range of uncertainties and difficulties, their inclusion does not in absolute terms disqualify the success of the overall gamification system. Rather, these challenges only present mitigatable difficulties in the implementation and effectiveness of such a system.

4.1 Student Demographics
With 19.9 million students projected to attend an American university in the Fall of 2018, the issue of widely varying student demographics is a projected issue in the implementation in any gamification system. Almost any commercial solution requires student interaction. Some examples include, attendance at events, smartphones, and personal computers. The implementation of the gamification system will need to adapt to what is available to a college's students.

4.2 Administrative Budgets
Implementing a full gamification solution, whether it be from scratch or a third party solutions, may require significant capital. Additionally, even with robust systems, greater administrative costs will be needed to up keep the program. While some colleges may be able to easily pay such costs, others will need to base their final decisions on cost effectiveness.

4.3 System Infrastructure
A commonly overlooked feature of gamification systems in the backend infrastructure. Even consumer facing systems may require robust backend infrastructure for everything to run together. Part of Route 44's difficulties in its pilot has been its lack of infrastructure. Because the lack of infrastructure common results in higher administrative costs (when considering the automation infrastructure provides), the planning for a robust backend is wholly necessary. However, common blocks to robust backend infrastructure in higher education includes underfunded information services organization, lack of technology knowledge and respect at the administrative level, and privacy laws.

4.4 Legal Obligations to Privacy

In order to share student data in a public leaderboard or forum, administrators in higher education must comply with a privacy laws, most importantly the Family Educational Rights and Privacy Act. This law outlines the narrow situations in which a student's educational record may be released. Because some parts of a gamification system in higher education may include such a record, any publicly shared data must be cognizant of the importance of keeping such data private.

4.5 Unpredicted Reactions to Gamification Systems

A predicted error in planning gamification systems is the idea that all users will result to such motivations in a similar manner. This one-size-fits-all fallacy rarely works in real world scenarios with diverse users with diverse motivations [1]. A common example is the comparison between "explorers" and "achievers." Explorers are more likely to look for hidden items and features which they can collection by exploring the different areas of the game. This can lead to explores having achieves many small aspects of the game while rarely taking the time to deeply tackle a time consuming, yet easily observable, task. This is different from achievers who are more likely to complex as many challenges presented by the game by which they are given. This may lead to a situation with achievers unevenly experienced the system to the point of not achieving the system's stated end goal.

4.6 Failing to Include Intrinsic Motivativators

Additionally, when designing the awards to be given to users of a gamification system, it is important to structure such awards in a way which may encourage users to play the game for the awards rather than to improve oneself. Such monetary or concrete awards can conflict with the goal of creating intrinsic rather than extrinsic motivation.

5. Third Party Solutions to Improving Route 44

Listed are some off-the-shelf corporate solutions that Route 44 could potentially utilize to grow Route 44 and make it a more robust program.

5.1 Hoopla

Mimicking a sporting environment, Hoopla offers gamification packages geared for those doing repetitive but necessary tasks. It aims to create an engaged corporate culture with real-time goal progress, friendly competition, news, and recognition. With leaderboards, real-time metrics and mobile apps, Hoopla's gamification platform solves a multitude of corporate problems, like motivating teams transforming culture or connecting remote works. It may be slightly Sales oriented, however, there have been case-studies of it being used in other contexts. This would cost between $2,400 and $4,800 for ECS to use per year.
https://www.hoopla.net/

5.2 Bunchball

The software originally used by Whitman, Bunchball helps multinational companies improve engagement. Offering integrations with Salesforce, IBM Connections and SAP. Bunchball is a high end gamification platform serving across industries. Bunchball utilizes badges, team points,

and mobile applications to create a gamified environment. This is an extremely well owned and expensive gamification option that businesses are utilizing. More importantly, BunchBall is being used outside of the traditional sales context, but in other aspects of the organization.
https://www.bunchball.com/

5.3 TengoCard
This solution places incentives at the center of its use. Primarily, TengoCard is a way to increase employee engagement through gift-card incentives. TengoCard strategically designs an incentive program for each company it partners with. The company can send a giftcard incentive and it can reach the employee within a day. This is a strong solution for ECS, as they also have a developer incentive program. TengoCard is free to use.
https://www.tangocard.com/employee-engagement-incentives/

5.4 GetBadges
This solution aims to gamify the creation of a software project, turning tasks into RPG style games. GetBadges integrates your project management and software development tools such as GitHub, Trello, Slack and many others into an RPG-like game.Through GetBadges, development teams can play a game at work and at the same time improve their performance with more engagement in IT teams. Though, this product may not have the capability of handling a large client such as ECS.
https://getbadges.io

6. Including More Robust Gamification Elements
One way to increase user involvement is to gamify the Route 44 program heavily. Currently there are bare bones elements of gamification, but nothing robust. Below are some hypothesized features to be added along with their psychological reasoning and relative importance on a scale of 1-3 with 1 being of highest importance.

Table 2 Needs Analysis for the Route 44 System

Feature	Reasoning	Importance (1 highest)
Points	Positive Feedback	1
Real Time Leaderboards	Competition/Motivation	1
Notifications	Subconscious Reminder	1
Weekly Streaks	Loss Aversion	2
Loot boxes	Variable Rate Reinforcement	2
Trophies/Badges	Affirmation	3
Levels	Sense of Progression	3

6.1 Points
In almost any video game found, there is a point system as points are the metric for success or accomplishment. We believe a robust point system is the most important thing to be implemented in Route 44 as it is the backbone for many other features such as leaderboards, challenges, trophies, levels, etc. Without some numbering system or metric, there would be no way to determine leaderboard standings, or how high "level" a user is. Points would be offered for completing certain Route 44 tasks (meeting with advisors, attending career fairs) which can go towards other incentives such as loot boxes. The prospect of obtaining points is an incentive for students to complete certain tasks that ECS may have trouble getting students to finish.

6.2 Real Time Leaderboards
A real time leaderboard keeps track of player standings and is updated whenever a change in standings or points occurs. Leaderboards allow users to compare themselves to their peers. Users may be more inclined to participate and advance in the leaderboards if they see their peers climbing the ranks as well. Whenever there is some sort of competition, no matter how trivial, there will be those that want to be on top of the ranks. Leaderboards help facilitate the visualization of competition and can coincidentally lead to more student engagement.

6.3 Notifications
A problem we found when we polled students was that many students felt ECS events were not advertised enough or they knew too little information about them. Notifications, whether they be from a Route 44 application or through email, will help remind students about events. If an application was implemented, notifications could go straight to user devices about upcoming events, daily events, leaderboard shifts, and such which will subconsciously remind the student about Route 44 and theoretically increase user participation.

6.4 Weekly Streaks
Much like Duolingo's successful streaks, a weekly streak system could be implemented for Route 44 where a student achieves a certain goal such as number of points, number of events attended, etc. The higher the streak goes, the more inclined the streak owner would be to keep the streak alive, and in turn participate in Route 44 events and challenges. This has to do with the principle of loss aversion[4] where people will generally place higher importance on avoiding loss than achieving gain.

6.5 Loot boxes
Loot boxes are found in games and exploit the principle of variable rate reinforcement[5]. The user is guaranteed a prize with variable value every time a loot box is opened. One major complaint polled students had about the current state of Route 44 was the lack of tangible prizes. Students had no idea what the prizes were to be, and the general sentiment was that they would be more engaged if the rewards were more tangible. In Route 44, points could purchase loot boxes which would drop a prize every time, with more valuable prizes being dropped less. Prizes could theoretically include things such as free meal swipes, movie tickets, Syracuse apparel, and more. In order to obtain loot boxes, students would acquire points, and to acquire points they would have to engage in Route 44.

6.6 Trophies/Badges

Although somewhat trivial, the affirmation of accomplishment can go a long way in both academics and personal life. Trophies symbolizing accomplishment can serve as bragging points amongst fellow users which can in turn foster competition.

6.7 Levels

The feeling of progression can help users stay active and committed to the program. Duolingo was a prime example of this. They took something relatively mundane (education) and introduced explicit leveling tiers. Those tiers gave users a sense of progress which motivated users to continue their efforts. The same principle can be applied where users progress through levels in Route 44. If a user sees him or herself explicitly moving up the levels, as opposed to having no leveling system, they may feel more rewarded with their pursuits.

7 Verification of Gamification Effectiveness

7.1 Quantitative Methods to Verify Success

Attendance at ECS sponsored events

Increase in participation of students to various events happening over the years is main goal of Route 44 and hence trends of attendance can be recorded and if it shows a growth in attendance designed gamification process works. Recording data will also help in noticing what kind of events attract students and will allow better lineup of activities to offer in future.

Better student outcomes

Education is always calculated on the basis of how student performs and final goal of Route 44 is to see its students getting jobs and doing well in their career. Continuous check of job or internship placement should be recorded and compared every year. Taking feedbacks from student and company visiting about the process of approaching each other.

7.2 Qualitative Methods to Verify Success

Greater feeling of "belonging" and purpose on campus

Students come to college for education and with addition leave with tons of memories. Knowing various events and keeping track of them becomes a tedious jobs with so much to do at same time. The success of Route 44 can be determined if students believe their department is doing efforts to help them. Simple traction of students usage of Route 44 application can provide us details whether students care about activities happening and make effort to improve their education experience with their grades.

Greater knowledge of ECS resources

There are various resources on offer for students but lack of advertisement and information

makes them go unnoticed. Aim of Route 44 is to give regular notifications of various current and upcoming events and different points for different activities could be a potential factor to attract them. The success of it lies in attendance at various events like resume making, job shadowing, and at company visits. The interested feature will allow users to show their interest in activities and help the developers to know that the activities were noticed. More interest more involvement and finally better outcome.

6. Conclusion

With the continued advancement of gamification systems in the corporate world, the level of entry for such a system in higher education becomes more attainable. Currently, Route 44 in Syracuse University's College of Engineering and Computer Science provides a bare minimum implementation of gamification principle, adding up to a scarcely functional pilot. While there exists successful systems in the educational realm, challenges associated with gamification in higher education complicate the future improvements to Route 44. Particularly, not understanding student demographics, privacy laws, and the behavior of students, provide commonly unseen pitfalls which those without gamification experience could become victim to.

A potential recommendation for Route 44 is to start with a one or two gamification methods, and work itself out from there. In the near future, Route 44 could allow loot boxes to attract students and have a real-time leaderboard, and forego all other gamification concepts. This would allow Route 44 to be a functional gamification method that can slowly be built out over time. Alternatively, Route 44 could utilize a potential corporate solution that has proven to be effective for other institutions.

Ultimately, gamification solutions and their verification methods require significant time to implement and analyze. While the needs of the Route 44 system are currently clearly defined, with future additions, new unexpected needs may appear. For this reason, it is important to habitually conduct formal needs analysis as complex system, such as Route 44, continue to grow and evolve.

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