University of Nevada, Reno
Department of Computer Science and Engineering

Master CS

Project Part #1: Revised Concept & Project Management

Team 01
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1. Abstract

The most prevalent problem that the educational system has faced since the start of the pandemic has been how to shift a student base that is accustomed to learning in person to an almost fully online method of instruction. The goal of our project is to provide an engaging method of learning online that is tailored to each user. Our project leverages user's knowledge and interests with gamification to formulate the most engaging course content, and by doing so motivates users to continue learning. This document goes over the overall project, it's significance, legal and ethical aspects, changes made since the initial concept, responsibilities, risks, and the team members.

2. Project Description

Main Goals

The main goal of this project is to create an engaging application that motivates users to learn and want to continue learning. Master CS strives to create an experience that is tailored to the individual user. When users first create an account, they take a questionnaire that helps determine their main learning style and their interests. The application then gives users recommendations on courses and gives them study recommendations based on their learning style.

Intended Users

Our intended group of users are people who want to learn topics in computer science and instructors who want to teach on an engaging platform. Computer science is a growing field, and as a result more and more people want to receive an education in computer science.

Main Functionality and Capabilities

The main functionality that our application will provide is the delivery of educational content. Users will be able to navigate through curated topics in order to choose what they want to learn about. Each topic will have content in it along with a method of testing understanding. In addition to content delivery, our application will provide user statistics such as time spent on each topic, scores from individual quizzes, etc. Users will also have the ability to upload their own educational content for inclusion into the application base. The main characteristic of all of this functionality is the gamification of the process. The purpose of gamification is to help students be more engaged while learning. For example, when they do quizzes, they can be more integrated into learning. Our goal is to not only make educational content accessible, but also enjoyable.

Technologies

Master CS uses Vue.js, Node.js, Express.js, Bootstrap, and MySQL. The project is a web application, so users will be able to use Master CS on their computers or tablets.

Expected Dependability Properties

In terms of security, only authorized users will be able to view all of their profile information, they will be able to choose what is public, and their profile settings will always be accessible. For reliability, a majority of our system will be able to run if one component is broken. In terms of safety, our project will not be able to cause damage to its users or environment. One way we will achieve this is through moderator accounts that can easily block or limit functionality of user's if absolutely necessary.

3. Significance

This project is worthwhile to pursue because the demand for online learning has grown significantly. Users are able to learn on their own time at their own pace anywhere they want. Even with classes being in person, the need for an online learning platform is still prominent. Creating a platform for learning that is engaging and has features for all users is worth pursuing.

Professional Growth

This project will significantly help the team's professional growth. Through developing a website, the team will gain further knowledge on web development and the process of launching a finished product. More broadly, it will teach the team the process of software development through design, implementation, integration, testing, and maintenance. The development process will also help the team understand project management, in addition to learning how to work in a team to complete a software product in a timely manner.

New & Innovative Characteristics

One innovative characteristic of Master CS is the gamification. Many online learning platforms not geared toward K-12 ages are mainly focused on content delivery. Master CS makes learning fun for all ages. Another characteristic of Master CS is how versatile the platform is for all users. Our team has focused on allowing the user to customize their learning experience by providing different ways of learning. The user is not forced to follow one structured learning plan.

Similar and Related Projects

There are quite a few notable products that are similar to our own. Three of the most popular educational websites for computer science are Codecademy[website], Udacity[website], and edX[website]. In regards to indirect competition, it is quite difficult to find any to substitute the team's product. In our research, we found that there was a lack of educational websites that took a full teaching approach.

Market Potential

Despite there being numerous educational websites available, there is still a need for products that focus on individual learning needs. Master CS tailors the curriculum to fit each individual user and makes it engaging. From a market perspective, there is a continuously increasing demand for people educated in Computer Science, and Master CS is the perfect platform to do so.

Further Development Beyond CS 426

Beyond CS 426, our team would like to further develop this project from the instructor's point of view. We would like to allow instructors to host their class content on Master CS and use it as an alternative to Google Classroom and Canvas. We would also like to gamify the application even more by including more games and competitions.

Social and Environmental Impacts

The main social impact that our project has is helping with the shift toward online learning and making it more accessible. In terms of indirect environmental impacts, the resources used to get to an in person class and conduct an in person class will not be needed.

4. Legal and Ethical Aspects

Our project may involve legal issues related to video copyright. Our website is about a CS related online education website. Among them, video learning will be involved in the course. For the video resources of course video learning, we think it may face the problem of video copyright. For example, one of our courses is network security. The nature of the teaching video, whether it is free, whether it is allowed to be reproduced, source, background, etc. are the problems we have been thinking about. However, after the team discussion and asking the professor, we got a solution. We can embed the Youtube API for videos.

Regarding products in the ACM code of ethics, it means that software engineers should ensure that their products and related modifications meet the highest professional standards. First of all, we will ensure that our education website is targeted at all learners, from which they can obtain knowledge. The content we developed includes course chapters and contents, learning progress display, quizzes and final exam. After learning, users will see corresponding results, such as getting badges and rewards. In short, our website will not insert advertisements for the purpose of making any profit, which is not our purpose. We will ensure that the website is mainly for educational purposes, and there will be no advertisements or some content irrelevant to education. Secondly, we will try our best to achieve an appropriate combination of online and on-site. For example, students can register for the events to be held recently to give them more

opportunities to participate. In short, our website will pay full attention to guiding students in a positive environment ethically and morally.

5. Changes and Progress since the Initial Project Concept

For this educational website, our team has completed the setup of core components, such as the basic page framework and structure of the website, the course selection of the educational website, the sample of quizzes and videos are all working properly, as well as the database which involves users' personal information and the setup configuration for badge display part. This semester we have made some adjustments from the previous semester. Most importantly, we chose to use the front-end framework Vue, defined the language of the front and back-end connections related to the database, and restructured the features of the site. Previously, we were not using any framework, which caused us to copy or modify a significant portion of the completed code, like the navigation section which is included in all pages of the website. Using Vue simplified repetitive unnecessary operations. With our existing features such as videos, tests, badges and events, we decided to add some features to make this website more useful and feature rich. For example, we might add an autograder module, user ranking system, discussion forum and expand the quiz system with more details. Our major accomplishments on the project include finalizing the layout of the main website, porting the code created last semester into Vue, and testing the database connection.

6. Project Responsibilities

The main components of our project include the backend database, the site framework, the gamification of the website, the assessment of learning, and course content. The backend will be

constructed using a combination of Express and MySQL. Because of the copyright status of the content that will be used the site will never be hosted live. The framework of the site will be constructed using Vue.js. The gamification of the site will focus on achievements and progression with users being rewarded for various accomplishments throughout the learning process. The assessments will include course focused quizzes that can be linked to the achievements in order to determine meaningful progress. The course content will be sourced from an alternate location and most likely embedded on the webpage. We do not intend to host our own videos at this time. The following group members are responsible for each component.

- Austin
    - Backend (Database)
- Kayla
    - Framework
    - User Ranking System
    - Code Autograder (if time permits)
- Crystal
    - Achievement Badges
    - Leveling System (based on user progress, streaks, and goals)
    - Individual Course Pages
- Yan
    - Assessments
    - Improvement plan
    - Discussion forum
- Zhuqi

- Courses content design
- Chapter, video, learning progress display
- Concepts, projects, exams, etc

7. Project Monitoring and Risks

The team plans to monitor the project's progress by creating a detailed project management plan. This plan details what features need to be completed, who needs to complete them, and firm deadlines for those tasks. This outline spans multiple weeks. Additionally, the team created set meetings to go over what everyone has done, who needs help, and what needs to be done for the following week.

There are several risks in the development of the team's project. The first risk is code bugs and errors. A strategy for this risk is to constantly test our code. Added, each member of the team will make changes to the code on separate git branches before merging to the main branch. This will help make testing easier. The second risk is deadlines. The team has outlined a project management plan to help mitigate this risk to get tasks done on time. The third risk is the availability of team members. Due to busy schedules, there is a risk of a team member(s) not being able to fully contribute to the project for certain tasks. This risk can be managed by assigning deadlines and tasks. To ensure teammates get their task(s) completed, the team has implemented individual demos to the team of what feature that member has completed. The fourth risk is having enough features to make the software robust. This risk is managed by keeping a list of possible features to add and adding those features in based on the project management plan created by the team. The fifth risk is time to learn all of the necessary tools and technologies needed for the project. Recently, the team has decided to use vue.js and node.js for the website. All of the team members have little to no experience with these tools. As a result,

the team took a week for each of the members to learn what they can before starting the implementation of the features. The sixth risk is course video selection. The team took a risk to use embedded youtube videos for course video content. As a result, the team will not publish this site. The seventh risk is the team decided to restructure their requirements and features instead of what was intended the previous semester. This added more time needed and prompted the team to set firm deadlines for the new requirements and features. The eighth and final risk is lack of resources. This is a large risk the team is making. To mitigate this risk, the team got another advisor at the end of last semester as well as talked to the instructors about this issue.

Risk Register									
Risk ID	Risks	Current Risk			Raised	Mitigation Strategies	Residual Risk		
		Likelihood	Impact	Severity			Likelihood	Impact	Severity
Project Category: Development									
RP-1	Code Issues (bugs, errors)	4	4	6		• Testing • Separate branch	3	4	4
RP-2	Meeting deadlines	5	5	8		• Project management plan	4	4	5
RP-3	Business of member(s)	4	4	5		• Deadlines • Tasks • Team Demos	3	3	4
RP-4	Lack of features	5	10	16		• Feature list	5	9	10
RP-	Time to	5	4	5		• Week to	4	3	4

5	learn new technologies					learn			
RP-6	Course video selection	6	6	7		• Not publish site	5	4	4
RP-7	Restructure(requirements)	7	6	8		• Assign each team member specific tasks	6	5	7
RP-8	Lack of resources(users feedback)	8	9	10		• Communicate with advisors often • Test application on test users	7	7	7

8. Contributions of Team Members

Crystal Atoz: 2 hours

She worked on part 7 indicating the project risks and creating the risk register. She also helped with editing.

Yan Shore: 2 hours

She worked on part 5 Changes and Progress since the Initial Project Concept and helped with editing . She also discussed with other team members about the project and assignment.

Kayla Garin: 2 hours

She worked on the abstract, project description, and significance. She also helped with editing the document.

Zhuqi You: 2 hours

She worked on the legal and ethical aspects. She also helped with editing the assignment.

9. References

Codecademy (website). Retrieved from https://www.codecademy.com/.

edX (website). Retrieved from https://www.edx.org/.

Udacity (website). Retrieved from https://www.udacity.com/