

A Comparison of Perceived Norms: Standard Lectures vs Gamified Classrooms

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By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Gamification can be best described as incorporating game-like elements in an everyday scenario. Though games are often vastly different in style and design, most games consist of the following four elements: a central goal, a set of rules, a feedback system, and voluntary participation (McGonigal, 2012, p. 21). In general, a *gamified* system incorporates these elements by implementing reward systems, instant feedback, artificial challenges, and competitiveness, to engage and motivate its users (Seaborn, 2015). Examples of this can be seen in practice at some businesses which employ methods such as rewarding employees with “badges” and encouraging productivity.

According to the paper by Stott and Neustaedter (2013), course gamification is most effective when it utilizes the following four concepts: Freedom to fail, rapid feedback, progression, and storytelling. The paper then goes on to explain three case studies in which these four concepts are applied and shown to be very successful. The course plan proposed by Professor Floryan encompasses three of these four concepts. Students progress through the topics at their own pace and thus they have the freedom to not do anything and fail. The course website will allow students to take quizzes which are automatically graded. This gives students rapid feedback, allowing them to understand what they have mastered and what they need more work on. The course’s structure as a directed, acyclic graph, where topic nodes point to other related topics, gives a sense of progression. Topics can be locked and thus require a previous topic to be mastered before it is unlocked. As it stands, the course offers no sense of storytelling, though that may be left to the professor to improvise.

These elements seem to be shared by successful implementations of a gamified classroom, as shown in Stott and Neustaedter (2013), but how does this change the classroom environment? The typical lecture environment for a college class is one where roughly fifty to a hundred or more students are packed in a large lecture hall directed by a single professor. For instance, three sections of CS 2150 for the Fall 2020 semester at the University of Virginia are all over 100 students in size, according to Lou's List. There are, however, deviations from this norm. The gamified classroom is one such case in which it radically diverges from the standard lecture environment that students are used to. Thus, classroom standards, codes of conduct, expectations, and the perceived norms are bound to change in a gamified classroom. Some norms might also persist between the standard lecture environment and the gamified classroom. This research paper aims to compare the gamified classroom to the typical college classroom or lecture and observe the differences in classroom conduct and the perceived norms between them.

Framework

The notion of classroom *norms* can be described as the perceived and expected behavior of students in a given class. A norm is standard or accepted way of doing something, usually with cultural implications. Therefore, a norm in a classroom setting would be the standard or socially accepted behavior within a classroom. An obvious example of this is how students behave during class time. Are they paying attention and taking notes? Are they being quiet or are they talking loudly? Are they on their laptops or using paper and pencil? It is expected for students to be silent while a professor is

talking – this is a norm. In contrast, showing up to lecture unprepared and not wearing a shirt is typically not socially acceptable in most lecture environments.

A tool to observe norms is to look at students' expectations for the class. A study by Scutter (2011), conducted a survey on incoming undergraduates to multiple universities in Australia. The survey was conducted before the students' first semester, but it gauged what they expected from college education. According to that survey, the majority of the incoming students expected between 6 and 15 hours of work per class. The majority also believed that "...attending lectures and developing relationships with lecturers and university staff..." (Scutter, 2011), were the most necessary things to consider to be successful. Of course, these students were upcoming undergraduates and did not, at the time of the study, actually attend a lecture. Regardless, studies like Scutter's can show us what students perceive as the expected behavior in an educational environment. How much work do they expect? What is the most important activity to succeed in the class? Answering questions like these can show what students value and prioritize in a given course. If it happens to be the case where students don't find the educational aspect of the class to be essential when it comes to success, then this is an obvious flaw in the current educational system. Any modern educational system should be focused on having the students learn the class material if it wants to ensure that they will be well equipped for the real world.

When asked about a typical college class, most students will likely assume some variant of a standard lecture: one professor and a large class. They may not necessarily consider classes which deviate from this idea, such as a gamified lecture. Being a relatively new addition to the context of education, most students likely do not have a

reasonable understanding of what to expect from a gamified class. It may take time for them to adjust their expectations throughout the course of the class, especially if the course is structured in a vastly different way from other classes. The idea is that these types of courses will generate a new set of norms and expectations such that they will change how students perform in said classes. In an optimistic world, these norms will encourage students to focus on the educational aspect of the class and foster a desire to learn.

Case Context

The way students are taught has remained relatively consistent over recent years. Most major changes over the past few decades include vast changes in the technology used in classrooms, the desegregation of schools, and more students being able to afford higher education over the past few decades (Lakritz, 2019). Besides these changes, students are still taught in the age-old way of teacher and student. This makes sense, after all; if something works, why change it? A typical college classroom at the University of Virginia and many other universities consist of relatively large classes with a range of up to a hundred or so students in each class. According to publicuniversityhonors.com, the University of Virginia has an average class size of roughly 36 students, with about 15% of classes having over 50 students in them. However, size is not all that matters when we think of “the typical college class.”

A common depiction of college classrooms is that which takes place in a large room and a single lecturer speaking to a crowd of indifferent students. To some, this might not be the most engaging experience, though that is heavily dependent on the individual giving the lecture. For about three hours a week, the professor gives the

students the information necessary to complete any assignments and the exam. Then students take the final exam and then class is over. This system is what comes to mind for most of us when we think of the average college class, though there are a few variations on this idea.

Recent years have seen a shift away from the average lecture environment described above. Variations of the college class encompass classes which tend to be smaller and more focused on student engagement. Some ways this is accomplished is with group work, student-led activities, and class-wide discussions – all with various degrees of reception by the students in the classes. The question remains, is there a better way to engage students?

Enter the idea of gamification. In the book, *Reality is Broken: Why Games Make Us Better and How they can Change the World*, author Jane McGonigal describes the benefits of playing games and how they can be applied to the “real world.” McGonigal argues that everyday life is underwhelming and leaves people feeling unfulfilled. To make life more fulfilling, and thus more productive, McGonigal suggests looking at games because games “...give us more satisfying, hands-on work” (McGonigal, 2012, p. 55). Games give people *satisfying work* because they employ clear, achievable goals, and reasonable next steps to ensure progress. This makes people more productive by giving them the sensation of *flow* (McGonigal, 2012). *Flow* is the term given to the feeling of focus during a challenging but achievable task by psychologist Mihaly Csikszentmihalyi. Csikszentmihalyi discovered that being in this mental state allowed people to be their most productive and creative when performing a task by keeping them stimulated at but not beyond one’s ability (Oppland, 2020). Well-made

games achieve this by giving players challenges that are at their skill level (McGonigal, 2012). Naturally, if this feeling lets people experience a more fulfilling and productive life, then society should try and emulate this. Therefore, applying gamification to real-life situations should improve productivity and make people happier overall.

The field of education thus seems like a natural location to apply gamification concepts. By itself, the modern education system in America is heavily dependent on standardized tests and demanding work, leaving students with unhealthy levels of stress from grade school to their college education (Marble, 2018). Modifying the current educational system with gamification, therefore would not only motivate students to work more effectively with engaging class activities, but also reduce the stress induced with the class by challenging students at the level which is appropriate for them. For instance, gamification can be applied to a standard lecture and, while the lecture may not change significantly, the assignments may be structured differently to better reward students with instant feedback and to encourage learning and experimentation. This idea of applying gamification to the context of education is a relatively recent adoption (Dicheva, 2015); the idea has been applied in the context of business management with growing success, but it still has ground to gain among academics.

As mentioned earlier in this paper, the most successful gamification implementations utilize the following ideals: Freedom to fail, rapid feedback, progression, and storytelling (Stott and Neustaedter, 2013). Stott's paper elaborates on these four ideas by showing their application in games and then their equivalent in the classroom. For instance, games "...encourage players to experiment without fear of

irreversible damage...” (Stott and Neustaedter, 2013) by giving them large amount of health, checkpoints, and multiple lives. Stott claims that a classroom where students are encouraged to take risks without too much concern on how it will impact their grades will shift the focus of the class more towards learning the concept as opposed to focusing on the final grade. Rapid feedback is seen in the level design of games, where players can acquire power ups and, over the course of the level, learn how to use it to bypass obstacles. This can be applied to education in the same way by offering visual cues and quick answers to questions (Stott and Neustaedter, 2013). Progression is a significant aspect of games, either by advancing through levels and stages, or leveling up in power and unlocking access to new abilities. The classroom equivalent can be the notion of a progress bar that tracks how many assignments a student completes and shows what they have left to do to perform well. Games often times have an engaging story that drives the player to achieve certain goals. To accomplish this in a curriculum, educators must “put the learning elements into a realistic context” (Stott and Neustaedter, 2013), by coming up with example situations or even presenting students with quests that present a problem in an engaging manor.

Methods

The topic begets the following question: What are the perceived norms among students for a lecture-based class and a gamified class, and how are they similar or different?

To determine the perceived differences between lecture-based and gamified classrooms, the norms must first be observed. Other than by personal experience, the

norms can be determined by analyzing existing classes. For example, this includes student behavior in class, both explicit and implicit behavior.

To explore the perceived differences in both explicit and implicit reactions to the class, a survey asked students to consider their priorities when it comes to what I will consider as the three types of classes: the lecture-based classroom, the student-centered lecture, and the gamified lecture - the lecture-based classroom being the typical college class, the student centered lecture being a class that focuses on student engagement, and the gamified lecture being a course that employs gamification. The survey asked students whether they have taken or are currently taking a class in each of the three categories above and then asked the same set of questions for each. The questions prompted students to rank what they felt was the most important among seven aspects of a class in order for them to be successful (see Appendix A). These aspects were as follows: *Learning and understanding the material / Taking good notes, Getting an A, Attendance, Class Participation, Preparing for the exam, Doing assignments / homework, and Going to office hours*. Gathering the highest ranked aspects for each of the three types of classes will give insight to the perceived norms of the class.

In addition to the survey, UVA Professor Mark Floryan, the customer in the technical portion of this thesis, was interviewed and gave his perspective of gamified classes in general as well as the perceived classroom norms. Having taught introductory CS classes at the University, which would fall under the standard lecture classification as well as a pilot gamified course, Professor Floryan was able to give

insights on the differences he has observed from those classes and the pilot class he is currently teaching that employs gamified concepts.

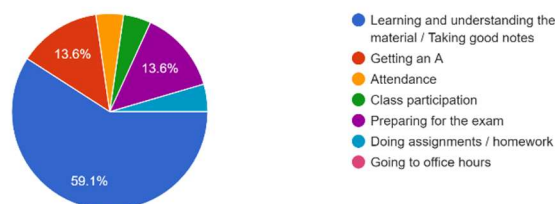
Results

It is unclear if the perceived classroom norms differ significantly between standard lectures and gamified classes, according to these results. The survey does not show any overwhelming evidence that gamified classes seem to influence classroom norms such that learning the material is considered the most important, however some interesting patterns emerged. The interview with Professor Floryan also suggested that the norms did not significantly change, and rather it was the structure of the class that changed how students pursued their education.

The survey was sent out to UVA students through group messaging services like GroupMe and Discord, with some chats having over 100 students. At the time of this paper, 22 students partook in the survey. Though a sample size of 22 is not significant enough to draw major conclusions from a population, some interesting patterns have emerged in the data. The results are as follows:

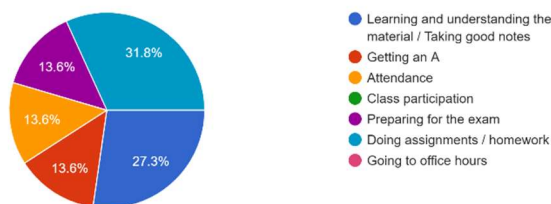
Which of the following options do you consider to be the MOST important towards your success in a lecture-based class?

22 responses



Which of the following options do you consider to be the SECOND MOST important towards your success in a lecture-based class?

22 responses



Which of the following options do you consider to be the THIRD MOST important towards your success in a lecture-based class?

22 responses

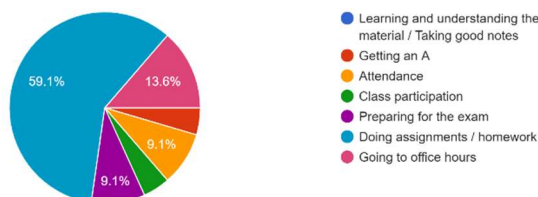


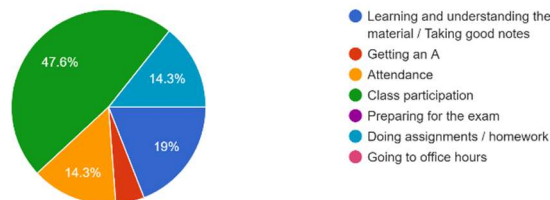
Figure 1: The charts represent the distribution of responses for what students considered was most important towards their success in a lecture style class. The option *Learning and understanding the material* appears as the most important to success by 59.1% of responses.

For standard lecture-style classes, *Learning and understanding the material* was considered the most important for success by the majority of participants. There also seems to be a consensus that *Doing Assignments / Homework* is the second or third most important for success for most students. Six responses, however, believed that

Getting an A, or *Preparing for the exam* were the most important to their success, and more believed they were either second or third most important.

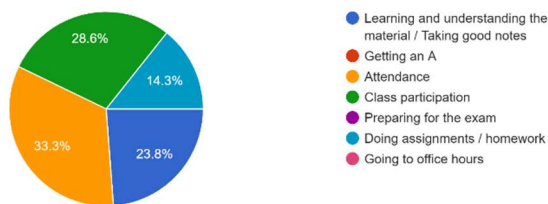
Which of the following options do you consider to be the MOST important towards your success in a student-centered class?

21 responses



Which of the following options do you consider to be the SECOND MOST important towards your success in a student-centered class?

21 responses



Which of the following options do you consider to be the THIRD MOST important towards your success in a student-centered class?

21 responses

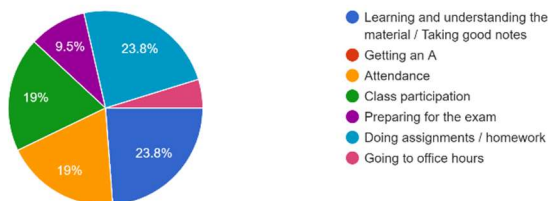
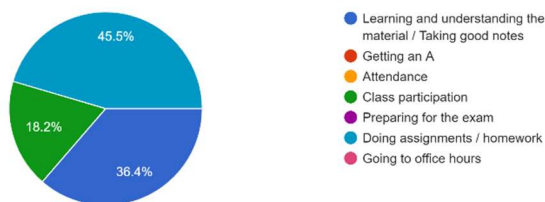


Figure 2: The charts represent the distribution of responses for what students considered was most important towards their success in a student-centered class. The option *class participation* is considered to be most important by the majority of students, though *Learning and understanding the material* is considered as one of the top three most important by most responses.

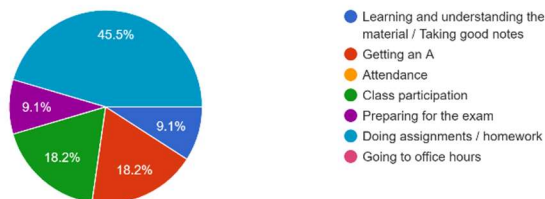
For student centered classes, *class participation* and *attendance* appear as either the first or second most important for success in the majority of responses.

Learning and understanding the material is also considered a priority by a smaller fraction of students, but most responses considered it as one of the top three priorities. Interestingly, *Getting an A*, is only considered a priority for one response and *Preparing for the exam* for the exam is a priority for two responses.

Which of the following options do you consider to be the MOST important towards your success in a gamified class?
11 responses



Which of the following options do you consider to be the SECOND MOST important towards your success in a gamified class?
11 responses



Which of the following options do you consider to be the THIRD MOST important towards your success in a gamified class?
11 responses

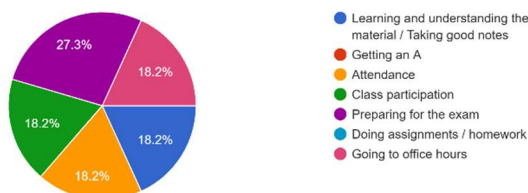


Figure 3: The charts represent the distribution of responses for what students considered was most important towards their success in a gamified class. The options *Learning and understanding the material* and *Doing assignments* are what most students consider as important to their success.

Seven of the 22 responses have taken a gamified class, though more answered based on what they assumed to be most important. Among all responses, the most important aspect of a gamified class was *Learning and understanding the material*, *doing assignments*, or *class participation*. All but one response considered *Doing assignments* as one of the top three most important. *Getting an A* or *Preparing for the Exam* do not appear as the most important for success, though some responses do consider them as the second or third most important.

The interview with Professor Floryan offered plenty of information regarding his idea of gamification as well as the progress on his pilot class (see Appendix B). Floryan has taught a number of general computer science classes at the University of Virginia, including CS 2150, CS 4102, and a number of Computer Science (CS) electives like AI and Game Design. He is teaching Data Structures and Algorithms (DSA 1 and 2), the pilot gamified course which is a yearlong class currently in its second semester. Floryan considered the class to be “Shallow gamification,” which he explained as consisting of some but not all elements of gamification. To him, a successful implementation of gamification must allow the freedom to fail and meaningful choice. Most significantly, however, Floryan emphasized the importance of structuring the class such that it aligns with student’s motivations.

When asked to compare DSA with a class like CS 2150, Floryan noted, as a professor, the importance of actually learning the material in both classes, especially to prepare for more advanced CS classes. However, he believed students in CS 2150 mainly strived to get an acceptable grade rather than actually taking the time to learn the material. He stated that the strict deadlines of the class discouraged students to

repeat less than satisfactory attempts – students tended to submit mediocre assignments by the deadline, even if it was not a fully completed assignment. When asked the same question about DSA, Floryan noted that the structure of the class did not rely on strict due dates. In DSA, students have unlimited resubmissions for homework and quizzes which are graded as pass/fail and the topics of the class are graded on a three-point scale: *not competent*, *competent*, and *mastery*, based on the number of assignments a student has passed. Floryan stated that, since there is no hard deadline, students were more inclined to take the time to perform better work without fear of being penalized for taking longer. He also quoted a specific example in the course reviews where a student mentioned that they were stuck on a particular assignment and, because they knew if they submitted it as it was, it would not be considered passing, they were able to take the time to actually learn the material more and complete the assignment and receiving a passing grade. Floryan did note that the students' primary motivation was still to receive a good grade in the class and that many students did still procrastinate, likely due to the relaxed due dates, however, he believed that students' taking the time to learn the material is aligned with their desire to get an A and thus end up learning the material as a consequence.

The course is part of an ongoing study by Floryan, who is continuously observing the efficacy of the class and intends to conduct follow ups where he observes the performance of DSA students in the future as they take advanced computer science classes. So far, it seems that student performance is better than in non-gamified classes, but Floryan acknowledged that this may be due to the class simply being “easier” due to its soft deadlines.

Discussion

This paper attempted to learn if there is a difference in the expected behavior of students in the class, such as if they take a gamified class more seriously than a lecture class. According to the results above, this does not seem to be the case, though more research is needed. The survey shows that students do seem to prioritize learning the class material in a standard class, and this does not seem to change with a gamified class. The difference that can be observed is that students do seem to also prioritize their grade and their exam performance in a standard lecture class. In the survey, nine students believed that their grade was critical to their success in a lecture class, but only two considered it important in a gamified class, and only one considered their grade to be important in a student-centered class. This implies that, while students do seem to want to learn the material, they are also worried about maintaining a good grade in the class in order to pass. If that requirement is relaxed, they might be able to focus more on the material and doing the work.

This is in line with Professor Floryan's approach to his gamified class. Since his class removes hard deadlines on assignments, students can focus more on mastering the material to do well on the assignments. However, Floryan's belief that most students prioritize getting an A in their classes does not seem to correlate with the survey, in which the majority of students consider learning the class material among the top three priorities for success. This could be an artifact of Prof. Floryan's personal bias, or the bias of the survey audience.

The low number of responses to the survey limits what can be ascertained from it. The survey was distributed at the beginning of Spring break 2020 and was likely

overshadowed by the outbreak of the Coronavirus and the news that the University would be transferring to online classes, resulting in few responses. A second round of the survey was redistributed to the same groups, and this resulted in more responses. A sample size of 22 students from the same environment is not an accurate representation of the population as a whole, though it may still hint at certain patterns in the overall population. If we take the survey results as is, it appears that gamified classes do not foster an increased importance on learning the material, but once again, this could be attributed to the responses not being an accurate depiction of the overall population. The seven survey options were also a limiting factor and may not have been entirely mutually exclusive. That is to say, for example, perhaps *getting an A* and *learning the material* meant the same to someone, making it difficult to determine where a response's priorities are. Also, *Learning and understanding the material* was paired with *taking good notes*. These may have been distinct enough to be their own aspects and as such could have been split.

According to Floryan, his course is "shallow gamification" and encompasses some but not all aspects of a gamified course. Thus, his experiences may be different from professors of other gamified classes. The class and the corresponding study he is conducting are both currently in progress and so results can change as the class evolves. It would also be worthwhile to investigate other professors who employ gamification in their classes, preferably beyond the University of Virginia. The additional input would allow comparison of the different way professors implement gamification. This would then show if the perceived norms change based on implementation. It would

also remove some biases from professors, such as Professor Floryan's view on student's motivations, which was shown to not be reflected in the survey results.

A future study should obviously try to gather more survey responses from a more varied population. For example, the survey could be distributed among other schools which also employ gamification in some classes. The survey could also be improved slightly; as opposed to having participants choose the top three most important elements, all seven elements can be listed and the participant can order them appropriately from most important to least important. Alternatively, the questions could be open-ended and allow the participant to enter in their own words what is most important to their success. This will make it somewhat more difficult to analyze but will gather more accurate information from the participants.

As someone who plays games and understands the educational potential of games, I have a personal opinion on the research topic. While gamification in the classroom has no immediate effect on my engineering practice, I can apply gamification ideals in a future career and/or leadership position to promote a more productive work environment.

Conclusion

Most students seem to understand the importance of learning the class material, but it seems that they also care about their grade in the class. Gamified classes seem to alleviate this importance of grades and thus allow students to focus more on doing the work required in the class and thus learning the material. This is reflected in Professor Floryan's design of his pilot gamified course, where the relaxed deadlines allow students to focus more on submitting quality work, which in turn allows students to learn

the material at a reasonable pace. The fact that some students are more concerned about their grade than they are with actually learning the material is peculiar and highlights an issue with the modern education system, however, this is beyond the scope of this paper. As suggested by Floryan, a solution would be to design the class in such a way so that learning the material is aligned with students' motivations to pass the class – in his case, this solution is gamification. Further research can look into alternative ways for gamification to allow students to focus on learning the material, and, if this research is conclusive, gamification might be a worthwhile investment when it comes to overhauling the modern education system.

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Appendix A – Survey Questions

<p>Standard Lecture-Based class</p> <p>A standard lecture based class is probably what one assumes when they think of 'a typical college class.' A single lecturer speaks for about 50 minutes or more, answering some student questions throughout the lecture, but otherwise, students are not involved. There may or may not be one or more exams and class sizes can be modest to fairly large (30-100+ students)</p>	<p>Student-Centered Lecture</p> <p>A student-centered lecture is one that focuses primarily on student engagement. Typically, students in this type of class are encouraged to participate in class discussions facilitated by the instructor, who acts more like a moderator and invites the class to speak up. There is usually a strong emphasis on group work and collaboration and in some cases, students are encouraged to "teach" their fellow classmates. Class sizes are typically smaller - no larger than 50 students</p>
<p>Have you taken a standard lecture-based class?</p> <p><input type="checkbox"/> Yes</p>	<p>Have you taken a student-centered style class?</p> <p><input type="checkbox"/> Yes</p>
<p>If you answered Yes to the above question, answer the following based on your own experience in that class. If not, then answer based on what you think would be the case.</p>	<p>If you answered Yes to the above question, answer the following based on your own experience in that class. If not, then answer based on what you think would be the case.</p>
<p>Which of the following options do you consider to be the MOST important towards your success in a lecture-based class?</p> <p>Choose ▼</p>	<p>Which of the following options do you consider to be the MOST important towards your success in a student-centered class?</p> <p>Choose ▼</p>
<p>Which of the following options do you consider to be the SECOND MOST important towards your success in a lecture-based class?</p> <p>Choose ▼</p>	<p>Which of the following options do you consider to be the SECOND MOST important towards your success in a student-centered class?</p> <p>Choose ▼</p>
<p>Which of the following options do you consider to be the THIRD MOST important towards your success in a lecture-based class?</p> <p>Choose ▼</p>	<p>Which of the following options do you consider to be the THIRD MOST important towards your success in a student-centered class?</p> <p>Choose ▼</p>
<p>Back Next Page 2 of 4</p>	<p>Back Next Page 3 of 4</p>
<p>Gamified Classroom</p> <p>Gamification is defined as implementing game-like elements to common tasks. A gamified class is one which incorporates these game-like elements in a classroom environment. Some game elements include obtainable rewards, a progression system, and instant feedback. Common implementation of gamification in classrooms typically allow the freedom to fail, rapid feedback, and meaningful choices. There is an emphasis on retrying failed assignments and the class is structured in such a way to allow students the freedom to complete assignments at a comfortable pace. Essentially, the class is structured like a big video game with the end goal being passing the class.</p>	
<p>Have you taken a gamified class?</p> <p><input type="checkbox"/> Yes</p>	
<p>If you answered Yes to the above question, answer the following based on your own experience in that class. If not, then answer based on what you think would be the case.</p>	
<p>Which of the following options do you consider to be the MOST important towards your success in a gamified class?</p> <p>Choose ▼</p>	
<p>Which of the following options do you consider to be the SECOND MOST important towards your success in a gamified class?</p> <p>Choose ▼</p>	
<p>Which of the following options do you consider to be the THIRD MOST important towards your success in a gamified class?</p> <p>Choose ▼</p>	
<p>Back Submit Page 4 of 4</p>	

Appendix B - Interview Questions and Answers

- Introductions; What courses have you taught?
 - CS 2150, 4102, DSA 1 & 2, Electives,
- In your words, describe how DSA is structured and how it fits the mold of a “gamified course”
 - “Shallow gamification,” some game like elements. Gamification requires some specific elements, freedom to fail & meaningful choice. Feedback loops - submit as many times as you want.
- In a general case, in your experience of teaching a typical lecture (CS 2150), what do you think is most important for students’ success in those classes (things like knowing the material, taking the exam, doing the homework)? What do you think the students perceive as the most important? Why do you think this is the case?
 - Should focus learning the material, students think getting an A is highest priority. Students want to get an A
- In your experience of teaching DSA, what do you think is most important for students’ success in that class? What do you think the students perceive as the most important? Why do you think this is the case?
 - Adjust mechanics of class so that students are inclined to learn material, still working on getting data, students seem to want to focus
- Comparing the two experiences, have you noticed any difference in student behavior? Student performance? Do the students seem more engaged in the gamified class or does the level of attention seem relatively the same?
 - Attention seems the same, little bit harder for TA’s. Students still procrastinate. Little bit easier to get an A.
- Any further comments?
 - Doesnt have to be flashy, about core mechanics.