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## **Abstract**

This project was focused on building a website that helps students from Indian reservations to learn and practice math online and enrich their entertainment life. Effective implementation of my web application could help students there to deal with long-distance study. The web application will allow students to practice their math skills while playing games on the website. It will serve as an alternative to the current teachers of Indian reservation who need to go to each student's home to help them.

## **Introduction**

There are some Indian reservation areas such as Hopi which is an Indian reservation not far from us that does not have a richer education electronic system than us. Students there cannot go to

school very frequently because they live very scattered and they only have one or two schools

on one reservation. Some children give up studying due to long-distance study situations. Due to the outflow of young people, they are extremely lacking in educators, especially computer staff. So developing an educational website is a better way to let every student or children who need to study at school to learn math online. My website is a solution for them to build their teaching website. Students who live far from school can practice their math skills online and can get resources from the website. Teachers also can keep track of the student's learning process and connect with students when they have any problems.

Web applications are one of the most efficient strategies to achieve long-distance education, it allows you to fit your learning around your work and home life. You can usually also set your own pace of study. It is your decision as to when and where you study. It doesn't matter where you live. Teachers also can manage all the information on the website rather than working by hand which may take a long time to work and make more mistakes. Computers are a convenient tool to help teachers manage everything. This project was creating a web math game using unity to let students practice math problems at home at any time and teachers also can keep track of students' scores on the website.



The big idea of the project was developing a math game and Embed to the website which allows everyone to play with it. The data of games will also let teachers keep track of it. Using a game can improve the interest of students' learning math. They are willing to play the game more to practice their skills.

# Background

I have been to Hopi Reservation with Westminster people (a class from Westminster) during the last May Term. We spent two days in elementary school and did some activity there. AS a computer science major student, I talked with their computer manager and other school staff in the school. They told me some kids cannot study at home and they lack the kind of technology to develop a teaching website because they do not have developers who want to work there.

I thought I could develop a web application to help them with their website. I have taken a soft engineering class that develops a game using Unity 2D. And I was taking a web application class last semester which is learning how to make a website using HTML, CSS, and JavaScript. I was also learning some basic Django and SQL databases from these two classes which might be helpful to finish this web application. I have kept learning how to use Django and SQL for the past three months and I have learned many new database technologies from unity and Django website. Using a website and playing games on the website is easier for elementary school students. Games can also improve their interests and make students have more motivation. After logging to the website as a student, you can start the game by choosing a math model such as addition and subtraction. Then you have to give the right answer in a limited time. The question is getting harder and harder as you answer correctly. When you can not

answer right and the time is over, then the game is over, and it will show the score you earned at the result page.

## Methods

### Gaming part

Unity:

When I was trying to develop the gaming part, Unity is a powerful tool to develop a math game. I have some experience with Unity in my previous class. So I decided to use unity to develop the math game

interface and layout of the game:

Unity is very flexible with the interface and layout of the game, it allows me to design the interface using the tool that is inside Unity rather than writing code.

Math algorithm and function:

Unity allows C# to realize the function of games, so I was using C# for the five different models of math(addition, subtraction, multiplication, division and random). And I was also using C# to generate the result and all basic logic like changing pages and ending the game. C# has a powerful API to allow me to use it to fulfill all functions of my game.

WebGL: Unity can generate a web version of a game that will allow me to insert games to my web app in Django and HTML.

## Web App:

### Front-end

Html: this is a basic front-end web page development tool for me to use and it works for Django. So I am using HTML for all the web pages development/

CSS: I am using all CSS for the design part of HTML because the design of the website is not complex, CSS is easier for me to design the webpage.

### Back-end

Django: I planned to use Mysql for the database at first and then I talked with my advisor

(Kathy). She told me Django can fulfill all the databases for my website, so I had started learning Django and used Django to develop the back-end and Django also made it easier to test locally during the process. It has a powerful API to use for HTML and CSS and it also has an instruction on their website to teach me how to set up a database using Django. This is really helpful for me to develop the database because I have never learned anything about databases. The database includes all the information I need for the website. For example, both the username and password of students and

teachers. So this makes students and teachers sign up and log in to their page. It also saves the scores of the students when they play the game each time, and then the backstage of the teacher's page can return all the information in which teachers can keep track of all students' scores.

## Results

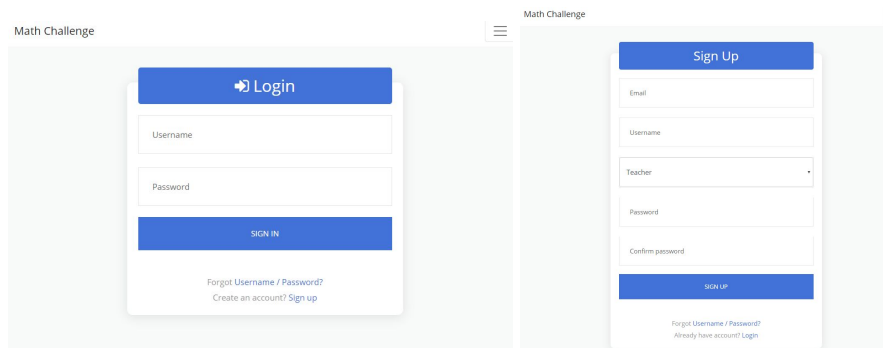


Figure1

Figure2

Figure 1 and show the first step of the website is that you need to sign up and log in to the website. In the signup page, you need to give your information and choose if you are a student or teacher, this will bring to a different page after you log in to the website, students are going to the game page and teacher is going to the teacher's page. After you sign up, it will go to the login page, you can log in to the website.



If you login in as a student, then this game page will show after that, you can click play to start the game and choose the model you want to practice. Then the game will start and the timeline is working, when the time is run out, then the game is over and it will give you the score of this time and the highest score you earned before.

## Students' Score

ID	Username	Email	Score	MaxScore	Play At
1	asd	asd@asd.com	4	4	3 weeks, 5 days ago

If you login in as a teacher, then the backstage of teachers will show after login in, as a teacher, you can see the information for each student such as name, email, score, max score, and playtime.



Math Challenge

Home

Login

SignUp

Math Challenge

Home

Login

SignUp

Math Challenge

Home

LogOut

You can find there is an options list on each page that shows pages you can go to for now, and you can log out if you want to change the account or quit the website.

## Discussion

The main goal of this project was a final test for my developing skills and self-study of new technologies. Therefore, the main objective was to learn more technical skills than theoretical skills. I believe that learning how to create an entire web application was a big learning experience that developed technical skills. Most of the functions that I created in the web application and databases were new for me or the development of existing skills.

Since I had no knowledge and experience of databases, it was a learning process for me to start this project. The Django and Unity websites give me lots of instructions to

learn, and this makes me realize that the most important skills of a computer science major student is self-study, you can find any resources you want online, and the college education is not enough for your technology skills. When I was trying to make the Django works, it was not that easy, it gave me many errors even though I followed the instructions exactly. The developing process is the error fixed process and the self-study process.

Creating login and sign up was no easy task, this is much more difficult than what I thought before, it takes me one month to work with it and I planned to use one week to deal with it, so this may let me think about the time management for one project. Everything should be planned to start early to leave more time for those tasks you did not think would take too much time but it is actually.

I am excited that I have learned lots of databases and unity back-end technologies while I was developing this project. This is really helpful for me because I want to become a web developer in the future. And the process of this project made me realize that self-study is the most important skill of a developer. The most different thing between computer science and other majors is that you need to keep studying in your whole life to follow up on the technologies.

Developing the whole web app improved my web development skills and software programming skills for games, I have learned many new skills, especially Django and

database skills. This is a good opportunity to learn the back-end skills which I have never learned before I graduate.

## Conclusion

The project changed some functions from the proposed idea to make it reasonable. Since I planned to let students see their information such as points and accomplish. I think it is more important to let teachers see those pieces of information, so I was focused on making both teachers and students pages work. And due to the time limits and the game is easy to understand, I decided not to put the game instructions on the websites. Teachers can send a simple instruction email to the student directly. And students can not provide feedback to teachers on the website because I do not have time to develop that function. If I have more time in the future, I will develop the game instructions and feedback system sections for the website. Since the database was set up successfully, this is not complex to develop.

Overall, the web application has a basic function for both teachers and students to use. The database is functioning, and features related to the database are working. The whole Unity game is embedded in the web application and worked successfully. This website is easier for students and teachers to use and it is running smoothly. The application makes sense to an average user.

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