

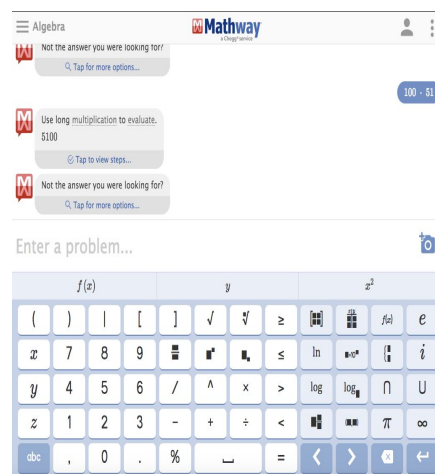
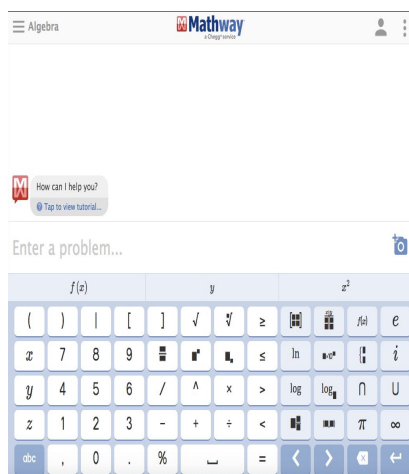
Project 3 Write Up - Abdullah Assaf & Kameraia Dungee

Introduction:

Our web based application is called Quick Maths. It is an interactive, single or multiplayer game that is designed to teach kids basic mathematical concepts such as addition, subtraction, multiplication and division. Due to the current global pandemic, thousands of children are out of school. This causes concern for their cognitive and social development. We are designing a web based application to combat this issue and ensure children can stay connected in an online classroom from home while also learning and having fun.

The game promotes mental math and fun learning. While many online math games exist, we are not basing it off of any specific math game. However, we have derived inspiration from the MathWay interface from <https://www.mathway.com>. MathWay is not necessarily a game, it is a study tool and specialized calculator. MathWay's interface demonstrates an interactive communication between the user and the system. This is something that we found critical to our interface. We have had a vision for our web application system to communicate with the user in order to establish an intuitive flow of interaction between the system and user. This will be seen in the gameplay aspect in which users will be able to play math based games with the system and receive direct feedback and progress reports. We are hoping that a strong sense of communication and community will promote our web application as a useful tool for students and teachers alike.

As you can see from the following image, the MathWay interface prompts the user to ask a question and the user can enter an equation via text entry. This design would be used prominently for the gameplay of our interactive game. The system will ask the user a question and the user will input a response. The system will alert the user if they are correct or incorrect and progress through the game accordingly. This will help establish a clear form of communication between the system and the users. Aside from the gameplay design, our interface will be mostly original. We have included daily challenge, practice mode, quiz, dual mode, progress report and message teacher. These features will incorporate drag and drop, radio buttons, checkboxes, drop down lists, text entry and scrollable content.



Our application will feature drag and drop, radio buttons, checkboxes, drop down lists, text entry and scrollable content in the following forms:

Drag and Drop: the interface displays a math question and prompts the user to drag the answer and drop it in the answer box. If the user answers correctly the system will provide feedback by encouraging the

user and rewarding them experience points (XP). If the user answers incorrectly, the system will encourage the user to try again or ask for help. Users must drag the correct numbers and drop them in the answer box to solve the question correctly.

Radio button: the interface will feature timed quizzes where users must select the answer by choosing a radio button. Radio buttons allow users to select one input at a time, this will be useful on quizzes and tests.

Checkboxes: users can select game modes using checkboxes.

Drop-down lists: the system will have a drop down list. The use of the drop down list will allow users to roam the interface freely and have the ability to navigate back and recover from mistakes.

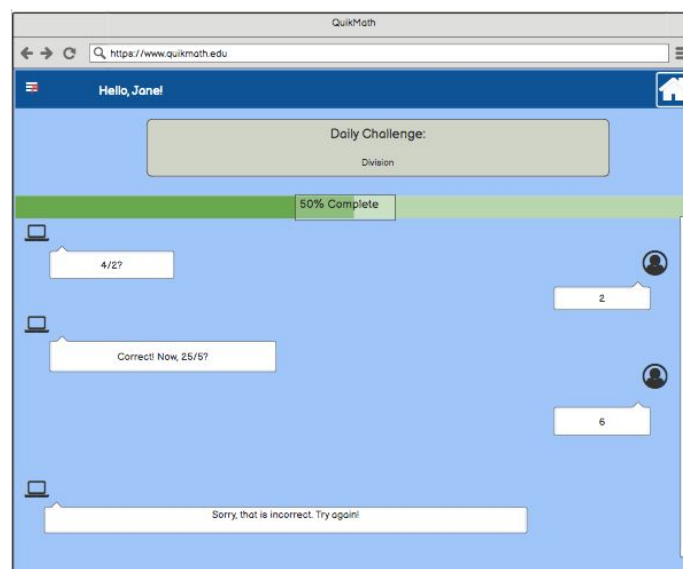
Text entry: users can type solutions and show work from a text entry box on quizzes and various game modes. Users can also use a text entry box to find classrooms and add other users by their usernames. Text entry will also be used to enter login credentials, and in messages to the teacher. This facilitates communication between users.

Scrollable content: users can scroll through the leaderboards, classroom rosters and different themes in the drop down list. We want to keep scrolling to a minimum during gameplay to keep the user focused on the material they are learning and not worried about looking for content.

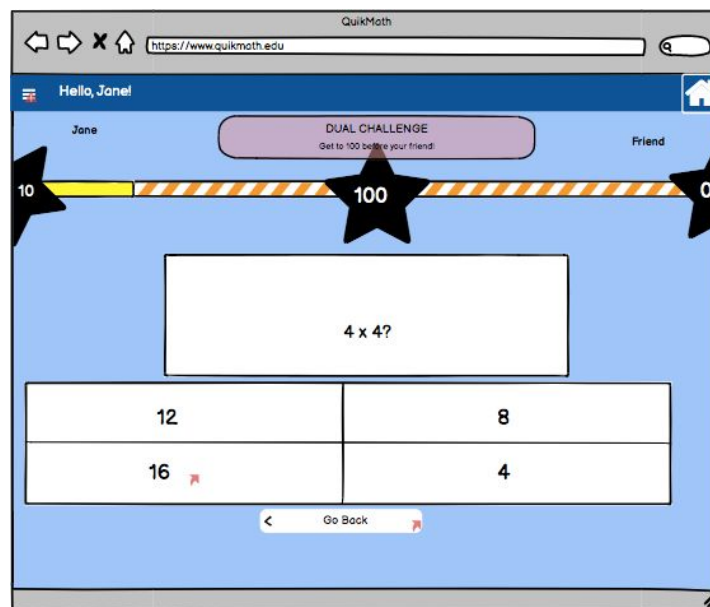
Design Patterns:

As we have learned this summer session, the use of design patterns is imperative in developing an interface that will promote learnability, familiarity, comfortability, recoverability, consistency, robustness, feedback and error prevention. We were able to achieve these goals in the following ways:

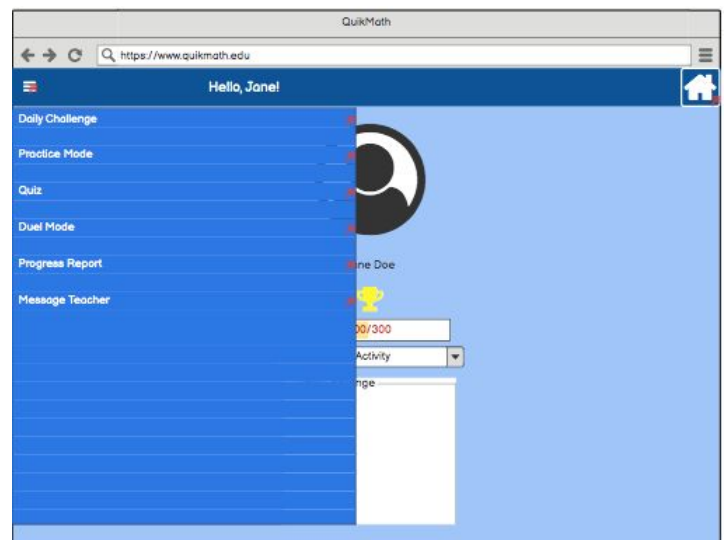
1. **Feedback, Recoverability and Error Prevention:** Our web application promotes feedback from the system to the user in various gameplays modes. In this instance, the user is playing a math game against the system. The design for this interface is heavily influenced by MathWay as cited in the beginning of the text. The image below is a screenshot from the daily challenge game mode of our Balsamiq prototype. Here the system asks the user what the answer of four divided by two is, the user responds with either the option of text entry or radio button. The system encourages the user to continue working and the system constantly gives feedback to the user if they are correct or incorrect. This promotes a sense of learnability and familiarity while also promoting instant gratification. As you can see, our interface includes a home button in the top right corner and a menu button in the top left corner. These are present on every screen in the interface, except for the login screen. The home and menu icons promote recoverability from mistakes because users always have a path back to various screens of the interface. This strong display of recoverability increases error prevention and allows users to safely explore the interface without worrying about causing damage to the system or not being able to navigate through features.



2. **Learnability, Familiarity, Comfortability, Consistency and Natural Mappings:** These are all grouped together because they work harmoniously to achieve ideal usability principles. Our balsamiq prototype displays an interface with natural mappings that allow the user to naturally understand the flow of the application's functionality. This is important because it creates a sense of familiarity between the user and the system. As a user becomes more familiar with an interface, they learn how to fully experience and use the interface. Increased learnability and consistency in design and user-system interaction promotes comfortability with an interface. Our balsamiq prototype shows these design principles in the following screenshots. The image below displays the results after a user interacts with the interface and plays the game. As you can see, the user selected the correct answer (red x in the box with 16) and the interface highlights the progress meter yellow. The system also adds the user's XP to the progress meter at the top of the screen. The user gained 10 XP out of 100 possible XP. In this screen, the user has the option to go back, open the menu or go home.



In the image to the right, you can see the use of the fat menu in our interface. The fat menu is essential because it allows the user to easily navigate the interface without causing errors. The fat menu displays all of the features the interface presents to the user and directs them to the web page upon clickable action. Behind the fat menu is the general home screen. The home screen displays the user's name, profile picture, and XP in a progress meter. It also displays a drop down list for the user to select a daily activity. Below that drop down list is a daily activity that the user can directly engage with. This home screen displays features similar to the dashboard design pattern.



Content-Fidelity Matrix

Content	Very Low Fidelity	Low Fidelity	Medium Fidelity	High Fidelity	Very High Fidelity
Information Design			X		
Interaction Design				X	
Visual/ Branding Design		X			
Editorial Content		X			

Information Design: Our information design is medium-high fidelity because our information is structured in a way that promotes natural mappings and consistency. Buttons are functional and we are confident that users will be able to learn the information mappings of the interface easily. There is a natural flow of information and users can easily understand the simple layout of our interface.

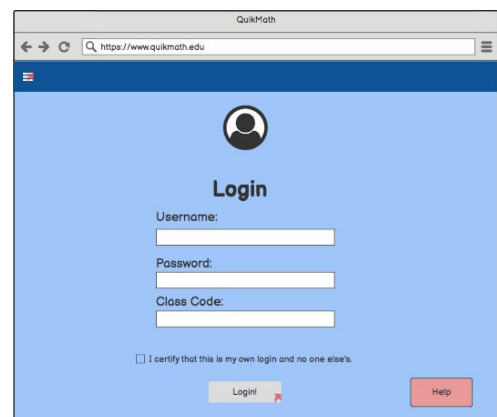
Interaction Design: Our interaction design is high to very high fidelity because our prototype is very responsive and demonstrates the flow of information and interactions between the user and the system. We focused heavily on the interaction design because the basis of this web application is consistent and clear communication between the user and the system. We believe our balsamiq prototype will be easy to learn and navigate through. Our buttons function and the guided interaction will allow the users to understand the functionality of the features presented.

Visual/Branding Design: The visual branding in our balsamiq prototype is low-medium fidelity because we have just now established a color scheme but not yet a marketable brand for our application. With balsamiq, we were mainly focused on developing the flow of functionality and interaction rather than focus on visual branding. The next step would be to pick our final color scheme and develop a brand.

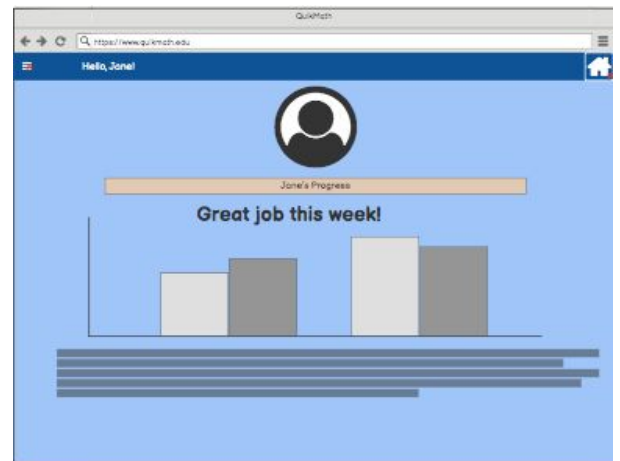
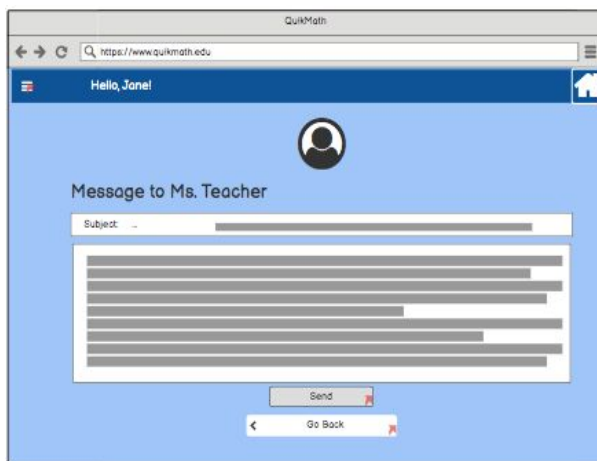
Editorial Content: The editorial content is low-medium fidelity because we needed to show certain screens as accurately as possible in order to properly show the interaction. This is very apparent in the game play screens in our balsamiq prototype.

Prototype Walkthrough:

1. Users select to login or sign up. Users must enter their login credentials and check the agreement box then they are directed to the home screen.



2. From the home screen, users can see their profile picture, name, XP on a progress meter, daily activity options and direct access to a direct activity. This would be ideally used as the user dashboard. From this screen, the user can access a fat menu from the top left corner and a home button from the top right corner.
3. When the user opens the fat menu, they have options to access multiple features.
4. If the user selects a gamemode, they will have various gameplay options. These different options are shown on different screens. Users interact with the system and with other users. They can complete games by answering questions using radio buttons, text entry and drag and drop items.
5. If the user selects the progress report tab, they will be taken to an interface that demonstrates user progress based on data collected by the system. The data will be presented to the user in colorful graphs and simple terms to allow the user to easily interpret the information.
6. If the user selects the message teacher tab, they will be directed to a screen with their teacher's name and classroom code and a text entry box. This will be a form of communication between the student and the teacher in our interface.



7. Users can easily navigate back to their previous screens using the fat menu in the top left corner, the home button in the top right corner or the go back button that is available in certain screens.

Prototyping Process Technique:

Using balsamiq was a much more efficient and enjoyable experience than powerpoint or inkscape. We struggled a little bit with balsamiq at first but we were quickly able to adjust and figure out how to find and format items on our web application. With balsamiq, we were able to find a webpage border and use that as the template for our web application interface design. This was more effective than using rectangles on powerpoint. Having our web page template allowed us to design and format the features of our interface much more efficiently. With balsamiq we were able to layout multiple features such as a menu, home button, drop down lists, text entry boxes and progress meters with little problems. Another great feature about balsamiq was that it is very simple to link buttons to web pages. This helped us establish a realistic prototype that functions properly based on user interaction.

Self Critique:

Overall, we are much more satisfied with this balsamiq prototype than our powerpoint or inkscape prototypes. This prototype flows much more naturally and efficiently. We were able to achieve design

goals on this prototype that we just could not hit with powerpoint. We were able to establish a strong and well designed structure for our interface that is consistent in every screen. After establishing our information design, we were able to develop the interactivity and link our buttons and web pages together based on functionality. Although we have not finalized our web application, this is the highest fidelity prototype we have made thus far and we are very confident that it not only accurately depicts our ideal interface but also performs naturally, functionally and aesthetically. We are confident that our prototyping has guided us in the right direction that we would be able to actually implement our web based application and bring our ideas to fruition.