SchoolSpace

by

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Submitted to
the Faculty of the School of Information Technology
in Partial Fulfillment of the Requirements for
the Degree of Bachelor of Science
in Information Technology

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April 2021

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ABSTRACT

SchoolSpace is the best solution for any parent or student concerned about Covid-19. By using *SchoolSpace* students can gain a better understanding of key curriculum classes such as Math, Science, English, History and even Chemistry. There are many functions that *SchoolSpace* can provide. By using *SchoolSpace* users will be able to learn these courses through both interactive mini games and cool visuals that will make learning the subject more fun. Additionally, users will be able to create their very own avatars that they can make it look as if they're actually in the game as well as interact with their own classmates!

1. INTRODUCTION

1.1 Introduction

Society is facing a pandemic like no one has seen or experienced before and it is not only affecting adults, but also children. All over the world schools are being held online and there is an ongoing debate on whether to allow kids to go back to school. According to Unesco, “The education of nearly 1.6 billion pupils in 190 countries has so far been affected – that’s 90% of the world’s school-age children.” One side says that going back to school is necessary, so kids don’t have a crucial part in their childhood taken away while the other side says that it is putting kids in the crosshairs of Covid. Video games have had a bad rap for being bad for kids, but that just is not true. On the contrary, video games help kids in many ways, such as making friends, building leadership roles, and also relieving stress. By playing video games kids can take a breath of relief from their normal day to day regimen of doing Zoom calls and we hope we're the type of people to do it.

1.2 Problem

The problem is that Covid is taking away kids’ social and learning time with their classmates. According to an article, stress in kids has escalated dramatically. Kids are basically told what to do and how to do it without having a say in the matter. On top of that kids are quarantined away from almost any interaction with both their classmates and friends, causing addictions as one mom told the Times, “I’m seeing 100% more behavioral problems,” says Stanton. “My son, who has learning issues, has three meltdowns a day. With my daughter, the problem became an addiction to the iPad. She has a TikTok account and created an [alias] of an older girl. We took the tablet away, and there were hysterics. She told us, ‘I want to be on the

tablet all the time because [when I am] I don't feel so lonely'." Based on the research we've done we haven't found any alternatives to either going back to school or staying online. But, we think if someone provides a fun and safe alternative for kids to both we can help kids retain their youthful experiences while learning at the same time.

1.3 Solution

SchoolSpace is a game where kids can create their own avatars to participate in classes, play with other students, and learn. *SchoolSpace* is an alternative for kids to keep being kids and to have fun learning with their classmates. The game will be a download from a website in which parents will have to create a profile (username and password) for their kids. Once the user logs into their account, they will be asked to create an avatar in which they can choose their race, hair, shoes, shirt, and pants. After the avatar is created then the user will be taken to a world that will be their classroom along with their other students. From there they can talk, play educational mini games, and learn.

1.4 Project Goals

SchoolSpace's objective is to help kids rekindle their excitement when going to school and participating in the classroom. The game will function like the kids are in their actual classroom. With this game, kids can talk, participate, and interact with each other. The game will be a more fun and safer alternative to going into an in-person environment while also easing parents', teachers', and governors' concerns. We hope for our solution to be implemented into K-12 schools nationwide and we aim our sights on fighting the virus with our own fun and safe way of learning.

SchoolSpace features will include:

- Users will be able to move their characters freely
- Users will be able to login into the game
    - Security
    - Database
    - Usernames
- A website will be made for parents to download the game for their kids
- The game will be run from a Server
- Assets - models such as buildings, avatars and desks
- Animations - to make the avatars and surroundings move
- Audio - to have sound, so teachers and students can here each other
- Environments and Boundaries - where the avatars can and can't go
- Teachers and Students will have the ability to share files to each other

1.5 Overview

Throughout this final report, there will be information on how the project was completed. The report includes in-depth processes and includes the following sections: design objectives, methodology, budget, timeline, problems encountered, and future recommendations.

2. DISCUSSION

2.1 Project Concept

The concept for *SchoolSpace* was inspired by the recent COVID-19 pandemic and wanting to find a way for kids to relieve the stress of going to school while the pandemic is going on. So, we came up with the idea of making an online learning tool to combat the virus while helping kids relieve some stress.

2.2 Design Objectives

The original idea of this project came from brainstorming solutions that the world needs right now. As the pandemic has been on everyone's mind in some capacity we knew a creative solution to teaching would be useful. Having to deal with online schooling ourselves, we saw everyone having to experience online video conferencing and a need for a different type of solution arise.

For our own goals we wanted to make a project that was new and exciting and would be a creative edge on competitors trying to solve this education dilemma. A game that could be used as a tool rather than a novelty. A game that would satisfy hesitant or concerned groups that aren't ready for students to go back to school. Creating a game with a real world purpose is also something that's different and would catch eyes rather than just another app that some college students made for a project.

2.3 Project Timeline

Table 1: Project Timeline The following diagram, Table 1, demonstrates the project timeline and when certain parts of the project will start and end.

Task Name	Duration (Days)	Start Date	End Date
1. 0 Project Management and Deliverables	232	8/24/2020	4/14/2021
1.1 Team Building	1	8/24/2020	8/24/2020
1.2 Ideas and Brainstorming	1	8/24/2020	8/24/2020
1.3 Fall Semester Assignment 0: Team Members & Project Name	1	8/24/2020	8/24/2020
1.3.1 Project Name	7	8/24/2020	8/31/2020
1.3.2 Project Logo and Branding	7	8/24/2020	8/31/2020
1.4 Fall Semester Assignment 1: Team Contract	7	8/24/2020	8/31/2020
1.4.1 Project Approval	7	8/24/2020	8/31/2020
1.4.2 Gantt Chart	7	8/24/2020	8/31/2020
1.4.3 Work Breakdown Structure	7	8/24/2020	8/31/2020

1.5 Fall Semester Assignment 2: Project Abstract for Tech Expo	42	8/31/2020	10/12/2020
1.6 Fall Semester Assignment 3: Team Contract Resubmission	7	10/5/2020	10/12/2020
1.7 Fall Semester Assignment 4: User Profile	14	10/5/2020	10/19/2020
1.8 Fall Semester Assignment 5: Use Case Diagram	14	10/5/2020	10/19/2020
1.9 Fall Semester Assignment 6: Draft Report	14	10/26/2020	11/9/2020
1.10 Fall Semester Assignment 7: Final Fall Semester Report	21	11/9/2020	11/30/2020
1.11 Fall Semester Oral Presentation	21	11/2/2020	11/23/2020
1.11.1 Presentation Practice	21	11/2/2020	11/23/2020
1.12 Spring Semester Assignment 1: Testing Plan/Report	28	1/11/2021	2/8/2021
1.13 Spring Semester Assignment 2: Abstract	7	2/8/2021	2/15/2021
1.14 Spring Semester Assignment 3: Draft Tech Expo Poster	14	2/15/2021	3/1/2021
1.15 Spring Semester Assignment 4: Final Poster	7	3/1/2021	3/8/2021
1.16 Spring Semester Oral Presentation	21	3/15/2021	4/5/2021

1.16.1 Presentation Practice	21	3/15/2021	4/5/2021
1.17 Spring Semester Assignment 5: Final Report	21	3/15/2021	4/5/2021
1.18 Spring Semester Assignment 6: Safe Assign Final Report	21	3/15/2021	4/5/2021
1.19 IT Expo	7	4/5/2021	4/12/2021
1.19.1 IT Expo Exhibit and Preparation	7	4/5/2021	4/12/2021
1.20 Spring Semester Assignment 7: Final Library Copy	7	4/19/2021	4/26/2021
2.0 Research	42	9/7/2020	10/19/2020
2.1 What Needs to be Done	21	9/7/2020	9/28/2020
2.1.1 Set Up Environment Layout	7	9/7/2020	9/14/2020
2.1.2 Setting Up Website	7	9/7/2020	9/14/2020
2.1.3 Determine Size of School	7	9/14/2020	9/21/2020
2.1.4 Best Subjects for School	7	9/14/2020	9/21/2020
2.1.5 Voice Chat	14	9/14/2020	9/28/2020

2.1.6 Look at Ways to Share Files	14	9/14/2020	9/28/2020
2.2 Requirements for Software	22	9/9/2020	10/1/2020
2.2.1 Study Unity	5	9/9/2020	9/14/2020
2.2.2 Look for Best Server Setup	4	9/14/2020	9/18/2020
2.2.3 Getting Assets for Program	2	9/18/2020	9/20/2020
2.2.4 Controllers	4	9/20/2020	9/24/2020
2.2.5 Setting Up Audio	4	9/24/2020	9/28/2020
2.2.6 Boundaries	3	9/28/2020	10/1/2020
2.3 Requirements for Safety	7	10/1/2020	10/8/2020
2.3.1 Find best Way for Login to Work	7	10/1/2020	10/8/2020
2.3.2 Set Up Database	7	10/1/2020	10/8/2020
2.3.3 Ways to Access and Modify Database	7	10/1/2020	10/8/2020
2.3.4 Set Up 2FA	7	10/1/2020	10/8/2020

2.4 Miscellaneous	7	10/14/2020	10/21/2020
2.4.1 Best Ways to Moderate	7	10/14/2020	10/21/2020
2.4.2 Animations	7	10/14/2020	10/21/2020
2.4.3 Minigames for Breaks	7	10/14/2020	10/21/2020
2.4.4 Best HUD look	7	10/14/2020	10/21/2020
3.0 Design	21	10/19/2020	11/9/2020
3.1 School Layout	7	10/19/2020	10/26/2020
3.1.1 Rooms	7	10/19/2020	10/26/2020
3.1.2 Atmosphere	7	10/19/2020	10/26/2020
3.1.3 Class Subjects	7	10/26/2020	11/2/2020
3.1.4 HUD/Menu Look	7	10/26/2020	11/2/2020
3.1.5 Student/Teacher Model Representations	7	10/26/2020	11/2/2020
3.2 Website Layout	7	11/2/2020	11/9/2020

3.2.1 Wix API Integration	7	11/2/2020	11/9/2020
4.0 Environment Set-Up	15	9/21/2020	10/6/2020
4.1 Setup Wix Site	15	9/21/2020	10/6/2020
4.2 Setup GitHub	7	9/21/2020	9/28/2020
4.3 Install Unity & Visual Studio	7	9/21/2020	9/28/2020
4.3.1 Set up Unity 3D Environment	12	9/24/2020	10/6/2020
4.3.2 Configure Unity and Visual Studio	12	9/24/2020	10/6/2020
4.4 Setup Firebase	12	9/24/2020	10/6/2020
4.4.1 Setup Database	12	9/24/2020	10/6/2020
4.4.2 Connect it with Visual Studio	12	9/24/2020	10/6/2020
4.4.3 Get Firebase Interacting with App	12	9/24/2020	10/6/2020
5.0 Development (Back End and Front End)	123	10/1/2020	2/1/2021
5.1 Player Controller	14	10/1/2020	10/15/2020

5.2 Lightning	14	10/1/2020	10/15/2020
5.3 Models	14	10/8/2020	10/22/2020
5.3.1 Students	14	10/8/2020	10/22/2020
5.3.2 Teachers	14	10/8/2020	10/22/2020
5.3.3 Moderators	14	10/8/2020	10/22/2020
5.4 Environment	109	10/15/2020	2/1/2021
5.4.1 Interactive Items	21	10/15/2020	11/5/2020
5.4.2 Not Interactive Items	21	10/15/2020	11/5/2020
5.4.3 Skybox	21	10/15/2020	11/5/2020
5.5 Object Models	95	10/29/2020	2/1/2021
5.5.1 Players	21	10/15/2020	11/5/2020
5.5.2 HUD	21	10/15/2020	11/5/2020
5.5.3 Menus	21	10/15/2020	11/5/2020

5.5.4 Icons	21	10/15/2020	11/5/2020
5.5.5 Scripts	21	10/15/2020	11/5/2020
5.6 Website and Security	21	10/15/2020	11/5/2020
5.6.1 Login Feature	26	10/15/2020	11/10/2020
5.6.2 Usernames	34	10/15/2020	11/18/2020
5.6.3 Website Textbook	16	11/29/2020	12/15/2020
5.6.4 Sales Tab	21	10/19/2020	11/9/2020
5.6.5 Script Interaction With Website	28	10/19/2020	11/16/2020
6.0 Testing	72	2/1/2021	4/14/2021
6.1 In Game Controllers	29	2/1/2021	3/2/2021
6.1.1 Voice and Chat Communication	29	2/1/2021	3/2/2021
6.1.2 Animations	29	2/1/2021	3/2/2021
6.1.3 School Objectives	29	2/1/2021	3/2/2021

6.1.4 Instructor Abilities	29	2/1/2021	3/2/2021
6.1.5 Outside Files For Class	29	2/1/2021	3/2/2021
6.2 Quality Assurance	30	3/2/2021	4/1/2021
6.2.1 Glitch Testing	30	3/2/2021	4/1/2021
6.2.2 Fixing Bugs	30	3/2/2021	4/1/2021
6.2.3 Polishing Game	30	3/2/2021	4/1/2021

Table 1

2.4 User Profile

Figure 1: Form 1 The following diagram, Figure 1, demonstrates the user profile for GitHub, Unity, Firebase, Wix, Visual Studio and C#.

User Profile **Form 1**
Application: **GitHub, Unity, Firebase, Wix, Visual Studio and C#**
Potential Users: **Developers/Administrators**
Software and Interface Experience: **The user should be familiar with the GUI used in the application's creation. The user should also be familiar with the coding used in the creation of the web application.**
Experience with Similar Applications: **Need to be familiar with the languages used in the creation of the web application. Should also be familiar with GitHub, and visual studio**
Task Experience: **Using the applications in the creation and maintenance of the web application SchoolSpace.**
Frequency of Use: **Once the website is created the user will only interact with the application as needed. The user will interact with the web application after its creation to stay compliant with security requirements, to correct application bugs discovered after launch, and to update features based on end user comments.**

Key Interface Design Requirements that the Profile Suggests:

This user will need to be able to work with the programming languages and interfaces to create and maintain the website properly.

Figure 1

Figure 2: Form 2 The following diagram, Figure 2, demonstrates the user profile for the SchoolSpace web application for principals.

User Profile

Form 2

Application:

The SchoolSpace web application.

Potential Users:

Principals

Software and Interface Experience:

Users should have experience using the internet and a social media website.

Experience with Similar Applications:

Unity Games

Task Experience:

Head of The SchoolSpace Server, makes sure students and teachers are behaving properly.

Frequency of Use: **Monday through Friday throughout the school year.**
Key Interface Design Requirements that the Profile Suggests: **SchoolSpace needs to be secure, easily accessible to the user, and easily navigated by the user.**

Figure 2

Figure 3: Form 3 The following diagram, Figure 3, demonstrates the user profile for the SchoolSpace web application for teachers.

User Profile **Form 3**
Application: **The SchoolSpace web application.**
Potential Users: **Teachers**
Software and Interface Experience: **Users should have experience using the internet and a social media website.**
Experience with Similar Applications: **Unity Games**

Task Experience:

Head of the classrooms, makes sure students are behaving properly, and learning.

Frequency of Use:

Monday through Friday throughout the school year.

Key Interface Design Requirements that the Profile Suggests:

SchoolSpace needs to be secure, easily accessible to the user, and easily navigated by the user.

Figure 3

Figure 4: Form 4 The following diagram, Figure 4, demonstrates the user profile for the SchoolSpace web application for students.

User Profile

Form 4

Application:

The SchoolSpace web application.

Potential Users:

Students

Software and Interface Experience:

Users should have experience using the internet and a social media website.

Experience with Similar Applications: **Unity Games**
Task Experience: **Kids going in to learn and have experiences for the adult life.**
Frequency of Use: **Monday through Friday throughout the school year.**
Key Interface Design Requirements that the Profile Suggests: **SchoolSpace needs to be secure, easily accessible to the user, and easily navigated by the user.**

Figure 4

2.5 Use Case Diagram

Figure 5: Use Case Diagram The following diagram, Figure 5, demonstrates the use case for SchoolSpace. The diagram shows all possible users with corresponding tasks.

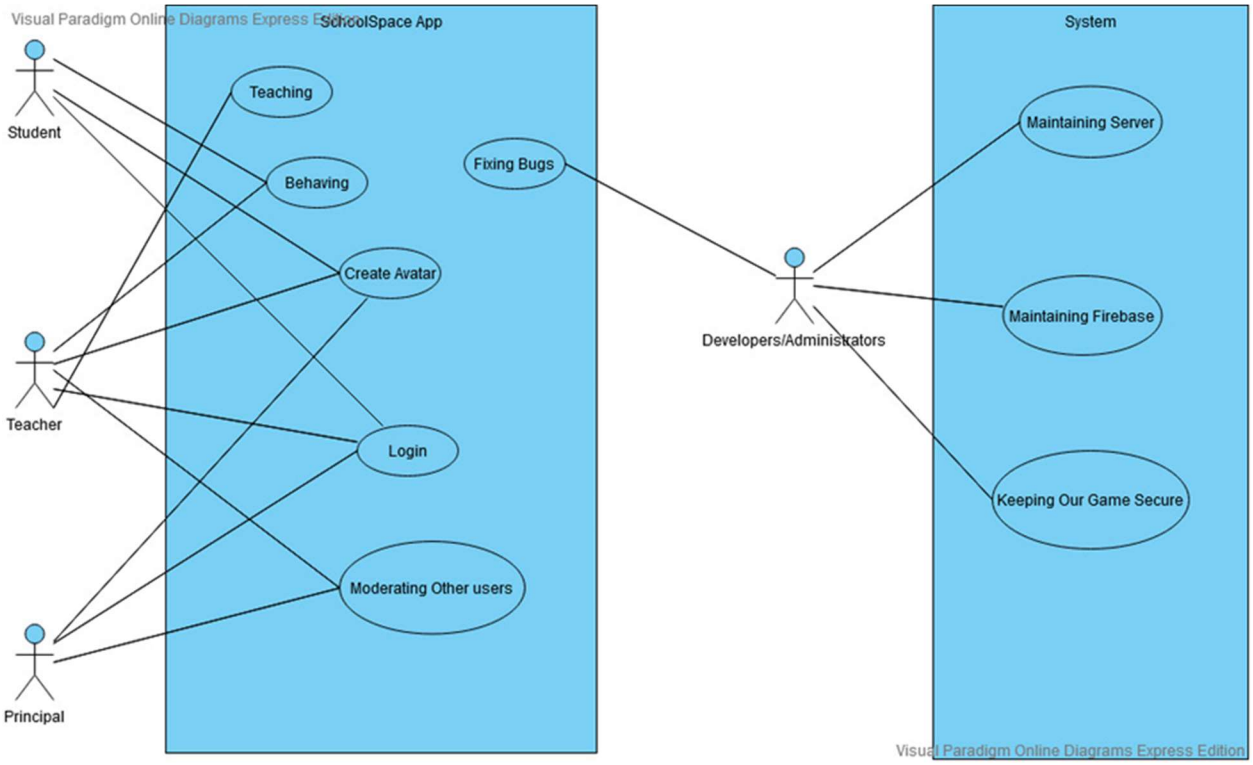

Figure 5

2.6 Technical Architecture

Our team strategically chose the technologies we would use for our project. These technologies cover the Website, Program, and Security architecture. Though they all require training to use, many of them are easy to learn. In order to keep the technologies updated and relevant, the business owner will need to be able to understand them. This explains the reasoning behind our technical architecture.

Website

The website is built on Wix.com. This is not the most technical choice for our project, but it is maintainable for our group to manage going forward. We use this website as the home for

our program. The website will have the installer for the website located in a different page from the home page. It also has a place where a user may create an account for saving their preferences for the game.

Program

The program is being built using Unity. Unity is a game engine that can handle 3D graphics and custom scripts. We picked this engine because of how easy it is to pick up and anybody and anything can run Unity. Unity has problems we didn't foresee such as not providing native multiplayer creation tools. Mirror, a third party modification, must be utilized for server-client framing. Assets and models we used were provided for free or used from Herman's personal collection. In the future we would need to receive licenses for using certain assets or hire a specialist for modelling our own assets. We used Unity Collaboration to work on the program together. This program was a first party tool to update the game whenever a team member made adjustments to it and store changes in the cloud. Unity Collaboration is free with three people, but a license is required for a larger team or large project file size. If this occurs in the future, we will need to move the project to GitHub, a free and team cloud storage tool.

Security

The security for this was implemented with Firebase. Firebase is a platform developed by Google for creating mobile and web applications. Firebase lets us create a database that we need for security and login features. We chose Firebase because it can work with the Unity Engine and we are familiar with it from classes at the University of Cincinnati. Firebase will provide the tools and platform we need to create and manage user accounts and backend data management.

2.7 Testing

The testing will be done by friends and family, and people who would have insight that can aid or give perspective on this project. Testers will be asked to navigate the website to download the program without aid to ensure an average user will be able to accomplish this. We will also be looking for impressions on the website design and security features like account login. When the game has been opened and finished loading the tester will navigate throughout the game. We will be looking to see if controls and menu navigation is intuitive. We are expecting to see older adults struggle more with controls than children and young adults due to exposer to online games being more prevalent in younger people. When playing the game, we will have testers play solo and with others to demonstrate multiplayer connectivity and chat functionality. When playing solo we will ask the tester to navigate the virtual school building and play through the minigames provided. We are expecting to see a successful transition between the player spawn point, navigation to the minigame area, transition to the minigame screen, completion of the minigame objective, and transition back to the game starting area. We will conclude each tester's session by asking them to fill out a survey and rate the website/game in its usability, complexity, and communication functionality. We will finish by asking for voluntary see back and features that they liked, did not like, and what they would like to see in future versions of the game. This feedback will help us plan for the future and rework existing features if the pose problems for testers.

2.8 Budget

Table 2: Project Budget The table below displays the budget for our project. It is an estimation of real-world costs. The budget represents what the small business would be billed for the services our company provided, as well as the costs to maintain the services we implemented. Many of the programs integral to SchoolSpace have costs that vary widely based on factors such as company revenue, number of team members, and web/program traffic.

SchoolSpace Budget				
NO.	ITEM	UNIT, HOURS	UNIT PRICE	TOTAL
SOFTWARE				
1	Wix	1	$276/yr	$276
2	Unity Personal (Revenue under $100K/year)	1	$0	$0
	Unity Plus (Revenue under $200k/year)	3	$399/yr	$1197
3	Firebase (based on amount of website account traffic)	1	$0	$0
	Subtotal			$1473
LABOR				
4	Maintaining and Updating SchoolSpace Unity Program	2	$125 (could cost if another member was added	$250
5	Website Build	2	$125	$250

6	Database Build	2	$125	$250
7	Security Modifications	2	$125	$250
	Subtotal			$1000
	Total			**$2473**

Table 2

2.9 Gantt Chart

Figure 6: Gantt Chart The following diagram, Figure 6, shows the Gantt Chart for SchoolSpace. The Gantt Chart shows the project schedule for fall and spring semester.

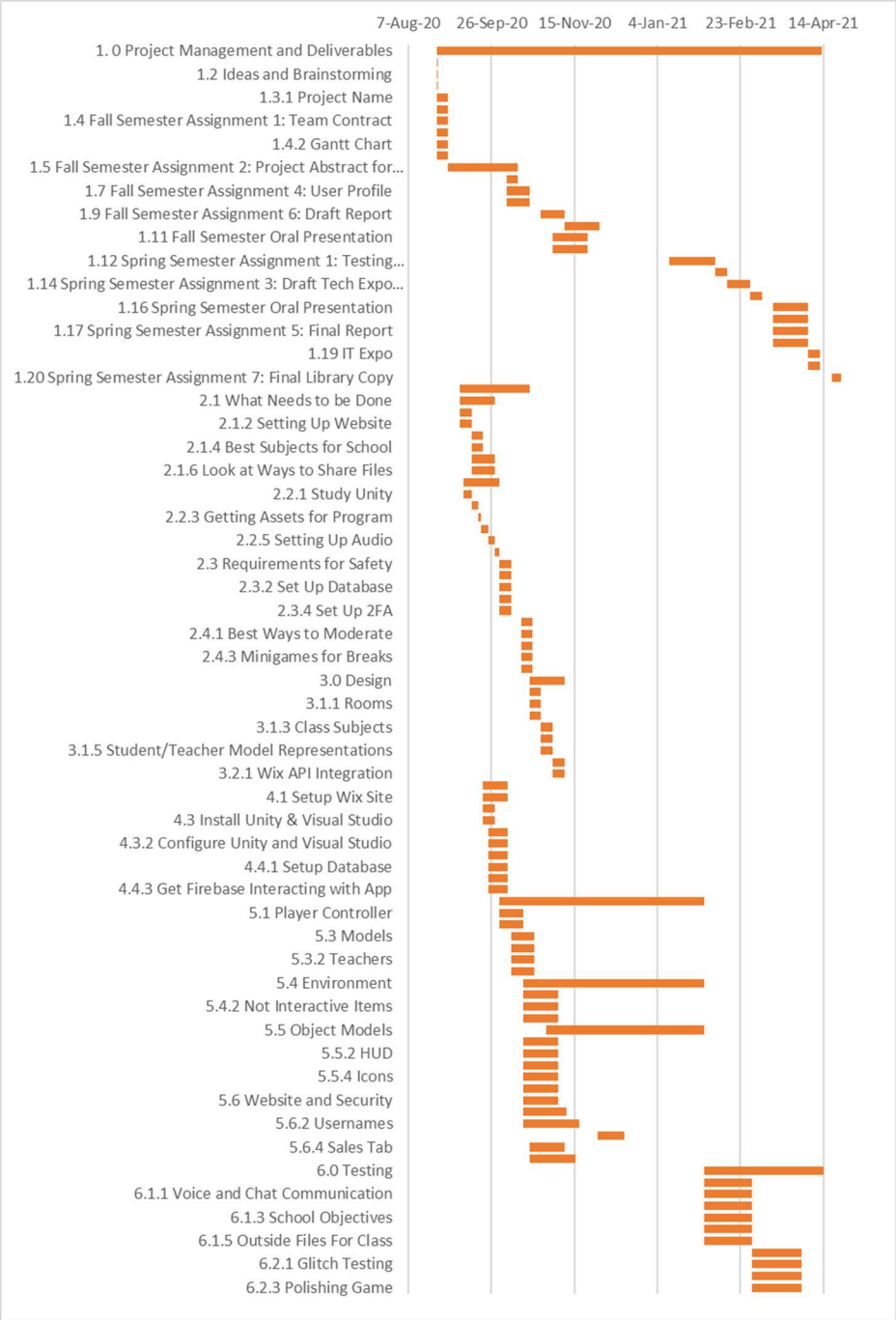

Figure 6

2.10 Problems Encountered and Analysis of Problems Solved

Nick:

There were some problems encountered when working on the product. For instance, when making the website there was issues trying to make the website more readable. So, to solve this we discussed as a team what colors look better for the website so that all audiences can read them.

There were also issues with working with Unity, mainly because it was brand new to Nick. To solve the issue, he researched more about how to use Unity as well as asked his teammates for help.

Chris:

As a student we do not have the experience of professionals to know what will and will not work. Many decisions came down to trial and error and some decisions were too ingrained to change such as changing website creators or games engines. Unity is not an optimal program for networking and learned that through experiences from this semester alone. We still do not know many of the odds and ends to creating games but continue to discover new things through guides or by accident. Diligence has also been an issue with self-governing project progress for the whole semester. We have never had the amount of freedom with creating this project.

Tom:

Because of how Wix works, he was not able to work on the website with Nick. He was learning about Unity throughout the course. He felt like he should have worked more often on this.

He tried not to annoy the group member and it took a while to find a use case diagram maker.

2.11 Recommendations for Improvement

So far, the project is on track to get done on time, but there is always stuff we could improve on. If we were to redo this project, we think we might have chosen Unity again but maybe investigate it more such as what it can do and perform to meet our goals. Some other improvements we could do as well is have more team members that are more familiar with such tools as Unity, so we can have more people working together on that aspect of the project. Our plan for this project is to go live by the end of the course, so everyone can download our online learning tool.

3. CONCLUSION

3.1 Lessons Learned

We have learned many new things through both this course and by doing the project. We have learned:

- Attention to detail
- Working in groups
- Meeting deadlines
- Planning out the work schedule
- Learning new tools

With these new insights into business, we are more prepared than ever to enter any field.

3.2 Abilities and Skills Developed Throughout Project

Our abilities and other skills have also developed throughout this project. For instance, Nick who majored in Cybersecurity learned more about how Unity works and is able to make a Menu for a game! We all also have the ability to get our stuff done on time, every time so we can meet deadlines. We've even learned how to perform cost and benefits for our project as well as planning out phases for the project.

3.3 Plans for Future

In the Future, our focus will be to continue to work on the website and learning tool, but our focus will be to make sure the learning tool works as it's supposed to. Our goal is to have improvements done such as better graphics and adding multiplayer functions.

REFERENCES AND APPENDIX

4.1 References

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4.2 Appendix