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Developing a Gamified Online Learning Management System for Business Students

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Developing a Gamified Online Learning Management System for Business Students

Shiyu Liu

Abstract

Traditional learning methods for business students typically involve repeated practice and memorization of class content. Instructors provide students slides and textbooks to learn from and give exams and quizzes to test on how well they learned the material. However, traditional learning has its limitations in terms of how incentivized students are and how well they can manage their learning process, especially for the younger generations. We propose an **online learning management system (LMS)** for students to keep track of their records, manage learning materials and prepare to do online practices. We also incorporate **gamification** - that is, to use features typically found in games to our LMS to make the process more enjoyable. We treat all lessons, quizzes and exams like “quests” the character (student) has to conquer through a “game map”, each quest (quiz/exam) is randomized, target specifically on certain knowledge and can be done at any time repeatedly. Students can earn currencies and can use them to purchase items on the store. We are interested in whether such a system provides a more enjoyable environment for student to learn business related content and how incentivized they are, and whether it makes the learning process more efficient, effective. Those criteria are used to evaluate the system. Online statistics, such as how many times and how well a student does on the quizzes, are used to evaluate how well students learn compares to traditional methods. Additionally, student surveys are used to provide qualitative data on learning experience.

Acknowledgments

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Developing a Gamified Online Learning Management System for Business Students

Shiyu Liu

A departmental senior thesis submitted to the
Department of Computer Science at Trinity University
in partial fulfillment of the requirements for graduation
with departmental honors.

April 29, 2020

Thesis Advisor

Department Chair

Associate Vice President
for
Academic Affairs

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Developing a Gamified Online Learning Management System for Business Students

Shiyu Liu

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Chapter 1

Introduction

Traditional learning involves the process where students physically attend a class and engage in face to face (F2F) communication and interaction with instructors and peers. Students attend classes regularly at a fixed time and are tested by either quizzes or exams at a pre-specified time and students prepare for them during their off-hours. Traditional learning, however, is becoming less effective for the younger generation. For the generation of students born between the mid-1980s to 2000s, their world is shaped by technology, social networks and video games. These students generally have shorter attention spans, spend less time in reflection, have a smaller sense of history, and expect a different educational experience than previous generations [3]. Moreover, there is a problem with scheduling and flexibility where students might find a specific time of their day to study more effectively but are unable to do so with traditional learning. It is also hard for students to keep track of their progress and knowledge by reviewing course materials in their free time and going to classes for quizzes and exams.

To solve the above problems, educational technology, specifically, learning management systems (LMS), have become more prevalent in higher education and students are no longer

restricted to F2F interaction and communication [29]. The combination of e-learning and F2F teaching can increase accessibility, flexibility, and choices for interactivity for many university courses [21]. LMS has also been put into wide use for a long time. By 2005, over 95% of institutions were using LMS in the UK [4]. LMS can address a lot of aforementioned problems. It can increase efficiency of learning by saving travel times for students and faculty, saving time on in-class exercises and exams that could be done online, and reduce the overhead cost of faculty by more efficient use of resources [19]. Students are also able to customize their learning plan and choose where and when they learn the course material. Student efficiency can also be increased as putting learning material online allows students to skip the part that they already know and can put more time and effort into new and more important knowledge [13]. However, those benefits of LMS do not make it a perfect system. The lack of interactions between students to instructors might negatively impact students' participation rate, level of focus and efficiency. The effectiveness of LMS also depends on how its content is designed and whether the content fits within the technology being used to create the LMS [17]. More importantly, LMS alone does not increase users' motivation to use them. Additionally, the use of LMS does not make the learning experience more fun and enjoyable either.

Gamification, as addressed by many existing research, can be useful to raise user engagement, learning efficiency and effectiveness [17][24][26]. Gamification is defined as the use of game design elements into non-game contexts [7]. People are drawn to video games because many elements of video games, such as narrative, character development and immediate feedback, make the experience fun and engaging. Various research have shown that systems with the proper inclusion of game-like elements like leaderboards, badges, story/narrative into non-game systems, can increase users' motivation and enjoyment of learning [1][23][14][16][19]. Many existing systems also successfully incorporate the use of

gamified elements that are widely used in an educational context [2][22][27][28].

Gamification has gained increasing popularity among researchers. Many applications of gamification have been designed and implemented each year and the concepts and proper use of gamification into existing non-game systems is still under research [8]. We noticed that while there is much existing and ongoing gamification research, most of it is conducted on very common gamified elements such as badges and leaderboards without taking consideration of other elements. Most of the existing frameworks also lack the cohesiveness between gamified elements and the context of the courses, that is, the gamified elements are not tied into the theme of the course material, thus mitigating the effect on enjoyment of learning and consistency. Those systems often showed strong similarity with each other [14]. We believe that the incohesiveness and mass similarity between existing systems could signal a lack of innovation. Meanwhile, most works with gamification are actually games with the purpose of education, rather than a gamified system. Even fewer systems are proposed with the incorporation of role-playing-game (RPG) elements.

For the purpose of both helping users manage their learning progress and learn materials in a more enjoyable fashion, we combined RPG elements including storyline/narrative, currency, inventory and virtual store with a learning management system specifically designed for business students. The incorporated game elements are purposely chosen based on we expect to increase enjoyment of using the system, without making it too much like a game that could take away the learning efficiency and effectiveness. It is possible for students to just learn how to play the game without proper understanding of the target instructional domain [6]. Thus, the proposed learning management system could potentially alleviate the problem by incorporating fun gamified elements in a non-game system versus making it completely a game.

The remainder of this paper is organized as follows: chapter 2 describes related concepts

and existing works and systems associated with gamification and learning management systems; chapter 3 involves the method of designing and implementing the proposed system and how user data and survey are gathered and evaluated; chapter 4 discusses the result of our survey; chapter 5 discusses some of the difficulties and limitations of our work. Finally, chapter 6 involves a summary of our findings and lessons from this project and directions of future work.

Chapter 2

Related work

There has been a rapid proliferation of systems taking inspirations from video games without the proper definition of the concept. Although there have been terms like “playful design” and “playful interaction”, such terms do not really encapsulate the core idea of using game-specific elements. The term gamification is thereby introduced to describe the complexity of gamefulness, gameful interaction, and gameful design. One of the earlier definitions for gamification is that gamification is a process of enhancing services with (motivational) affordances in order to invoke gameful experiences and further behavioral outcomes [9][12]. A more general definition is later provided by Deterding et al., which is that gamification is the use of game design elements in non-game contexts [7]. Despite its many definitions, gamified elements such as badges, leaderboards, points, feedback and time constraints are commonly used in online learning tools, quiz software tools and E-learning platforms without a consensus on the specific definition [10]. In the context of education, systems involving game-like elements can be categorized into two major categories. The first one is educational games, which are fully gamified and categorized as real games with educational purposes [18]. The second category is gamified learning systems, which are based

on non-game frameworks with the incorporation of gamified elements. Researchers have long debated about the effectiveness of the aforementioned systems. However, numerous research has shown the effectiveness of individual gamified elements. Meanwhile, results of many existing applications using gamification shows that the incorporation of gamification can be effective in increasing engagement, learning effectiveness and efficiency.

Existing literature shows a diverse and comprehensive review of the effectiveness of various gamification elements. Marsh et al. found that a puzzle and narrative component of serious games can increase student's learning effectiveness and improve their learning experience. Meanwhile, an off-screen character as the narrator of the system helps reach a synergy of fun and learning [16]. Gulz showed that systems with narrative and characters can help the fulfillment of deeper personal relationships, thus increasing motivation and sense of ease and comfort with the system [1]. Landers showed that the incorporation of a leaderboard in a competitive system can be effective, while in other non-competitive systems the incorporation of narratives and other elements might be more effective [14]. Muntean's research showed that different gamified elements such as achievements, virtual goods, levels, challenges and leaderboards can serve as extrinsic motivations that directly ties to users' intrinsic motivations such as competition, self expression, achievement, status, reward and altruism to increase motivation and engagement [19].

Many systems that are educational games or gamified learning environments are developed by researchers and generated significant empirical results on the effectiveness of those systems. Horn et al. developed an educational game for teaching computational thinking and computer science specific knowledge to middle school students and found an increase in performance and enjoyableness of learning [11]. Chen et al. developed an adventure RPG-based learning system involving task-giving non-playable-characters, items and problem solving, with over 90% of participants claiming to have a more fun learning

experience and increased motivation and efficiency [5]. Wu et al. integrated RPG concepts into a simulation system on practicing the project assessment of software development in a software engineering course and found a significant increase in student learning outcome after the use of RPG elements [28]. Su and Cheng designed a series of mobile gamification learning systems for elementary school science curriculum to help engage and motivate students [22]. Besides applications developed in research fields, many existing large-scale learning systems that are already published for commercial uses also involve various degrees of gameful design. Duolingo ¹, for instance, included various game-like features including virtual currencies, items and power ups, achievements and leaderboards as a language learning application, and the result revealed a significant increase in learning effectiveness and motivation on Spanish language learners [27]. As another example, Hackerrank², one of the most popular and effective websites for people to practice coding skills, incorporated many common gamified elements like leaderboard, badges and currencies [15].

For learning management systems, its use has been widely used in higher education [17]. Rapuano and Zoino developed an electric and electronic measurement course using LMS [20]. Many LMS products are also commercially available, such as Blackboard ³, Desire2Learn ⁴, ANGEL—LMS ⁵, and IntralearnTM LMS ⁶ [29]. Meanwhile, there is evidence suggesting LMS combined with gamification can be effective. Veltsos draws parallels between game elements, instructional design, and the teaching of business and professional communication and showed that gamification can be incorporated into business courses to make them more effective [26]. Mutean suggests that gamification can be used in e-learning systems to raise

¹<https://www.duolingo.com/>

²[hackerrank.com](https://www.hackerrank.com)

³www.blackboard.com

⁴www.desire2learn.com/

⁵www.angellearning.com/products/LMS/default.html

⁶www.intralearn.com/Products/intralearn.aspx

engagement [19]. Vukovic et al. provided a model that combined characteristics of LMS and gamification and showed its possibility of use in practice [25].

We present an online learning management system with gamification. The course currently designed is specifically for business students. We hope that the presented model combines the advantages of both LMS and gamified elements that could increase learning engagement, fun of learning, and potentially make it easier for users to learn more easily and efficiently. In the next section we discuss in detail about the method for designing and creating the proposed system.

Chapter 3

Method

In this chapter, section 3.1 covers what gamified elements are included in the system and the intention and rationale behinds the design. Section 3.2 entails methods for user data collection through in-app statistics and surveys. Section 3.3 outlines criteria on how collected data from survey and in-app statistics are evaluated to analyze the performance of the system.

3.1 Incorporated Gamified Elements

Various elements of gamification incorporated into our online learning and management system, includes: **game map, virtual currency, items, narrative, story line, virtual stores, user inventories, and tasks.**

First, traditional learning components like quizzes and lessons are incorporated but in a more game-like fashion. Different lessons, quizzes and exams are laid out on the game map, where different components are organized in a linear fashion, meaning that users are suppose to proceed their learning linearly from beginning. However, users are not forced

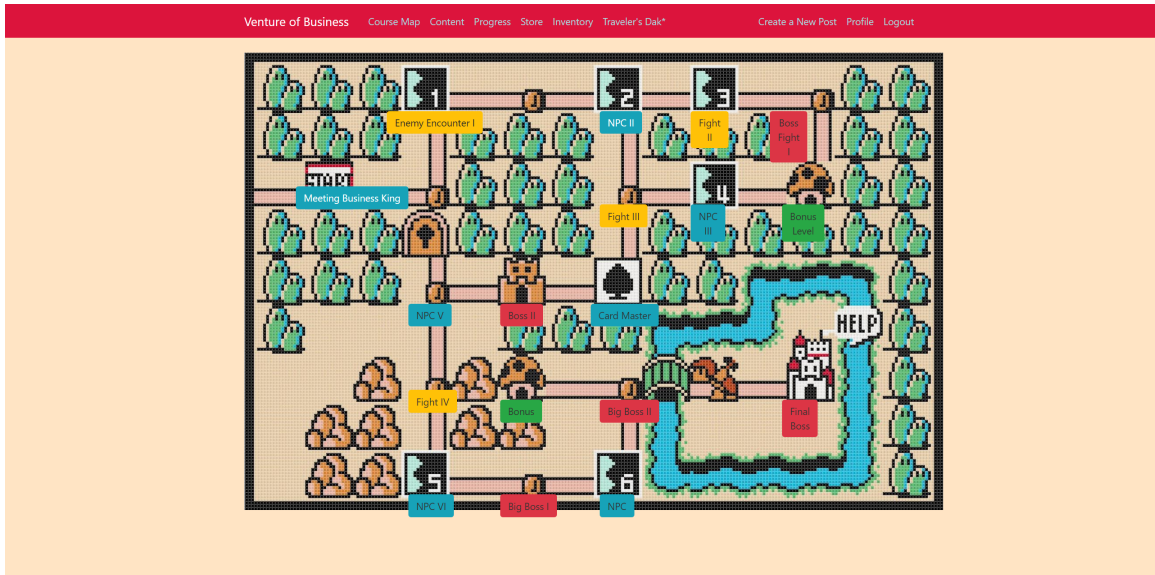


Figure 3.1: Course map as the main page of the system. Lessons (blue) and quizzes (yellow/red) are laid out on the map

to complete all previous sessions to do the current one. This allows some users to have the freedom to choose what they want to learn first and focus less on knowledge points that they already know.

The wordings and structure of the narrative are designed to make users feel they are in a role-playing-game world, in a way resembling a non-playable-character (NPC) giving missions and having conversations with the player. Quizzes are combined with randomized narratives and scenarios for the user to give a feeling that the user is completing a contract or defeating an enemy. When enemies (quizzes) are defeated (completed), virtual currencies and items are randomly rewarded to the user (the player) for their achievements. Depending on how well the task is completed, the reward will be different. For each correct answer, the user is rewarded with currency. The more correct answers, the more bonus the user receives. Virtual currencies can be used to purchase various items that are sold in the

Venture of Business Course Map Content Progress Store Inventory Traveler's Dak* Create a New Post Profile Logout

misterfish February 11, 2020 Update Delete

First Lesson as a Mercenary: "Time Value of money"

Welcome to the world of "Venture of Business". Today, you will no longer be a student. You are a mercenary, and your job is to fight against all obstacles through out your journey. Of course, you are not fight them for free. You will be earning rewards and coins along the way. Who knows what kind of goodies you could purchase in the store...

Anyway, this is your first lesson as a mercenary. It is really important for you to first know about the time value of your money.

You may wonder, the value of my money? It is printed on the money! If I have \$100, that's \$100!

However, be careful that we are talking about "time value of money". As a mercenary, it is important that you know that time matters. If you finish a contract, you should be rewarded, let's say, 30 coins. Now, I could give you the 30 coins right now, or give it to you 3 days later. Which one do you like? Of course, now! For many reasons, the uncertainty and delay in time makes you want the money now rather than in the future(Although I have the incentive to give you money later, hopefully you would forget about it).

Thus, "money has a time value-cash you receive in the future is worth less than an equivalent amount of cash you receive today."


In Venture Island Bank, you can save some money and earn some interests in the future. "The additional money you earned represents the time value of money."

Figure 3.2: Narrative based Lesson covers knowledge needed for the quiz.

Venture of Business Course Map Content Progress Store Inventory Traveler's Dak* Create a New Post Profile Logout

Question category: Value of money Question 3 of 5

Potion making II: on your way home, you remembered about the lady you met before. She did invest 100 Rupees in the ingredients. She expected to earn 150 rupees in 4 weeks. At the same time, there is a really good deal on Venture Island bank where you get to invest money with a weekly interest rate of 10%! Without considering other factors and assume that the lady would choose the option that grants her more money, which one should she choose?



Invest in the bank

Make potions

Next

Figure 3.3: Question in a quiz with incorporated background story/narrative

store, and once paid, items will be added to the user's inventory. Different items also have different functionality: some are straightforward extra credit purchase and some are items like virtual keys to unlock an optional bonus lecture and bonus quiz.

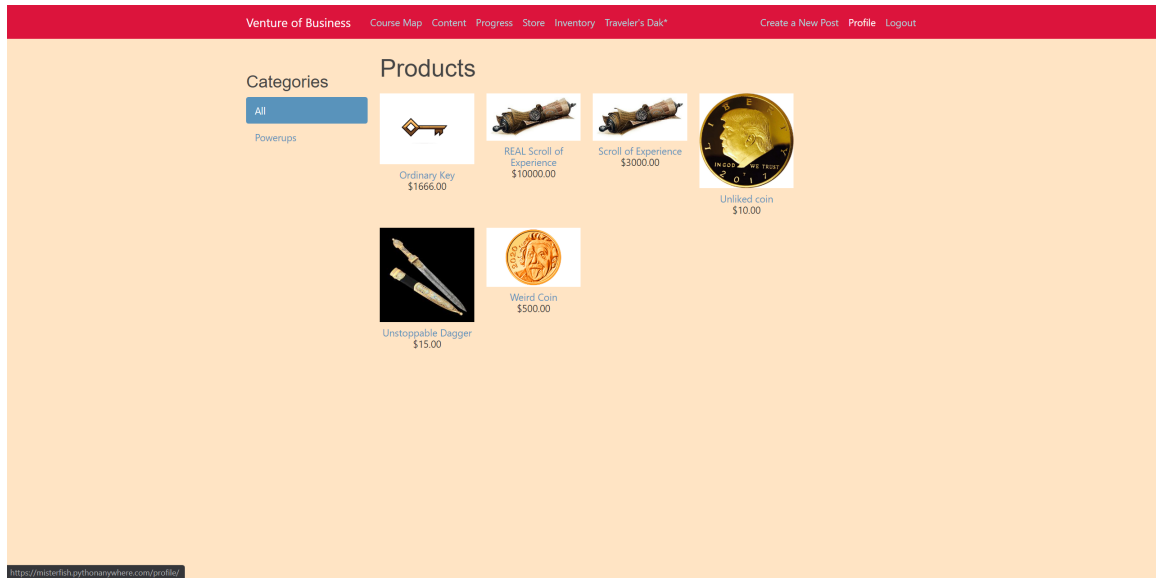


Figure 3.4: **Virtual store: users can use currencies earned by doing quizzes to purchase certain items**

By including gamified elements, we intend to provide a more enjoyable experience rather than increase learning efficiency and performance. As shown by previous research, whether the incorporation of gamified elements can increase learning performance and efficiency remained to be tested further by research and experiment. Thus, the main purpose of the proposed system is to create more incentive for users to study and manage their learning process, and elements incorporated in this system are specifically designed to reflect that idea. However, even though game-like elements and fun presentation of course content are intended for increasing user satisfaction during the learning experience, the result of the construction of those elements might also increase the quality of learning as well. Students

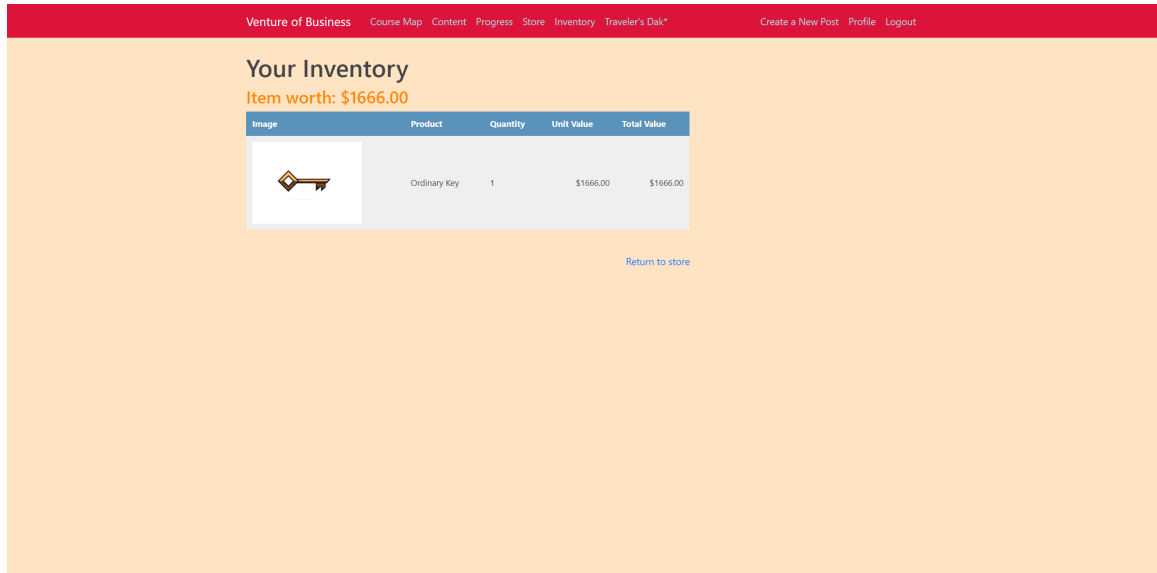


Figure 3.5: **Inventory:** items purchased by user are stored in user's inventory

are able to do quizzes repeatedly because the content might be different every time the student takes it. Questions in any single quiz are randomly selected from a larger collection of questions to achieve randomness and keep the content fresh. Choices and order of questions in a quiz are also randomized so that a student might not be able to quickly and repeatedly do a bunch of questions to memorize the location of the correct answer instead of actually learning. Students might simply do one quiz multiple times to see the change in different narratives. Meanwhile, it is also possible that the students might strive to unlock bonus lectures simply to see what content is there, thus learning additionally to earn more currency by doing more quizzes.

One thing to be mindful of here is that even though the proposed method of course material construction could potentially improve both enjoyment and effectiveness of learning, it is by no means that such a result is achieved by changing the course content itself.

To ensure the fairness of comparing our method to traditional learning, the number of factors including course material and tasks are equal for both approaches. Only the means of presenting the content to students are changed.

3.2 Learning Management

The website as a whole is based on a learning management system framework, where users are able to learn new materials, take tests and quizzes to examine their understanding of materials, and keep track of their progress along the way.

Course materials are presented as posts that can be viewed by all users. Users will also be able to post either questions or thoughts through posts, making the system potentially more like an educational classroom with more peer-to-peer and peer-to-instructor interaction. Quizzes and exams, question categories, the number questions that answered correctly, total number of finished questions are recorded when users answer questions and are stored in the database what users can access anytime through the “progress” page to see how well they are doing. For each question during the quiz, feedback is given to the user indicating a correct/incorrect answer along with a detailed explanation about the question. When the user finishes a quiz or an exam, a passing grade is given based on how many questions the user has answered correctly.

The learning management aspect of the proposed system aims to provide users with better accessibility to materials and better control of their learning progress. Also, unlike traditional learning methods, it is not necessary for users to finish each section of their learning process one by one. Users can not only choose what time and place they study, but they can also choose to select which lessons and practices they want to do first, and whether they would like to take a bonus lesson.

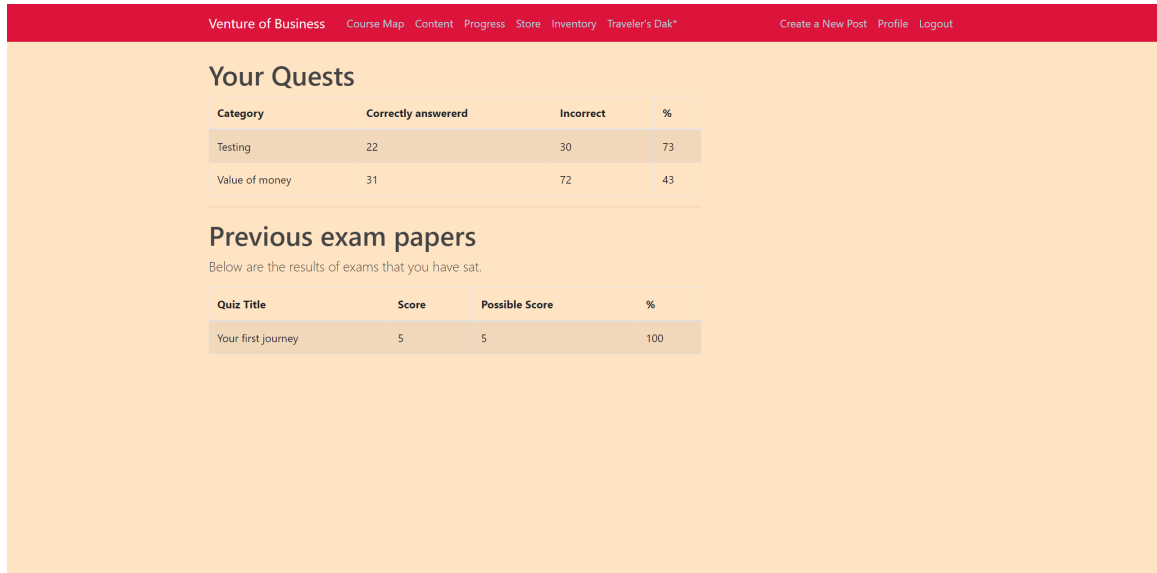


Figure 3.6: **Progress page: users can see information about quizzes they have done, number of questions did and accuracies**

3.3 Survey and Data Collection

Users are given the link of the website and are given enough time to spend on the website to test features, learn materials and practices. During each user's learning process, the system stores the quantitative data in the online database. Once finished, users fill out the survey. We collect both quantitative and qualitative data from participants. Quantitative data from each user are collected from website statistics, including number of trials for each question, quiz accuracy, currency earned, etc. Qualitative data are collected through an online survey that mostly consists of free response questions and scaled response questions measuring the score of various aspects of the system participants love the most. Open ended questions are to provide more analytical and constructional feedback about the proposed system.

Question	Question Type/Choices
Email address	Basic Info
Name	Basic Info
Gender	Basic Info
Major	Basic Info
Class Year	Basic Info
How good a job do you think the website does helping you manage and keep track of your progress ?	Scaled Response
Do you think the learning experience is more fun than tradition learning ?	Scaled Response
Do you think elements like virtual currencies give you more incentive to learn?	Scaled Response
Overall, do you think this website makes it easier for you to learn materials than traditional learning?	Scaled Response
Do you think you learnt more effectively this way than traditional learning?	Yes/No/Maybe
Are you having fun using this website?	Yes/No/Maybe
Do you spend more time learning using the system than with traditional learning?	Yes/No/Maybe
Which game-like elements do you like most about the website?	Free Response
Which game-like elements do you like least about the website?	Free Response
What do you think if added can make the website more effective for you to learn?	Free Response
What do you think if added can make the website more easier for you to manage and keep track of your progress?	Free Response
What do you think could be improved on the website to make it more fun?	Free Response
What do you think would be additional features that would make the website more fun to use (without losing learning effectiveness)?	Poll

Table 3.1: **Survey: list of questions including choices and types that are asked to users after they have used the system; scaled question have ratings 1 to 5 with 1 being very bad to 5 very good**

To evaluate the performance of the system, 3 major criteria are considered: efficiency, effectiveness and user satisfaction and enjoyment.

The first criterion is how efficient the learning and management aspect of the website is, i.e. how much easier the system is for users to learn than traditional learning. The users will rate how much more control the system gives them in terms of accessibility to knowledge, how convenient and easy for them to learn new materials and practice and how well it helps user keep track of their progress compare to traditional learning. The system is considered efficient if it receives a high rating on the aforementioned criteria. An efficient system means users are able to practice and learn in a more customized schedule and duration, learn materials and practice more efficiently and help users keep track of their progress better than traditional learning methods.

Effectiveness outlines users' performances using the proposed system and the degree that users are incentivized to learn more and spend more time on the system. The system is considered effective is users spend more time on average learning, believe the system is more effective and have better understanding of materials using the system than traditional learning.

Last but most importantly, we aim to analyze the gamification aspect of the system. Specifically, how does the system perform to increase user satisfaction and enjoyment. Does the proposed system make the learning process more enjoyable and fun for users to use compared to traditional learning? Does the incorporation of gamified elements provide more incentives for user to learn? What gamified elements are considered effective by the users? What are considered less effective? What other gamified elements do the users think that could make the system more effective? The system is considered fun to use if it received on rating on those scaled response question and believe many gamified element included in this system to be effective and fun.

An intuitive prediction is that the proposed system does make users spend longer on the system, but has no significant improvements on learning effectiveness. It is also possible to decrease the effectiveness of learning for users since users can be distracted by technologies and game-like features of the system. However, as long as the learning effectiveness stays about the same or does not reduce significantly, the proposed system can still be useful in terms of convenience and accessibility for users to learn. More importantly, the system is expected to create a more fun learning experience for users, thus giving them more incentives to learn new materials.

Chapter 4

Result

From the survey we conducted, we found that out of the 5 people who have used the website for learning and successfully finished the online survey, the website received a median of 4 out of 5 score on how it helps the user keep track of and manage their progress, with 1 being very bad and 5 being very good. Compared to traditional learning method of reading slides and taking face-to-face quizzes, lectures and exams, the system received a median of 4 out of 5. That is to say all the people agree that the system gives them a more fun experience during the process of learning. The system received a median of 5 out of 5 score on whether the system gives them more incentive to learn materials. The system also received a median of 4 out of 5 on whether the system is easier to learn materials than the traditional learning.

All users claimed they are having fun with the system. For other non-scaled multiple choice questions, the system received mixed opinions. Out of 5 people, 3 people believe they can learn more effectively using the proposed system. 1 person claimed the traditional method of learning to be more effective and 1 person is unsure which one is more effective. On the question asking whether they spent more time on the proposed system, only 2 people claimed that they spent more time using this system than traditional learning, while the

Question	Median score (out of 5)
How good a job do you think the website does helping you manage and keep track of your progress ?	4
Do you think the learning experience is more fun than tradition learning ?	4
Do you think elements like virtual currencies give you more incentive to learn?	5
Overall, do you think this website makes it easier for you to learn materials than traditional learning?	4

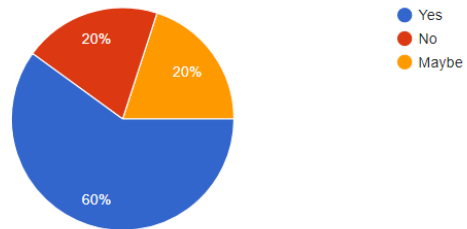
Table 4.1: **Survey result for scaled response questions**

other 3 reported that they spent less time.

The survey also involved several questions asking what game-like aspects do you like/dislike the most about and what features if added can make learning with the system more effective, fun and efficient. 5 participants all like different aspects of the gamification feature, but in total they covered all the features included in the game, such as narrative, items (especially the one that grants extra credit to the course), map visualization and being able to earn currency and purchase from stores. 3 people mentioned that the post format for giving out learning material is too dry and long to read through, indicating that a change in presentation of course materials might be needed. 1 person mentioned the incorporation of narrative gets in the way of actually learning the course material. In terms of the effectiveness of learning, 2 people mentioned that the incorporation of sound and animation can increase the understanding of materials. 2 people claimed there were too few questions available and a lot of duplicate questions when they redid the quiz multiple times. 1 person mentioned that the quiz model can be restructured to go beyond normal multiple choice questions, such as rapid fire rounds where you quickly type out the answers with time limits. Many people mentioned that either adding an overall progress bar or being able to see details about their past quizzes can help them keep track of their progress better.

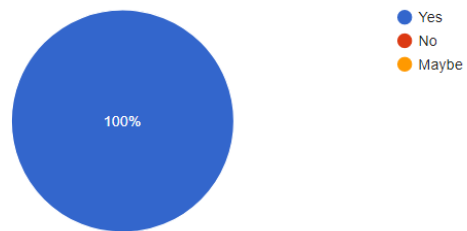
Do you think you learnt more effectively this way than traditional method?

5 responses



Are you having fun using this website?

5 responses



Do you feel like you spend more time learning using this website versus what you would do for traditional learning?

5 responses

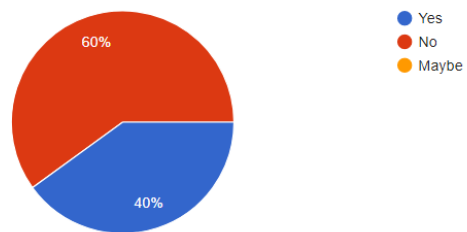


Figure 4.1: Pie charts for showing the distribution of choices for Yes/No/Maybe questions

Finally, the survey finishes with an open-ended poll where users can select or otherwise tell which gamification feature they would like the system to add. 2 people selected “boss fight” quiz, where the quiz is mimicking a boss fight and each correct answer reduces the health bar of the boss and you succeed the quiz by depleting the health of the boss to 0. 2 people selected adding more interactive images or animations to course material rather than just plain texts. 2 people selected making the quiz more interactive, i.e. certain items can be used during the quiz and have some effects. 1 person mentioned that adding NPCs with more personalities will make the system better.

All 5 people who finished the survey are either juniors or seniors. One interesting observation we made is that seniors, while still agreeing that the website is more fun to use than traditional learning methods, generally don’t think learning using the website is more effective and efficient and mentioned that it’s possible that elements like narrative can get in the way of their learning, while juniors generally believe the website is more effective to use and are willing to spend more time on it. This could provide information about what student group this system should be targeting and whether this system is suitable for people with limited time and under high pressure of learning. Either way, the result of the survey matches our expectation, that despite no significant increase in learning effectiveness and efficiency, the system is able to provide a more enjoyable environment for students to learn materials, and students generally feels they can manage and keep track of their records more easily and conveniently.

Chapter 5

Difficulties & Limitations

While the system has complete functionality as a gamified learning website, is bug free and easy for administrators to use, it does exhibit some limitations.

5.1 Early feedback, testing and improvements

The first difficulty is website testing, user evaluations/feedback and improvements on the website. The three seemingly separated aspects actually are tied closely to each other. We spent a lot of time thinking about what aspects of gamified elements or functionality to add to the website without finalizing a fully-fledged base model. This creates a lot of obstacles in the later stage of content and functionality design and creations where many features that are thought to be beneficial to the performance of the website are not implemented. This also ties to the second aspect of the limitations: user evaluations and feedback. A better approach would be, instead of brain storming various features and content creation methods, having the base model to be debugged and experienced by users first and asking for feedback. Then consider the result of the feedback when forming course content and

gamified features. This does not mean that all the features and elements that are included on the website should fully come from end users by any means. After all, the inclusion of features favored by users does not guarantee to make the system more effective. Still, feedback and evaluation on early stages of the production would help the system be better in production. This also leads to the third point, which is to improve on mistakes either made in the low level production code or higher level concepts. Earlier evaluation and testing should significantly facilitate the fine-tuning process of this project.

5.2 Technical issues

There are technical issues involved with Django code was deployed on a cloud server. The server behaves differently than running on local machines, which causes a lot conflicts and errors. While unused or deprecated packages can coexist with active packages nicely on local machines, it is not the case for online servers. The server constantly checks those unused and deprecated packages and generates error messages, which can be difficult to debug.

There is also problem with using existing libraries and packages. While there are existing models like quiz, shop and inventory that can be used for the creation of the project, the fact that those projects are built based off different versions of the framework makes them incompatible with each other and unsuitable to be incorporated. For the purpose of developing a fully-fledged and error free application, models are implemented from scratch. This process is purposefully under-emphasized as the purpose of this project is about gamification rather than the technicality of web application and programming language. For the same reason, the lack of time spent on error checking and handling makes the error more difficult to handle later in production. The lack of experience with fullstack web development

along with the unsystematic approach of handling technical issues winds up costing time for system building. Those time can be devoted more to adding features, course content creation and system evaluation.

5.3 Additional and improved features

The combination of reasons discussed in the first two sections leads to the fact that less gamified features are eventually implemented into the final system. Given more time, early feedback and better organization of the project, additional features like "boss fight" quizzes (where the boss has a life bar and each correct answer reduces health on the boss), more customization on user's profile (levels, experience, equipments) and better quiz model (being able to use items during quiz, sound effect, better visual representation) can be achieved. The way of presenting course materials also needs improvement. The original purpose of presenting course content as pure-text posts are to facilitate content creation and management, but it is hard for users to follow along with full texts, which is also one of the major features users complained about. All those features are proposed at the early stage of the design process and are favored by users according to survey results.

5.4 Limitation on test group/control group

The original plan was to divide test users into two different groups. The control group is learning through course content through traditional methods, i.e. learning from physical slides and textbooks and take in-person quizzes and exams. With the outbreak of COVID-19, distance learning and lack of access to in-person testers makes the traditional learning approach unfeasible and we now relied solely on the result from test group. The lack of comparison for end users could introduce bias where they might think one way but the reality

contradicts with what they thought. The fact that the survey are conducted on people that the author's acquaintance could introduce some bias where evaluation and feedback tend to be more positive and supportive. Testing the website on a wider audience would lessen the effect of the bias. There is also limitation on the number of people that have experienced and successfully finished the survey. Since there is only 5 people, the result concluded from this project might not significant enough.

Chapter 6

Conclusion & Future Works

6.1 Conclusion

In this paper, to address the problem where the learning process can sometimes be boring and users might feel less motivated to learn through traditional methods, we presented a gamified learning management system. The system has the basic functionalities to make it easier for users to learn materials, practice and keep track of their records. The survey showed that the system is successful in achieving that. More importantly, we incorporated the idea of gamification, that is to add features that are commonly only found in various form of games into the system to make it more fun to use and potentially increases the motivation for users to learn more. We found that the system is also successful in simply being fun to users. From the survey, however, we did not find an universal agreement from users on whether the system is better than traditional learning method in terms of efficiency and effectiveness. Furthermore, although more people claimed to feel more motivated using this system than traditional methods, the claim that it can increase motivation for users to learn remains to be ensured by further researching and experimenting.

6.2 Future works

There are two future directions where this project can lead to. The first direction has to do with gamification features that could be improved or newly added to the system. The second direction deals with content and model reformatting for the system to work better as a learning management system.

To start off, additional role-playing-game elements can certainly be added to the existing system to make it more fun and more like playing a game than learning a lesson. However, one has to be careful about making the system too fun rather than being effective. Further research needs to be done on the degree of gamification on the system so that the system remains to be fun but still efficient and effective for learning purposes.

The second one has to do with the diversification and generalization of the current model. Diversification means that the current model is not limited to its current form as a gamified learning system. It can be converted into a multiplayer classroom where there are more interactions between users and administrators. Right now the model has certain features that could make it more interactive. For instance, an authorized user has the ability to write thoughts and feedback by creating posts, which is visible by all people. Additional features like being able to host real-time video lectures and discussion forums where user can post questions, follow up questions and reply to other users will be appropriate additions to make it a multiplayer classroom,. The way of presenting course content can also be diversified to either short video lecture, graphs, or simply little mini-games with the purpose of presenting certain knowledge point. Generalization of the model means that the system is not limited just to users learning business. Depending on different subjects that users learn, the course content, quizzes and narratives can be fabricated to reflect that needs. In future works, a generalization of course content creation can be structured to target a wider audience.

The final remark is that due to unforeseeable circumstances, not enough participants are involved in the experiment and only 5 people successfully finished the survey. This makes our result, while showing the result we were hoping for, less significant and conclusive due to the small number of participants. In future explorations, more participants should be involved in this project to provide more data to analysis. Meanwhile, except for testing the system on different majors, a result for the effectiveness, efficiency and enjoyment of the system on business students solely would be beneficial.

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Appendix A

Additional Resources

A.1 Website

The online gamified learning and management system is deployed on pythonanywhere. The website link is : <https://misterfish.pythonanywhere.com/>.

A.2 Survey

The survey is conducted using Google Forms. The web link for the survey is:

<https://forms.gle/xm2iMqqMTywBe38E8>.

A.3 Code

The code for the entire project is uploaded to a github repository. The author has full authorization on the code. The code is open source and can be used for educational purposes as long as the author is mentioned for derivative projects. No commercial use is allowed without the consent of the author. The github repository is :

<https://github.com/sliu-trinity/Gamified-Learning-Management-System>.

A.4 Image Assets

All assets in this project are used for educational purpose only and are downloaded using free-copyright search on Google Images. Copyright experts are consulted before any of those assets are put into use to ensure that all assets used in this project are under fair use.