ORIGINAL RESEARCH ARTICLE

Swords and sorcery: a structural gamification framework for higher education using role-playing game elements

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Students attend the first sessions of your units and then disappear, some of them forever, and some of them have no clue what is going on or they work for other units' assessments. When it comes to providing them with formative assessment, it is not always well received as it is perceived as extra work. The purpose of this article is to define a gamification framework based on structural gamification that focuses on that weak part of your cohorts that do not engage as much, and it does that in a great way, as it embeds video game rules and role-playing into the curriculum. This is achieved through implementing game elements to the entire second-year cohort ($N = 34$) of computer game development students, in the unit 'Engineering Software Systems'. The goal is to motivate and engage the at-risk students of the cohort with lower activity, attendance and involvement in the unit.

Keywords: action-research; motivation; player archetypes; SDT; RPG; Structural; Gamification; Role-Playing; Higher Education; HE; Player

Introduction

Academics in higher education (HE) seem to find challenge in maintaining the high motivational levels of their students during their teaching from the first to the last session. Sometimes, students seem to only care about their studies if it influences their final mark and, as a result, they are not participating in formative assessment activities or they are shifting their attention to units that have a submission deadline approaching at the expense of other units. Reigniting the spark of interest for those students can indeed be troublesome, but it is possible with the value that gamification techniques bring on the table. Imagine a world where students take part, engage, collaborate and are not lifeless puppets giving you the blank stare.

The sole aim of this article is the design and steady integration of a gamification framework focused around HE through an action-research project. For the purposes of this article, the framework will only address structural gamification and techniques/elements that were used within a unit for an entire semester (Kapp 2012). Studying the effects of structural and content gamification will lead to some good practices that will plan a more effective framework. Content gamification is the second phase of this study; yet, this is not within the scope of this article.

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However, it is worth mentioning that gamification is not the ultimate cure for non-motivating students. The idea is not to completely engage the whole cohort in a ground-breaking way, but rather to target that part of the cohort that does not seem to be motivated. Partial success is still success. We do not guarantee that every student in every cohort will enjoy gamification, but that is something academics do not have control over.

Background

Gamification

Gamification is an emerging technique, with which we can fuel the motivation and engagement of those involved with it, be it students in a learning scenario, employees in an enterprise scenario (El-Telbany and Elragal 2017) or plain consumers in a marketing scenario, in which the advert becomes a treasure hunt (advergame) (Straub 2018). This is achieved by 'gamifying' specific streamlined processes/workflows, such as learning activities and lesson-planning (in learning scenarios) or other work-/duty-related activities in the enterprise scenario through the usage of game elements/mechanics which originate directly from game design used in video games. In short, we can say that something is gamified when gaming rules are applied to non-gaming scenarios or contexts (Deterding et al. 2011).

These activities manage to turn something otherwise dull to its creative/vibrant counterpart, giving more meaning and joy to those who are directly affected by it. Examples of gamification systems include but are not limited to the following (Jackson 2016):

- Point systems that form leader boards (enhances competitiveness).
- Individual achievement badges (recognition after completing complex tasks).
- Personalised avatars (customisation for individual preferences, enhancing personal meaningfulness for the user).
- Progression bars and other imagery, like treasure maps (progress visualisation).
- 'Imaginary' currencies that can be used at any time to 'claim' rewards laid out in a reward system (feeling of accomplishment and reward).
- Countdown (provides pressure/tension during learning activities to make them more meaningful).

Gamification, on its own, comes in two types: *Structural* and *Content* gamification (Kapp 2013). The former tackles structure in varied scopes of education: from lesson and unit plans to course structures without altering the learning content. The latter gamifies the content used in the teaching scenario, be it a 5-min think-pair-share activity, micro-lecture or an assessment activity by adding the elements of challenge, story, choice and reward.

To provide context, many academics have implemented structural gamification in the past using the typical PBL triad (points, badges, leader boards). Firstly, Lee Sheldon, a pioneer in gamification, has turned his classroom into a role-playing game (RPG) using a similar system with experience points (XPs) and rewards, without the element of combat, but still paved the way for use of RPG elements within the classroom (Sheldon 2011). De Byl has gamified the classroom using JustJeopardy: a gamified version of the Jeopardy TV show adjusted for class use which used typical

structural gamification (de Byl 2012). O'Donovan has implemented an online learning platform that awards XPs, used on the leader board and dressed up in a unique steampunk theme (O'Donovan, Gain, and Marais, 2013). He additionally offered optional challenges and badges. Caton and Greenhill have designed a structural gamification framework that is used around positive and negative reinforcement, thus awarding or punishing students during group work (Caton and Greenhill 2013). Other cases of gamification using an XP system has been used by Barata et al. who has used leader boards and increasing levels to motivate students with the interesting addition of a public leader board visible throughout campus (Barata et al. 2013). Sticking true to the PBL, we can also encounter cases such as the studies of using badges on online learning environments (Hakulinen, Auvinen, and Korhonen 2015), the use of visual and thematic narratives to transform the class into an adventure (Leong and Yanjie 2011) and other complex systems have also emerged which are drawing from a pool of RPG terminologies such as characters, guilds, quests and raids, all linked to the quality of delivered work (Topirceanu 2017).

Like the mentioned studies above, we want to conduct an experiment involving RPG mechanics drawn from gaming contexts, which will be very familiar to our game development students. But the focus is on the structure with no alteration to content. As such, some of the suggested activities will not be linked with learning outcomes but will be linked with increasing metrics such as satisfaction, attendance and engagement.

Role-playing games

Role-playing games is a game genre in which the players control a single character (who has specific skills, personality, combat style, etc.) and must become one with it, and act as if they were that persona through the game's environment. This idea originates from tabletop RPGs, such as Dungeons and Dragons, also known as D&D (Gygax and Arneson 1974), which influenced every video game under the RPG genre. With D&D and alike games, the gameplay is focused on story and character progression, as ideally, we become someone else and role-play his choices in his life, based on some given elements of the story, and shape the story based on these choices, which become critical if not meaningful, which is also the most challenging aspect of these games. For example, a player is controlling an evil warlock who tries to use magic to summon beasts to help him destroy a small village. That player must act exactly as how that character would act in that imaginary story.

Another important feature is *combat and character progression*. When a character defeats a hostile entity through combat or diplomacy and/or quests, that character receives XPs. If enough XP accumulates, then the character levels up, and his statistics improve. Statistics are important for RPGs since they determine how strong, quick, smart or charismatic a character is, and, in turn, they influence a huge array of combat abilities (weapons and spellcraft) and story-related abilities (hiding, convincing, gaggling and networking).

Motivation

Motivation plays a critical part in this action research project as this is the main student attribute we are aiming to reinforce, as if a student is motivated enough, then

engagement will follow, confidence and skillset will improve and besides keeping the students happy and passionate with what they do, this increases their chances in getting their dream job as well as raise the satisfaction score of the university.

To create a gamification system that is effective, it must focus on both aspects of motivation: extrinsic and intrinsic. Extrinsic is achieved when a student completes a task because it is either increasing his mark or avoiding it to be decreased. Intrinsic is achieved when the student himself realises that he has complete power over his knowledge and the ability to get the dream job, and that is his driving force rather than a visible reward or threat (Cherry 2018). In our case, extrinsic motivation is completed through rewards and the XP system (from the positive perspective) and leader boards (from both perspectives – students like being on top, but hate being on the bottom). Intrinsic motivation is achieved through the autonomy of selecting a specific character class and participating in class battles. To have more chances of winning the battle, you have to be in class. This has shown improvement in attendance and engagement, which, in turn, has improved the intrinsic motivation.

The underlying theory behind this is the theory of *Self-Determination* (Ryan and Deci 2000; Deci et al. 1991). Based on the Self-Determination Theory (SDT), intrinsic motivation is the catalyst for complete motivation, since the internal needs rest at the core and that can then be externalised with extrinsic motivation. The three basic 'internal' needs are the following:

- *Competence*: Effectiveness of my actions in the current context.
- *Autonomy*: Degree of responsibility and making own meaningful and personal choices.
- *Relatedness*: Interaction with others in my current context/environment.

Player archetypes

One last part of this theory is the breakdown of player archetypes, which comes from *Bartle's Player Taxonomy* (Bartle 1996). According to it, a player can fit in a specific category, based on which elements of a game appeal to his play style. There are four categories and they derive from the degree of action or interaction the players have on the game environment or the other players:

- *Socialiser*: When you like interacting with other people and be part of a community. Socialisers generally like to work and communicate with other players, share and contribute in a piece of work, be part of a group effort and generally help others.
- *Killer*: When you like acting on other people, to become the best. Killers are spirits of pure competition, they like showing off how great they are by defeating other players in the game with their skills, wits or brute strength. They like the extra challenge because that confirms how great they are, should they achieve it and it is clear that it is their name that will be on the top of the leader boards.
- *Achiever*: When you like interacting with the environment. Achievers are all about the sense of achievement, but not in a way that would impede another player's progress. If a game has a completion rate, then they strive to get that 100%, no matter whether they have to collect all 250 hidden stars in all the levels or complete every single quest in the game, including all main and side quests, even those boring escort quests!

- *Explorer*: When you like acting on the environment. It has explorers that fully immerse in a game, with no obstructions or obstacles in their mind, they just go for it, exploring every nook and cranny; discovering all the secrets that the world is giving them, they also fancy trying crazy things out, listening to every single story a non-player character has to say; and learning more about the world, they are in through in-game text, which most people just do not bother with. They like having choices in the game that influences how the story or their character evolves.

Research rationale and consulting

There are three key issues that make a gamified class very attractive to potential learning and teaching scenarios for various academics. This came from personal observations and experiences over 4 years of teaching in higher education.

Student attendance issues

Students are generally most active at the start of a unit and less active towards the end of the unit as well as a couple of days before a deadline. This has two negative impacts:

1. Students are missing out on important topics that may be placed towards the end of the unit. This is compromising their knowledge and their success rate for this unit.
2. During times where another assignment is due, students may have decreased attention span, which is shifted towards working on their assignment rather than the session at hand.

Participation in formative assessments

Students generally believe that 'If I am not getting marked for that, I will not do it, this is extra work'. That is completely valid, but that on its own has a couple of negative impacts:

1. Pose a great issue with all academics who want to avoid the danger of a single big summative assessment. From one side, formative assessments prove to be a great asset for student learning experience and improvement, and from the other side though, students are not doing them disregarding the academic's extra effort to plan and integrate these in the classroom (Nicol and Macfarlane-Dick 2006).
2. Students are not receiving enough feedback from the formative participation since they do not generally take part unless it becomes mandatory, and this clearly has an impact on the outcome of the unit for them (Black and Wiliam 1998).
3. Students are genuinely interested in getting more marks and avoiding losing marks, and since formatives do not influence that directly, students lose interest and stay in a 'relaxed' mode throughout the unit, starting to work within a very limited and time-restricted time frame before the deadline (Wiliam et al. 2004).

4. This is having a critical negative impact on not only the students' performance and achievement, but also on their confidence, and the worst is that they do not even realise that until they are very late into the semester or when they start working on their submissions (Postlewaite and Compte 2002). Teaching time should be spent more to tinker with topics and answer pre-prepared questions to improve your learning.

The application of gamification techniques within the learning context is one of the ways to battle the three issues mentioned above and as mentioned before, even partial success and steady or partial conversion from an uninterested student to a motivated student within a specific part of a cohort will be considered a success.

Consultancy

The information required to green-light this research was supported by students and colleagues alike:

- *Level 5 students* mentioned that they would like their units to be more engaging during a seminar session we had with three different second-year cohorts.
- *Level 5 student reps* confirmed this information during a staff–student forum meeting. They furthermore provided information, tips and suggestions for an engaging and motivating structure to be implemented in a possible classroom environment that would be more attractive to them and their peers.
- *Academic colleagues from the games courses* provided us with guidance on school-related policies, so we completely understood the limitations of this research, as well as some ideas to implement in the gamification framework.
- *Tutors and colleagues from the learning and teaching team* provided us with valuable feedback about our project pitch and changes that were required to be made for the framework to have a more appropriate form, and all this information is currently integrated in the latest version of the framework.

The components of the framework

The framework itself consists of four main components.

XP system

The *XP System* ensures that students get awarded with XP based on their contribution inside and outside of class. Everything they do or say, how well they work together, or the quality and speed of their submissions is all converted to XP and awarded to them. As students accumulate more and more XP, the academics total these and form the class-wide *leader boards*. The leader boards themselves provide rankings for all students, and the element of competition, which is targeted towards the *achiever* and *killer* player archetype. A sample of the used XP system is presented below (Table 1).

Table 1. Sample experience point system.

Action	Result
Attend class	+5 XP
Original post in guild treasury (forums)	+2 XP per post
Unit feedback/NSS completed	+45 XP
Formative quest completed	+100 XP
Your game project published	+300 XP
Optional quest completed	+ Varied XP

RPG class

Each student can choose one of the four available *RPG classes* and use its abilities throughout the course. The classes influence the class and group dynamics, so the students must make wise choices, be diverse and use the class synergy to get the most out of it! This applies to *socialisers* and *explorers*. In the case of our study, we have utilised the following four classes: warriors, mages, rogues and priests.

- *Warrior (abilities only work if asking at least one question per session)*
  - Can guard incoming damage for your teammates as well as reflect it back to attackers. An integral part of every team in order to maximise survivability.
- *Mage (abilities only work if the student is carrying his logbook and taking notes)*
  - Important damage-dealing classes that can devastate others in RPG fights. Can use spells to move seats in class at any time, dispel enemy magical effects and replace one requirement of the team assessment brief with a feature from a pre-generated pool of features.
- *Rogue (abilities only work if rogue is not late and has over 80% attendance)*
  - Another important damage-dealing RPG class, but the only one which can completely avoid all damage. It is the only RPG class that can extend the deadline of a formative assessment by an amount relative to their character level.
- *Priest (abilities only work if priest has logged on Moodle and has commented in every forum post made)*
  - Priests are important classes that can heal damage done to the party as well as resurrect fallen team members so that they can continue fighting in future sessions. Furthermore, priests can cast special spells that multiply awarded XP to the entire team only if the entire team is present.

Encounters

Further to choosing their own class, students are called to use their class abilities in *combat scenarios* among themselves, which is a very engaging experience as they step out of class rules and follow the RPG combat rule set online. If a group is missing a critical class role such as their priest or warrior, then their team will not have many chances against well-rounded teams which are using their team synergy to overcome the fight. This promotes attendance and engagement and appeals to *socialisers and killers*. As this was found to be the most engaging aspect of the framework, we will explain the setup further. An important note before the explanation is that this is part

of structural gamification and as such has nothing to do with the session content. It is a means of having meaningful uses of the four-character classes. It is also important to note that if the technique is used, it has to be consistent throughout the module. Having said that, the 'rules' of the encounters are the following:

- Two teams are picked at random. They will have to combat each other through dice rolls.
- *Initiative phase*: If both teams have a rogue, they will both roll a d20 (20-sided die) to determine which team goes first. If neither have a rogue, then a random individual rolls the dice for them. If only one team has a rogue, they automatically go first.
- *Planning phase*: Both teams, knowing who acts first and second plan their moves. This is a very strategic part of the fight as a warrior can choose, for example, to reflect any damage towards another enemy or selectively protect a specific teammate. Mages and rogues prepare their attacks (or defences). All actions must be communicated to the lecturer before battle commences. Some actions are only available if a specific class type is present in the group or a number of people in the group have attended the session. If the team has a priest, he can choose to heal someone who will probably take damage.
- *Action phase*: Starting with the team that goes first, the lecturer announces the actions each member of that team takes, and if that action is countered by the defending team, then this is also resolved in class. Successful attacks cause damage to characters.
- *Healing phase*: This is where priests can have the final say regarding which character dies and which does not. If the priests have carefully made a pick who to heal, they can save someone from dying.
- *Resolution phase*: Any dead characters offer extra XP to the team that coordinated to kill other characters. The dead characters are respawning on the next phase.
- *Next combat phase*: If time allows, two more teams are randomly selected to fight against each other, and this process repeats itself until everyone has played or stops if there is not enough time.

Reward system

For the students who want to reach the highest levels in the class, there is the *reward system* which comes into play when they level up by accumulating enough XP (Table 2).

Common rewards are further increasing in their class abilities and extra health points. Furthermore, *achievements* are extra rewards that grant more XP but the requirement to unlock them is hidden to all students. This promotes students trying different things in class to earn the achievements, if they know they exist. This applies to *explorers* and *achievers* and some examples can be seen below (Table 3).

Methodology

This project was implemented with the action-research methodology and could only be completed within a single cycle. For the *Planning* phase, we talked with people directly and indirectly involved with this and got feedback and ideas on improving

Table 2.   Sample reward system.

Level	Award	XP to level	Accumulated XP
1	Class Feature I	5	0
2	Access to Guild Treasury (Forum)	7	5
3	Class Feature II	10	12
4	Health Up	15	22
5	Class Feature III	22	37
6	Class Feature IV	25	59

Table 3.   Sample achievements.

Achievement	Description	Scope	XP	Condition
I was there	You actually were there and lived to tell the tale.	Solo	20	Be part of 100% attendance in guild after week 6
Chrono-Breaker	You were there when no one said you would be.	Solo	10	Managed to come in class late at least eight times with a 100% attendance rate after week 8.
The Flash	So fast that eyes cannot see you.	Group	20	Delivered weekly assignment first for four times.
Submission Gold	You should proudly carry the title of submission one master.	Group	60	Best assignment mark

classroom engagement. We also studied gamification software that already exists and gamifies classrooms, such as Classcraft (Young, Young, and Young 2013) and noted what types of mechanics and techniques they use to achieve that. Afterwards, we designed our gamification framework which also considered that this is specifically targeted for higher education, meaning that there would be no cartoonish or children-friendly themes, but it would be targeted towards a more mature audience within the context of a university unit.

With the framework complete, it was time to test it. That is what happens during the *Acting* phase. At the beginning, students were assigned a team, and they got to select a class from a set of pre-defined classes of warrior, mage, rogue or priest. Depending on the class they selected, they had different abilities to use in-class for the mechanic of team fights, a core RPG feature. Everything they do now becomes XP. Answering/asking questions, attending lectures/practical sessions, submitting weekly deliverables and getting a good mark on the formative assessments all award XP. The leader boards are updated on a weekly basis after all sessions are over, and possible level ups occur then. This is the most troublesome part for some academics because it currently requires a lot of time to facilitate/monitor on top of everything else they already do (teaching/marking/supervising/research). From this phase, we have clearly seen the need of developing a tool that implements this framework in a way that saves time.

Following up, we have the *Observing* phase, which shows if the framework was an improvement even partially for the given cohorts by collecting and analysing the data. The analysis is based on attendance, activity levels on the forum, percentage of submissions for the formatives and marking average (quantitative data).

We are comparing that data with older years and cohorts doing that unit, but we are fully aware that data from previous years may have a different skillset diversity in their cohorts, a different lecturer, different assessment so that those records solely cannot prove whether the framework can indeed prove fruitful, yet indications at this early stage show that there is effectiveness.

Finally, we have the *Reflecting* phase, in which the students are providing feedback for the framework, its various aspects and what they thought of each component and whether they believe that this has improved their effort and enjoyment of their learning experience. This is done through qualitative/quantitative data acquisition with a questionnaire embedded on Moodle. During this phase, we attempt to identify the components that had the most and less impact, so we know which we can freely use for more units and which require further testing, adjustments and calibration to possibly achieve optimal results. The most critical part of the reflecting phase seamlessly sets the ground for the next cycle in action research.

Results analysis

Cohort information

The tested cohort comprised a sample of 34 students. Only one of them was a female and 33 were males. All students were studying in SWD505: Engineering Software Systems, a module that is part of the bigger computer games course. Fourteen came from the computer games (Indie) course, while 20 came from the computer games (Software Development) course. SWD505 is a shared module between the two courses. All students were avid gamers, and all were already exposed to gaming terminology as they all either play, watch or stream video games online.

Results analysis

Our results came from two sources:

- Comparing attendance records from last year and this year on the unit SWD505: Engineering-Software-Systems.
- Quantitative and qualitative feedback from students in the form of extra questions in the unit's evaluation reports.

Noteworthy results from the academic's perspective:

- The results were exceptionally good, notably showing a clear increase in student attendance by 44% in comparison to last year, as well as a 12% increase in formative assessment performance.
- There are always students who attend a session, so that they may have influenced their beliefs on whether gamification is effective or not for them (Figure 1). It is the ones that do not attend that we are focusing on.
- Students believe that the most engaging aspect is the RPG fights aspect (Figure 2) and the less engaging is leader boards (Figure 3), yet, part of the sample has put leader boards as most engaging and RPG fights as less engaging, so that it only confirms that different elements appeal to different students.

- A total of 91% of students believed that gamification helps improve the learning experience (Figure 4) which is highly encouraging for perhaps more complex type of gamification systems.
- Some students took it very seriously and had a lot of fun during sessions, some of them even asked us whether we would run an RPG fight in that session and were all over the class rules.
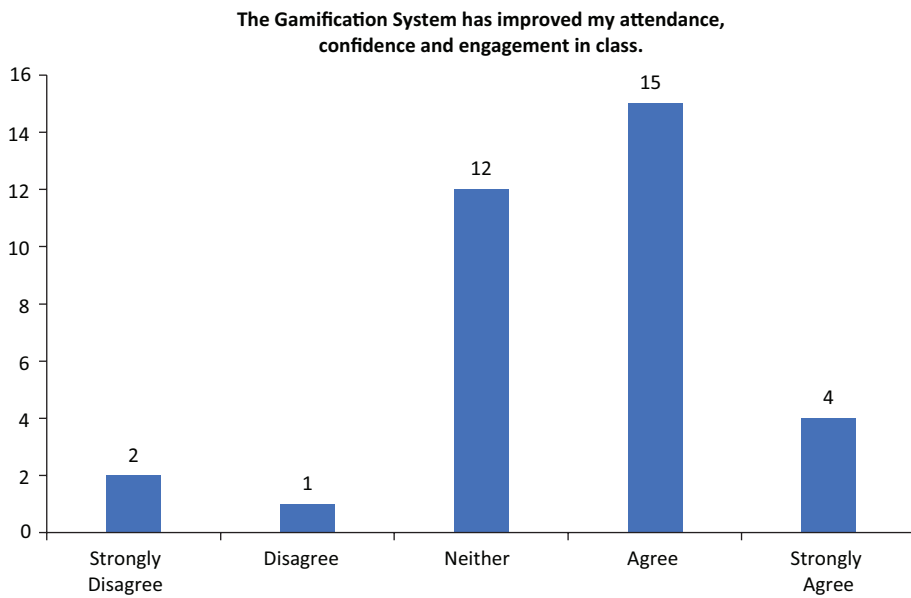
The Gamification System has improved my attendance, confidence and engagement in class.

Figure 1. Survey results for 'The Gamification system has improved my attendance, confidence and engagement in class'.

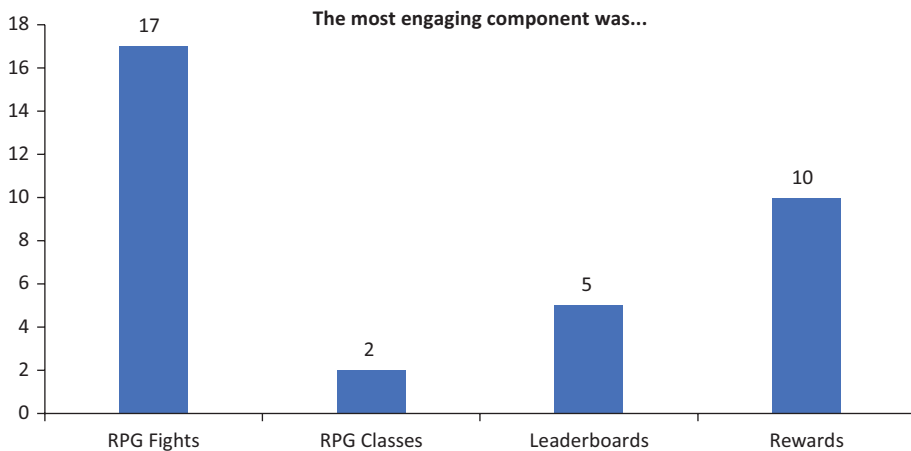**The most engaging component was...**

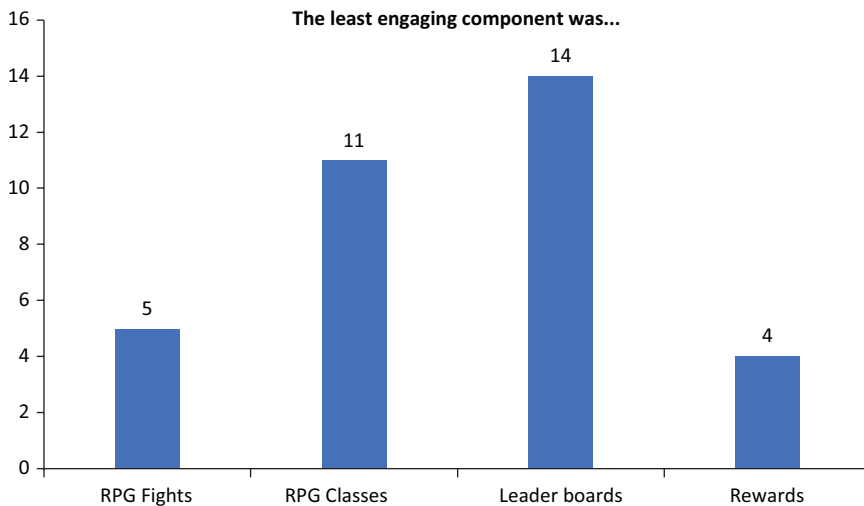Figure 2. Survey results for 'The most engaging component'.

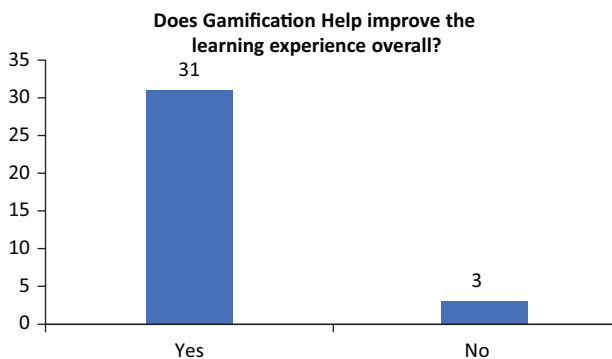Figure 3.   Survey results for 'The least engaging component'.

Figure 4.   Survey results for 'Does Gamification Help improve the learning experience overall?'.

- Students have also commented and suggested ideas for future integrations of the framework, proving that the framework can indeed be greatly enhanced in the future, and their ideas are very significant as all students come from a games course.
- This appealed a lot to gaming students. It would be very interesting to see implementations of this framework in the curricula of other subjects, such as history, law or other theory-heavy subjects.

Qualitative results

What would you change in the framework for next year, knowing that the goal is to increase participation in formatives, and get higher attendance in class?

We received some positive and constructive comments from students who really liked the system:

- 'I would add more variety to the character classes and make the fights more interesting, rather than just a single round. Something more like a Tabletop

RPG. Add inter-class fighting events occasionally. Add a raid fight (players vs. lecturer?) item rewards for doing well (weapon upgrades and such) Online Character sheets'.
- 'Use weekly completed tasks as power up to help in RPG fights and encourage students to do the tasks'.
- 'RPG fights had no lasting effect: dead players respawned next week, no levelling up'.
- 'I would focus less on the levelling up based on work completed and instead just let the groups have D&D style fights with the deliverable based presented on that day. So, more deliverables presented the bigger advantage given to that team'
- 'All I can say for certain is that the only part of the gamification I enjoyed was the battling. I maybe could have been more engaged with we played a card game or something as I personally did not care too much for the D&D style game'

Some students were neutral about it as the system was experimental at this early stage:

- 'The gamification did not affect my attendance, because I was going to attend anyway - it might be useful for some less motivated students'
- 'If many of the gamification features were to appear in other units as well, students would be more likely to continue putting in a lot of effort throughout the project (more than normal anyway)'.
- 'I believe the gamification does not need to be changed as it engaged the class and made people want to turn up to the lessons'.

Of course, some students provided critical feedback, indicating that this is not something every student would enjoy:

- 'I do not have any specific idea on what should be changed, but what I know is that the system needs to be completely reworked'.
- 'Nothing. The concept itself is flawed as the people who attend will attend and the people that will not change because of a gamified course'.

Discussion and implications

The results were very positive, and the students seemed to be very happy with how this unit turned out to be. This is similar to other case studies that have used gamification elements, where the results were positive (Caton and Greenhill 2013; Hakulinen, Auvinen, and Korhonen 2015; O'Donovan, Gain, and Marais, 2013; Topirceanu 2017). However, this was not smooth sailing from the start. Looking back at how the unit, classroom activities and gamification structure were implemented, we have identified four main challenges that may make gamification less likely to be picked up as a technique.

Any type of gamification intervention adds a lot to the academic's workload. This means that when we design our class schedules, plan out weekly activities and topics, write an assessment brief and lay out the assessment rubrics to our students, we are halfway done. We now need a way to incorporate all of them in class to retain our students and not just provoke enthusiasm only for the first few weeks. As such, this method is not recommended to use in more than one or two at most units per year.

Structural gamification or any XP-related gamification technique requires extra admin in-between teaching weeks. This is a quite determining factor on whether one can use structural gamification. With structural, you attempt to change the course or a unit's main structure. As such, you are tinkering with how things are running for your units. Keeping track of a class-wide leader board for the individuals, knowing exactly which student is at exactly which level with exactly how many XPs ought to drain a lot of time in-between the sessions.

Leader boards are demotivating if everyone is on them. That is a big mistake from our end. The 'year-wide' leader board we set up had every single student on it and not by an alias, but by the student name. While the ones on the top had heaps of fun, the ones at the bottom seemed to be out-of-sync. Unfortunately, the ones in the bottom turned out to be the ones we wanted to improve, and the leader boards did not help. So, if we are to do leader boards again in the future, every five or six students should be put in different leader boards, and furthermore, every student should have an alias, to avoid creating a negative environment in class. This has the potential of even reversing the outcome we want to achieve.

There needs to be a line between gamifying a class and playing a game. Students can often misinterpret gamification as turning the class into a game. While this may be partially correct, the end goal is always to maximise learning, achievement and involvement, not to play a game. The result of gamification is a channel that accelerates learning, and the more engaging a gamified intervention is, the higher the risks of it to be interpreted as a game which compromises the learning outcomes in favour of a fun experience.

While we had identified a few challenges, we also discovered that while doing in-class RPG fights, all students would be fully engaged, *including the weaker students*. These students usually do not seem to engage as they fear failing a unit due to lack of faith in their skills or exposing their lack of knowledge to their peers. This results in procrastination, less attendance, less effort and less achievement. Such fears keep them away from engaging, and this is exactly what was reported by them on several one-to-one interventions. The RPG fights mechanic though had them be part of the team and engage in a more meaningful way. This small 'push' was more than enough to keep most of them coming back and attending more sessions than ever before, primarily because of gamification and over time because they wanted to achieve. As such, while looking at the attendance metric of the weaker students against the same students of last year, we can establish that students of this year were about 49% more engaged (2017 = 16% attendance, 2018 = 65%). However, as mentioned before, this is not a definite metric as cohort skill levels, unit topics or lecturers are never the exact same, so this dynamic changes year to year. Even this small amount of participation seemed to be enough to engage these students a bit more with software engineering.

Additionally, this method is best suited for classes with small to moderate number of students, that is, 16–32, since each RPG fight would take approximately 4–8 min to resolve and this is multiplied by the number of teams. The real feasibility behind using this framework relies on two factors:

- Duration of the sessions – More fights can be completed in a 3 h session over a 2 h session.
- Whether all teams get to play in a fight each class or not.

Gamification has the potential to increase effort from students who are willing to participate in the experience and enjoy learning that way. We should always remember that it is not universally accepted by all students, and therefore, it would be nice to consider making it an optional part of the class. But based on factors such as at-risk students, sometimes it may be something worth trying in higher education. Following up this case study, there are plans of integrating content-wise gamification mechanics on the same unit running the year 2019, without structural metrics (such as XP, leader boards or badges). Information regarding this case study may be published in a future article.

Future plans

As found out during the action-research phases of the framework, it would help to reduce the time an academic is required to facilitate the framework and this would require a tool that simplifies the weekly calculation XP gains for every individual at the end of every week.

Furthermore, it would require more cycles to refine the framework and remove the components that do not resonate with students or reinforce/modify existing ones.

Finally, since this project tackled only structural gamification, it would make sense to design and implement a content counterpart that addresses learning activities and not unit/course structures.

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