SAME: A complementary eLearning platform for High School Students

Symbat Bekzhigit
New York University Abu Dhabi, sb7971@nyu.edu

Andy C. Quintuna
New York University Tandon School of Engineering, acq3433@nyu.edu

Mohid Raza
New York University Abu Dhabi, mr6174@nyu.edu

1. Introduction

The SDG goal that our group decided to focus on for our product was quality education. We believe that quality education is an important basis in order to continue building a strong and reliable future for generations by taking part in the cause of educating the younger generations to prepare them for the future. We found a research paper titled *The Impact of Human and Computer Interaction on eLearning Quality,* that talks about the impact human computer interaction had on education (Alebeisat et. al., 2022). It brings up an important term which is "eLearning" which is the use of technology in the role of education and imparting knowledge. The paper talks about converting education resources into digital format to enable more flexibility in teaching methods and introducing more interactivity for students to enhance their learning. The digital format enables professors or instructors to present the information in more creative ways which can lead to students interacting more with the content allowing them to take more interest in the course and thus retain the information more effectively. Another important paper for us was by Clara Cahill et al., in which the researchers introduce a novel system named "Zydeco" designed to facilitate students in conducting seamless inquiries spanning both school and out-of-school contexts, such as museum visits (2010). Zydeco comprises two components: a web-based interface for students to establish goals, formulate questions, and categorize information for their science investigations before visiting a museum, and a handheld device equipped with this information for students to capture, tag, and annotate data while at the

museum. Later, students can access their notes, tags, and annotations in the classroom. With this in mind serving as our inspirations, we created a web application with the purpose of enhancing learning for students from the comfort of their own home. We aimed to implement different technologies such Virtual Reality (VR) and Augmented Reality (AR) to enhance the quality of education our application will help provide. A web application is accessible to students and provides the capability to implement VR and AR in intuitive ways such as simulating the scenario of a chemistry lab, allowing students to experience hands-on learning from their homes. This provides students with resources that schools may not afford or the student may find difficulty in accessing for example being too far away from the school.

2. Design

The 3 main personas that we identified for our product were high school students, teachers (teachers, teaching assistants, etc.), and parents. We also wanted to give parents the ability to check on their own children's progress so they can be more involved in their educational journey. Thus, we created 3 separate interfaces for each personas having access to different features. For example, teachers obviously have administrative powers in managing their courses such as adding new topics, quizzes, and adding activities for the student to take part in. Parents get to view the progress of their multiple children (if they have multiple) in the different subjects such as grades, attendance, and whether they are meeting their deadlines. They will also be provided with the contact information of the instructors in case they want to get in touch about their child's progress. Students, as one of our main focuses, have access to multiple features in order to enhance their learning experience. Being able to access different kinds of activities tailored towards different topics such as labs for science classes, 3D graph manager for Maths class, and a time-based coding activity for Computer Science class. These additional activities supplemented on top of their usual daily studies make sure that they are grasping a better understanding of the concept by making them take a more hands-on approach to these topics and to think more creatively instead of the usual textbook revision. The layout of our web application was inspired by Brightspace and so we took what we felt are the most important aspects and put them in the front of our homepage which are announcements, quizzes, and the topics. This means seamless access for students when they want to do an activity or quiz. The teacher's homepage had a similar layout to the student's homepage with the added function of being able to add topics and quizzes. We focused on making sure that the teacher was well-informed about their progress during adding a topic and quiz by providing a progress bar at the top and providing a mock graphical layout so they can easily visualize the topic they are creating. For the parents page, we utilized drop down boxes in order to make the page not feel too cluttered and the parent can selectively view the information without unnecessary information cluttering their view. For the tasks, we aimed for the student personas to complete the activities for all 3 subjects in order to showcase how we plan to implement VR and AR into the platform and how effective the user thinks it would be. The teacher persona focused on adding an activity and quiz in order to test the

UI and to make sure the teacher would feel informed throughout the process and whether they understood the progression of adding a course correctly. The parent persona simply focused on accessing their page and to view the grades of their child to test whether all the information a parent would want to see for their child is present in a neat and presentable way.

3. Lessons Learnt

Our journey in developing this application has been enlightening in many aspects. Through iterative rounds of prototyping and evaluation, we gleaned valuable insights that shaped the refinement of our product. Here, we delve into the surprising discoveries and anticipated findings that emerged from this iterative process.

Surprising Lessons:

1. Challenge of Clarifying Features in Paper Prototypes:

During the initial paper prototyping phase, an unexpected hurdle surfaced as we grappled with the difficulty of effectively communicating certain features. The inherent limitations of the static paper medium and the absence of dynamic elements and interactive functionalities in it impeded our ability to articulate nuanced aspects of our product during paper prototype evaluation. This revelation underscored the critical need for clear communication strategies, as the static nature of paper prototypes demanded heightened precision in conveying information. The revelation prompted a reevaluation of our approach, recognizing the unique challenges posed by static prototypes and emphasizing the importance of clarity in communication.

2. Importance of Functional Elements in Prototypes:

Another essential lesson garnered from our prototype evaluation process underscores the imperative for every element incorporated into the prototype to be functional. While our intention was to include all interactive features envisaged for the product, time and platform constraints led to certain components lacking associated actions during the evaluation phase as we mainly focused on the interactive elements that were involved in the main tasks we asked users to do. The revelation that users instinctively endeavored to engage with all visible components, regardless of their role in primary tasks, dawned upon us. This underscores the critical importance of ensuring operability for all interactive elements, particularly buttons, to deliver an authentic and immersive user experience.

3. Intuitive User Actions:

Surprisingly, during the evaluation phase, we witnessed the natural and intuitive actions of users navigating our prototype. One notable instance was their effortless discovery of the log-out button by instinctively navigating to the profile section. This unexpected observation highlighted the inherent user-friendliness of our design, demonstrating that certain navigation paths, while not explicitly outlined, were easily discerned by users. This revelation emphasized the significance of not just explicit guidance but also the cultivation of an intuitive interface, where users can seamlessly engage with the product, fostering a positive user experience even in the absence of overt instructions.

Not Surprising Lessons:

1. Design Inspiration from Existing Applications:

It was not a big surprise, but it is worth highlighting how important it was for us to look at other successful and user-friendly apps when creating our own. Learning from what works in similar apps helped us ensure that our design follows established principles for user interaction and experience. By borrowing insights from successful models, we did not only strive to meet industry standards but also incorporate proven strategies to make our product easy to use. This approach provided a strong foundation and allowed us to benefit from the collective wisdom of successful designs that came before our product. This approach aligned with our commitment to user-friendly design and our ongoing effort to create an innovative and easy-to-use solution.

2. Facilitator Engagement for Meaningful Feedback:

The other lesson learnt that was not so surprising was how active one has to be in the role of a facilitator during the evaluation process. Facilitators played a key role in guiding users through the product assessment, ensuring not just interaction but extracting meaningful insights along the way that directly contributed to refining the user experience. Through asking users to think aloud while interacting with our product and voicing out their experience, facilitators played a crucial role in eliciting nuanced feedback and in bridging the gap between user expectations and evolving product design.

3. Divergent User Opinions:

Encountering diverse opinions during the design process was an anticipated insight, given the inherent variability in user preferences and requirements. It was not surprising that user feedback presented a spectrum of perspectives even within a small user group, and our challenge was navigating this diversity while aiming to address the broad range of user needs. The acceptance of conflicting feedback as a constant consideration underscored our understanding of the dynamic nature of user expectations. This acknowledgment guided our approach, recognizing the

inevitability of varying opinions and reinforcing our commitment to iterative refinement to accommodate the diverse preferences within our user base.

4. Revisions

After initial the initial round of prototyping with the paper model we've implemented these changes based off user feedback:
- Simplify the math activity instructions
    - Instructions were very clear but required a lot of reading from the user
- More clearly clarify how the reset button works for the chemistry activity
    - Users were wondering how far back the button would reset their progress, some liking both resetting the whole lab in just one step.
- Provide a default code structure for the coding activity.
    - The drawn ide was empty and users would have liked it to be more clear where they would be coding.
- Clarify that the "lesson" in our product is more so the theme that the activity and quiz are tied to.
    - Some users didn't understand the lessons are tied directly to an activity and quiz when trying to add a lesson as the teacher persona.
- Add in the option to view if a child turned in an assignment late and sections to see instructor feedback
    - Currently the parent account just sees their child's grades and users expressed they would like to see more information about how the child is doing in a course.
- Add in ways of contacting the instructor as a parent.
    - Users stated they would like an easy method to talk with the instructors directly to learn more about how their kid is doing and what could be done to help.
- Separating the courses by tab for the parents viewing their child's grades.
    - Right now it's all laid out but users explained they would like more organization and less clutter so they could focus on one subject at a time.
- Combine the different login buttons to a single one
    - Users thought it was very clear how each persona would login but a little redundant to have separate login buttons as the emails and passwords for each account would be unique anyways.

After the medium fidelity prototyping round we would implement these changes:

- Add more instructions to the activities themselves and not just about the interface.
    - Users commented that they expected to do more in the activities and that the '?' symbol would provide further steps.
- As a parent to more clearly show how their child is doing in school overall.

- For the parents page users thought it would be nice to see the students overall gpa or similar metric.
- As a parent view more about the subjects and topics their child is taking
    - Users expressed it would be nice to have more information available for the parent to better understand their kid.
- List all assignments and quizzes that are due.
    - Users liked how announcements were laid out and wished something similar for tasks students needed to get done.
- As a teacher add the option of creating multiple quizzes for a topic.
    - Users explained that not having a quiz tied to a topic would be more practical as many teachers tend to stay on certain topics longer than others.
- Being able to write a skeleton structure when adding the coding activity as a teacher.
    - Currently the space for students to write code is blank and as a teacher it makes sense to provide some starter code to guide students.
- Allow students to view their grades in one place.
    - Users would like to view them similar to how parents are able to.
- Add move around and add color to the layout and buttons of some activities and pages.
    - It wasn't immediately clear to some users that they could use the course bar to directly move to different sections or where each button was located.

5. Individual Contributions

All members equally collaborated during all the stages of prototype development and testing throughout the semester. We held weekly meetings for brainstorming sessions where all of us equally contributed ideas and collectively built the application.

During paper prototype development, Symbat was in charge of documenting the ideas during meetings and crafted the paper prototypes for the Login page, Main Home Page, Course Main page, and Math Activity page. Mohid was in charge of making the Profile page, Quiz Page, Coding Activity, and Main Page for the Parent account. Andy was in charge of making the Teacher Lesson, Activity, and Quiz pages, as well as the Chemistry Lab Activity. During all the in-class evaluations, all of the group members assumed various roles, functioning as Facilitators, Note-takers, and "Computer," and effectively executing the tasks associated with each role. For the Assignment 3 write-up, we equally divided the work among the group members as well: Symbat wrote the first two sections, Mohid wrote sections 3 and 5, and Andy wrote sections 4 and 6.

During the medium-fidelity prototype development, all of us attended the meeting where we discussed the feedback we got from the in-class evaluation and brainstormed together on the revisions we could make for our product and the lessons each of us learned. When creating

Balsamiq wireframes, each team member focused on the specific pages they had worked on during the development of the paper prototype. During the in-class evaluation, all of the group members assumed various roles to the best of their abilities, functioning as Facilitators and Note-takers, and effectively executing the tasks associated with each role. For the Final Paper, we divided the work between the group members in this way: Symbat was in charge of writing the "Lessons Learnt" and "Individual Contributions" sessions making sure that all other group members agreed with the stated contribution by each group member; Mohid was in charge of tying together relevant information from previous assignments and writing the "Introduction" and "Design" sections; Andy was in charge of refining the "Revisions" section with the feedback gotten from the recent evaluation round as well as recording Screengrab and taking photos of the prototype for the "Addendum" section.

6. Addendum

Images
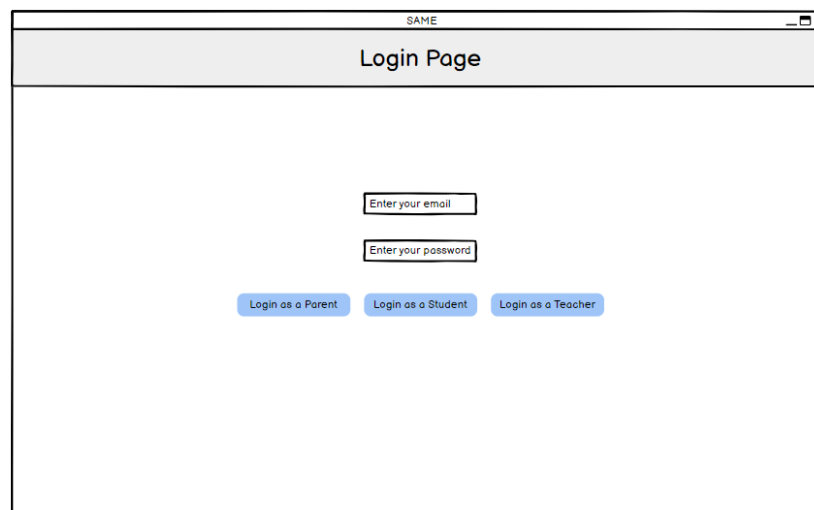
Figure 1: Login Page
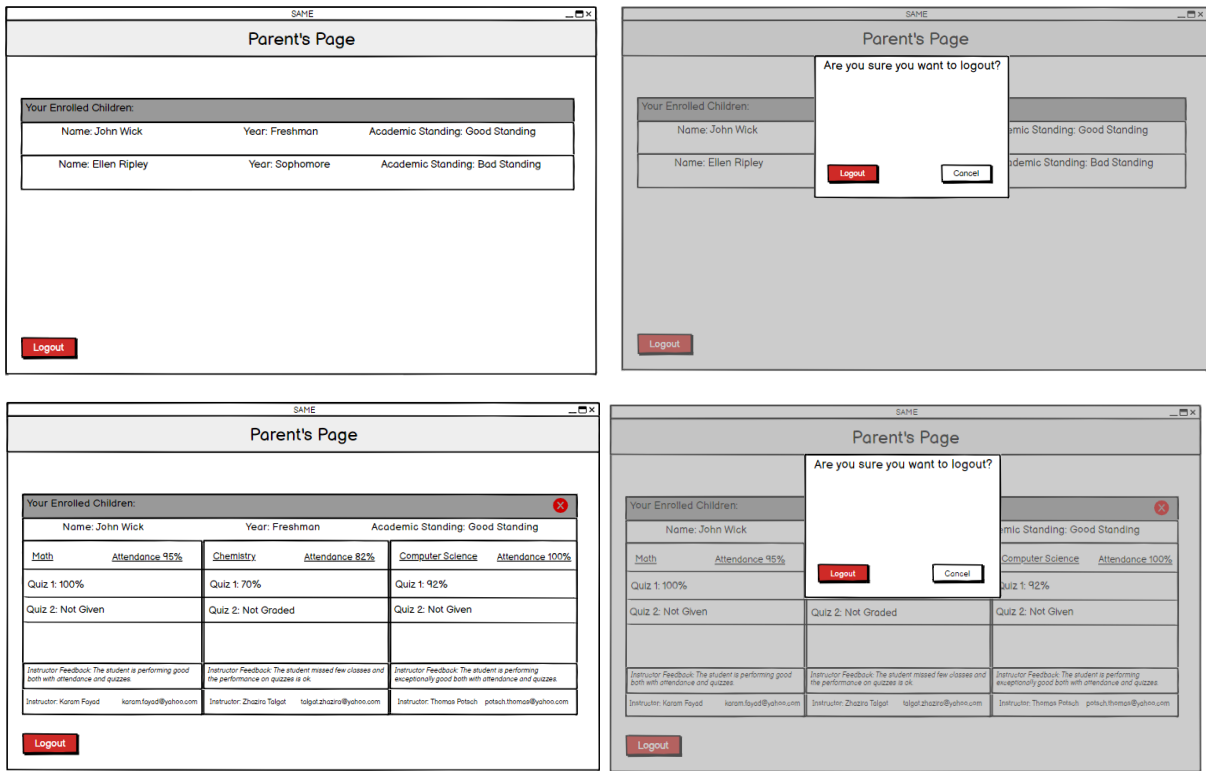
Figure 2: Parent Account Page and Pop-ups
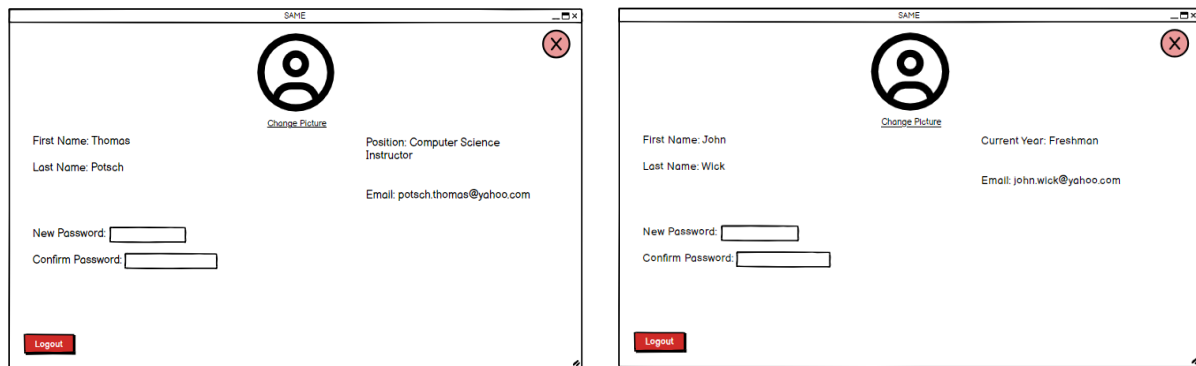
Figure 3: Student and Teacher Profile Page

Figure 4: Profile Page Pop-ups
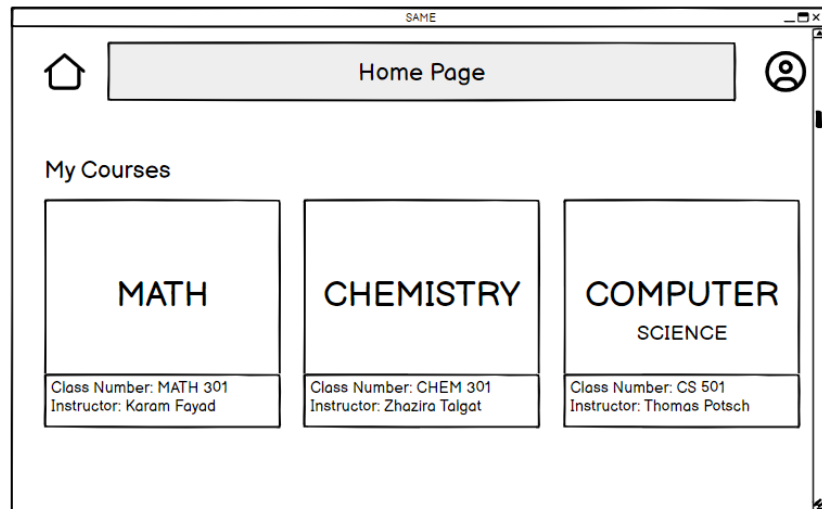
Figure 5: Student Home Page
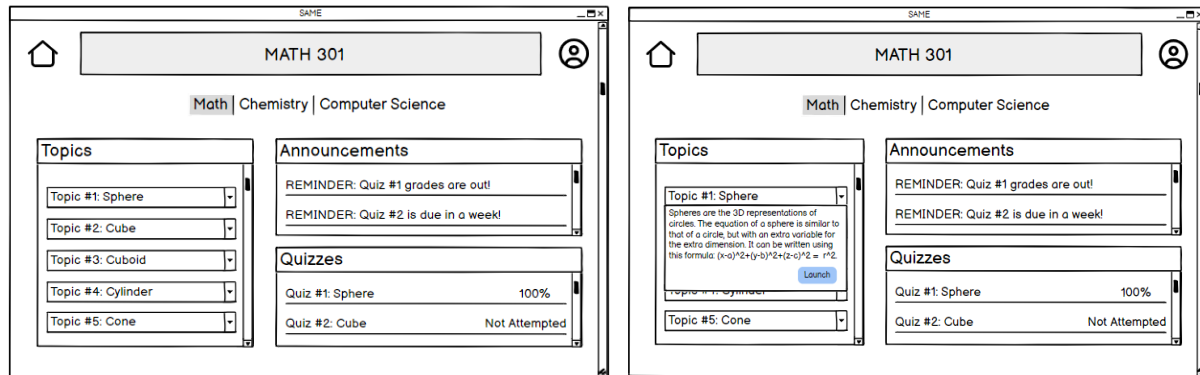
Figure 6: Math Course Page
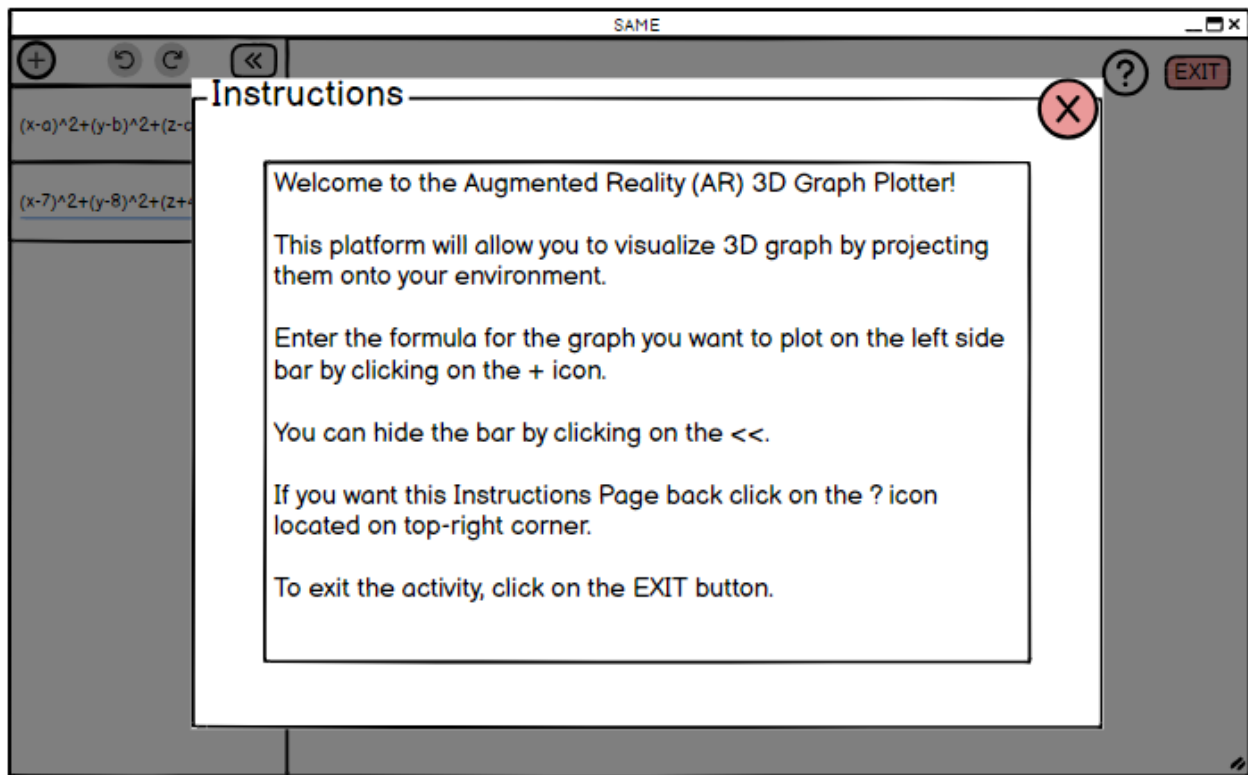
Figure 7: Math Instructions Page
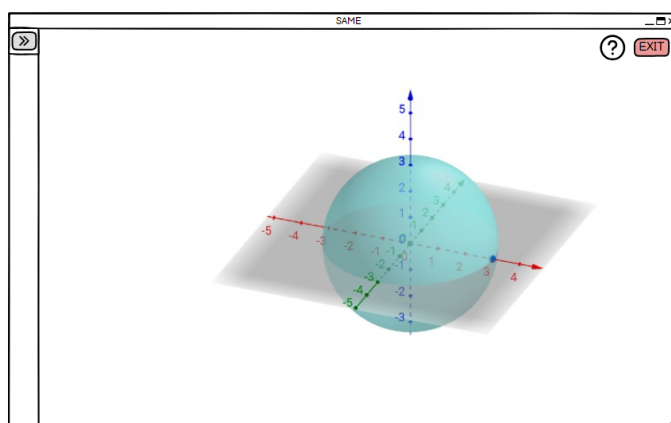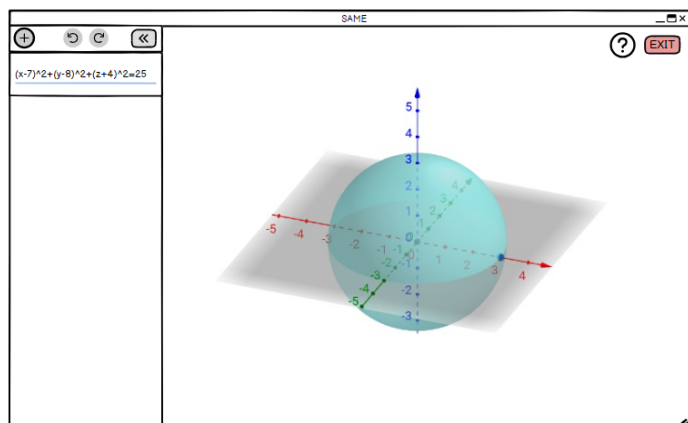
Figure 8: Math Activity Page
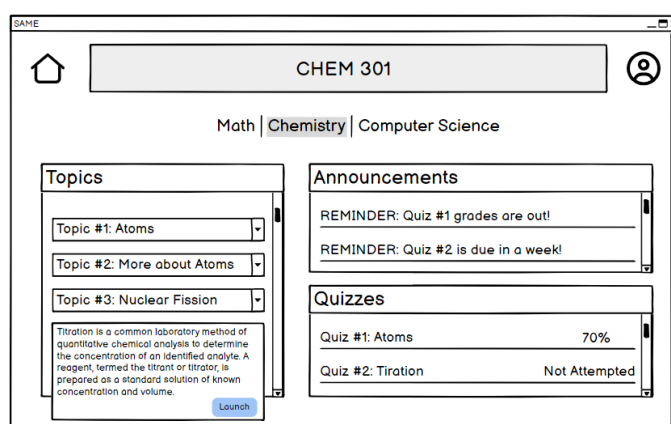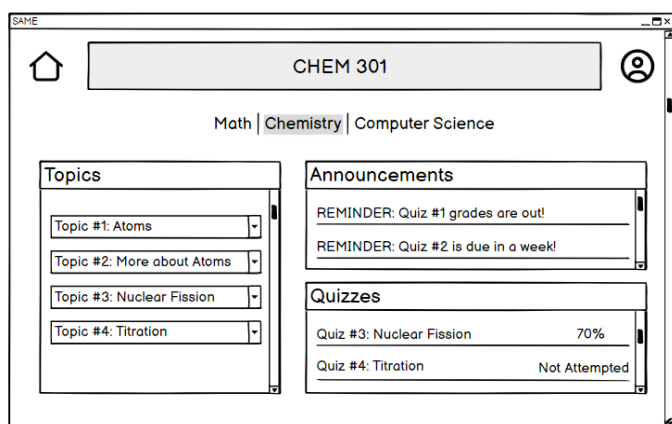
Figure 9: Chemistry Course Page
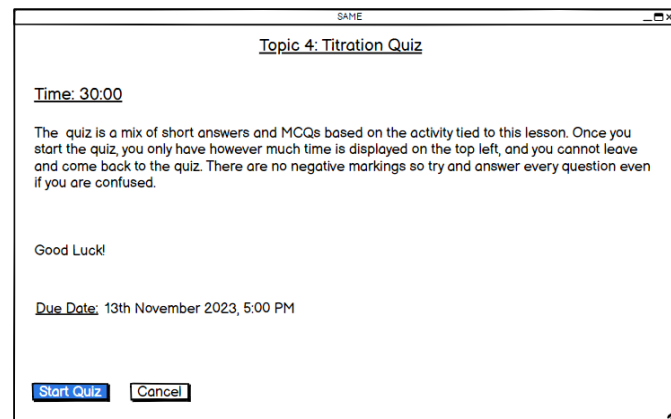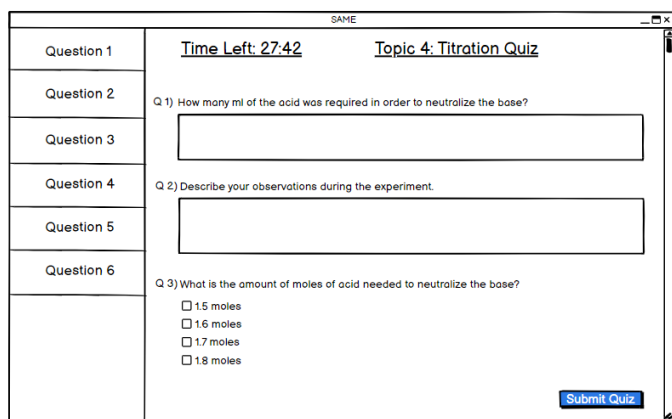
FIgure 10: Chemistry Quiz and Instruction Pages

Figure 11: Chemistry Quiz Submission and Completed Page

Figure 12: Chemistry Instructions and Lab Page

Figure 13: Computer Science Course Page
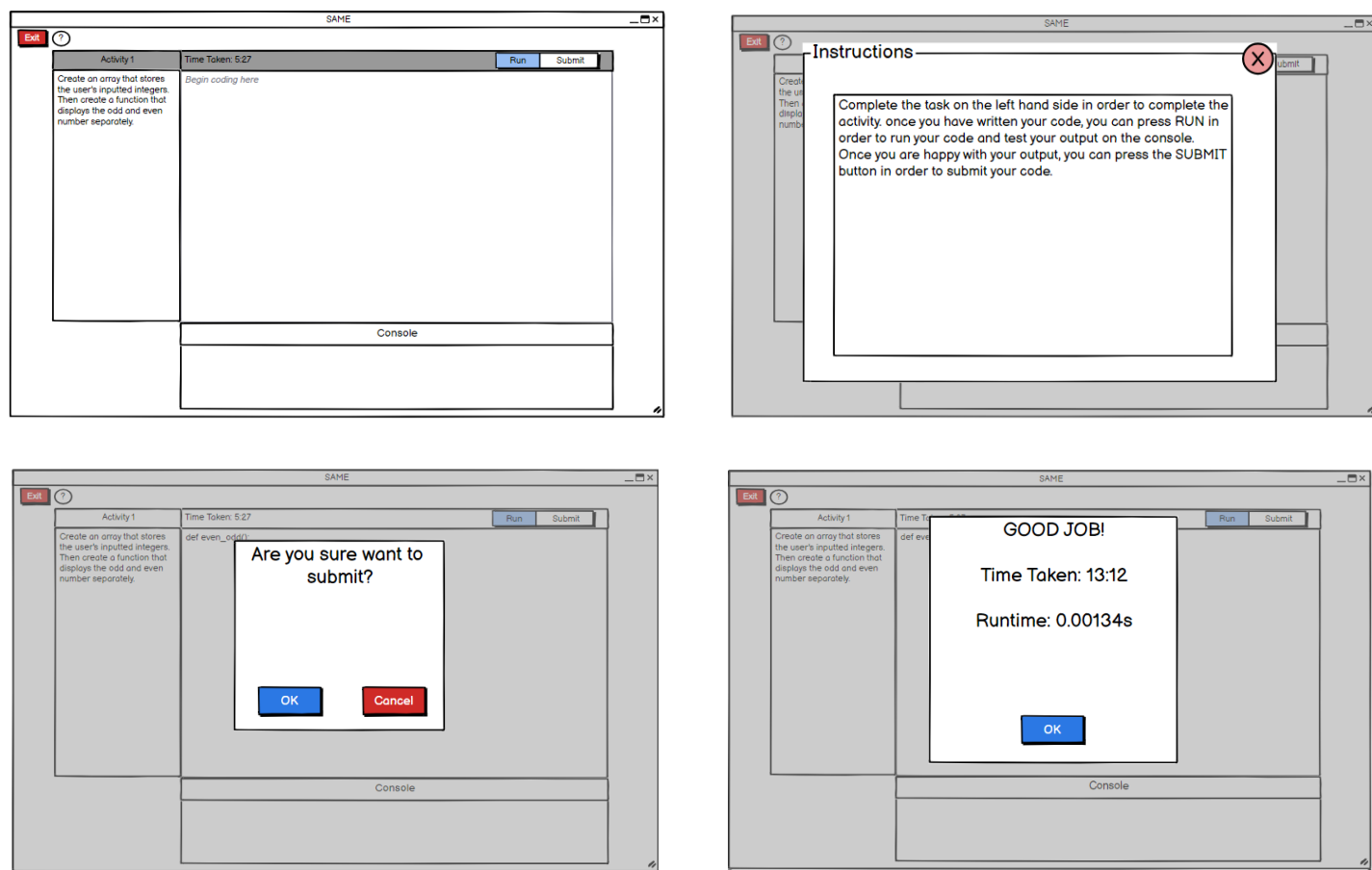
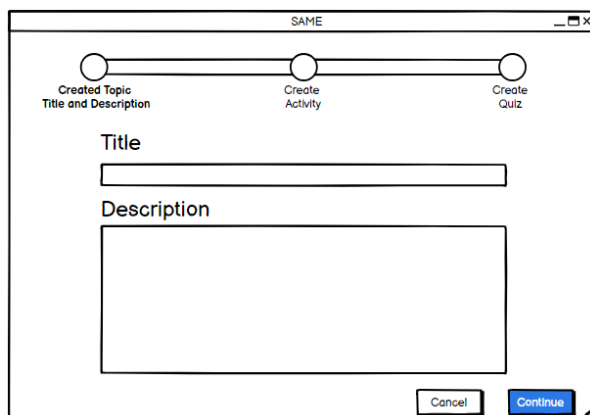Figure 14: Computer Science Activity and Pop-ups
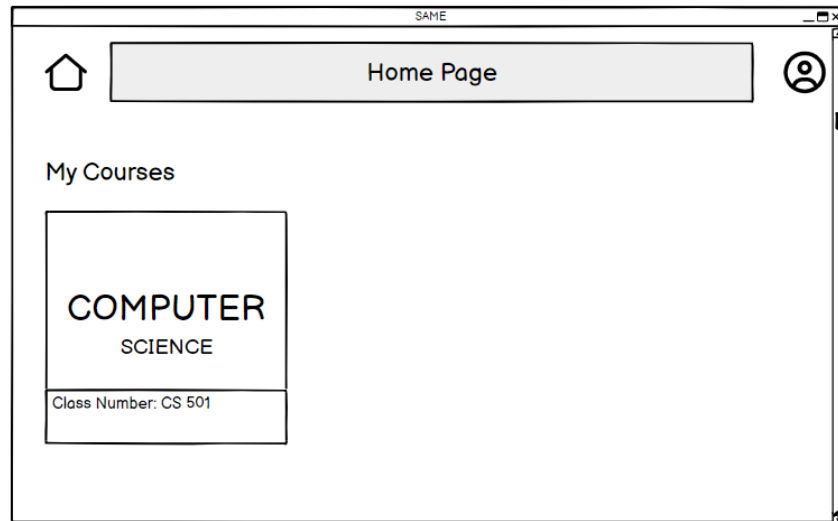
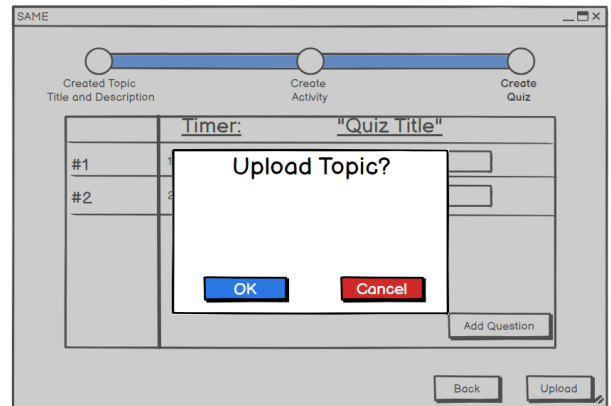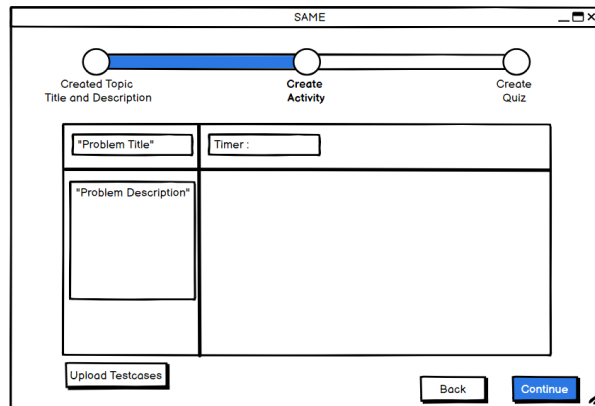Figure 14: Teacher Home Page
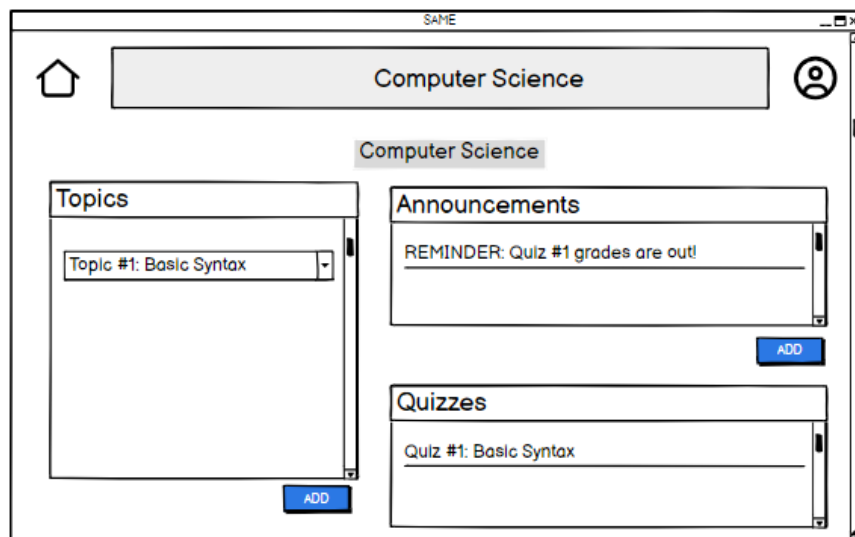
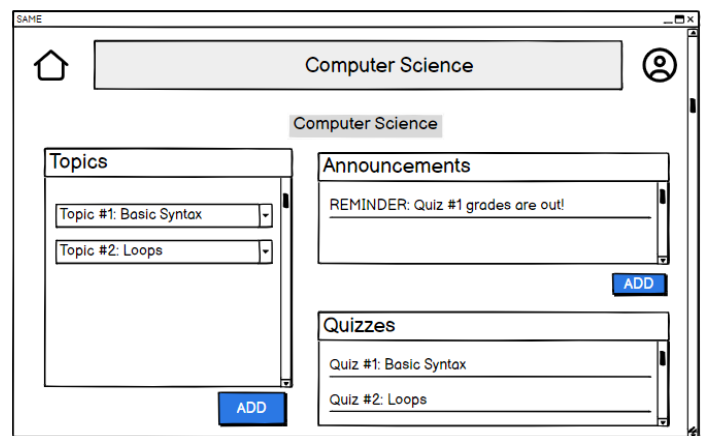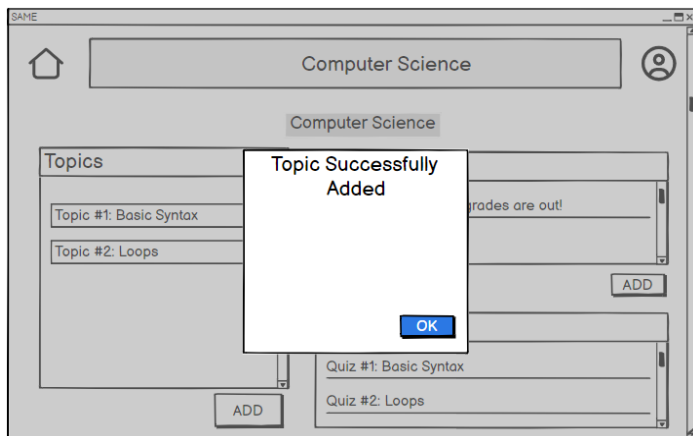Figure 15: Teacher Course Page
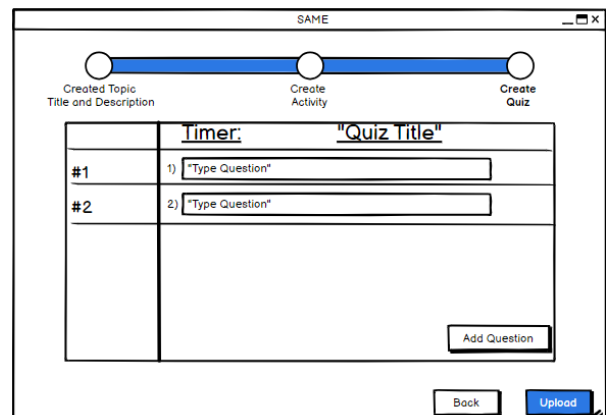
Figure 16: Teacher Topic Adding Pages

Figure 17: Teacher Topic Adding Success Pop-up and Updated Course Page

Link to the Video of Screengrab:

https://drive.google.com/file/d/15KDAxaqk4pgrPl44PGpDVf9e3SpC3wDO/view?usp=sharing

Bibliography

1) Cahill, C., Kuhn, A., Schmoll, S., Pompe, A., & Quintana, C. (2010). Zydeco. Association for Computing Machinery. https://doi.org/10.1145/1810543.1810564

2) *Alebeisat, F., Altarawneh, H. ., Alhalhouli, Z. T. ., Qatawneh, A. ., & Almahasne, M. . (2022). The Impact of Human and Computer Interaction on eLearning Quality. International Journal of Interactive Mobile Technologies (iJIM), 16(04), pp. 58–69. https://doi.org/10.3991/ijim.v16i04.27309*