CSC2002S MDD2 Assignment

THKPHU001

<u>**Overview**</u>

In today's age, children have a lot more access to technology and entertainment than they did 10 years ago. A study by the American Academy of Paediatrics showed that children's use of mobile devices has increased rapidly over the past decade. Additionally, it shows that the applications that they spend the most time on are YouTube, Internet Browser, and streaming services. There may be some educational content on these applications, however, there are none that solely focus on educating children in an interactive and fun way.

The aim of this project is to design an educational application aimed at children from ages 2-3 years old. The application will be an alphabet book that helps children learn and memorize the alphabet. The study further states that up to 75% of young children own tablets, rather than mobile phones. As a result, this application will be curated with the assumption that the user is using a device with a large interface. Additionally, it is assumed that the user does not know how to read, thus it will be fruitless to include worded instructions in the application.

The application will be designed in such a way that it is suitable for entry-level users who have no prior knowledge of the alphabet. Additionally to the features that were created in the previous assignment, the application will consist of the following features:

- It will allow the user to customize the book by adding their own photos or using their own images. The user will look for objects or letters in their environment which resemble the letter selected in the book and take a picture to replace the default image. This will allow for a more interactive and personal experience.
- It will have a "Text-To-Speech" mode which reads out the letter to the user. This will help users who have no prior experience with the alphabet learn how to pronounce the letters. It will also help experienced users recall letters they may have forgotten. Furthermore, it provides a more interactive experience and increases ease of use. Whereas in the old prototype, the user would have to read each word themselves, and receive no assistance if they did not know the letter.
- It will have a "Quiz Mode", which displays a set of random letters, reads out one letter, and responds positively when the user clicks on the correct letter. The benefits of this feature are synonymous to those of a class test. This feature will help users recall letters and quiz themselves on how much of the alphabet they have learned.

<u>Architecture</u>

The application will be native an require no server to function. This may limit it from having dynamic features that can be updated through the internet, however, this will not be necessary, as it is a relatively simple application. It does not require much data, as it the only

resources it makes use of are images, which will be stored in the device's internal storage. The images will be converted into bitmaps and accessed using separate threads in the background. This will make loading images more efficient. This means that the application will not require an internet connection, and thus be suitable for bandwidth-constraint users. This is suitable for the target audience of young children, because they are too young to know how to update the application or purchase credits to access the internet.

Overview of the Interface
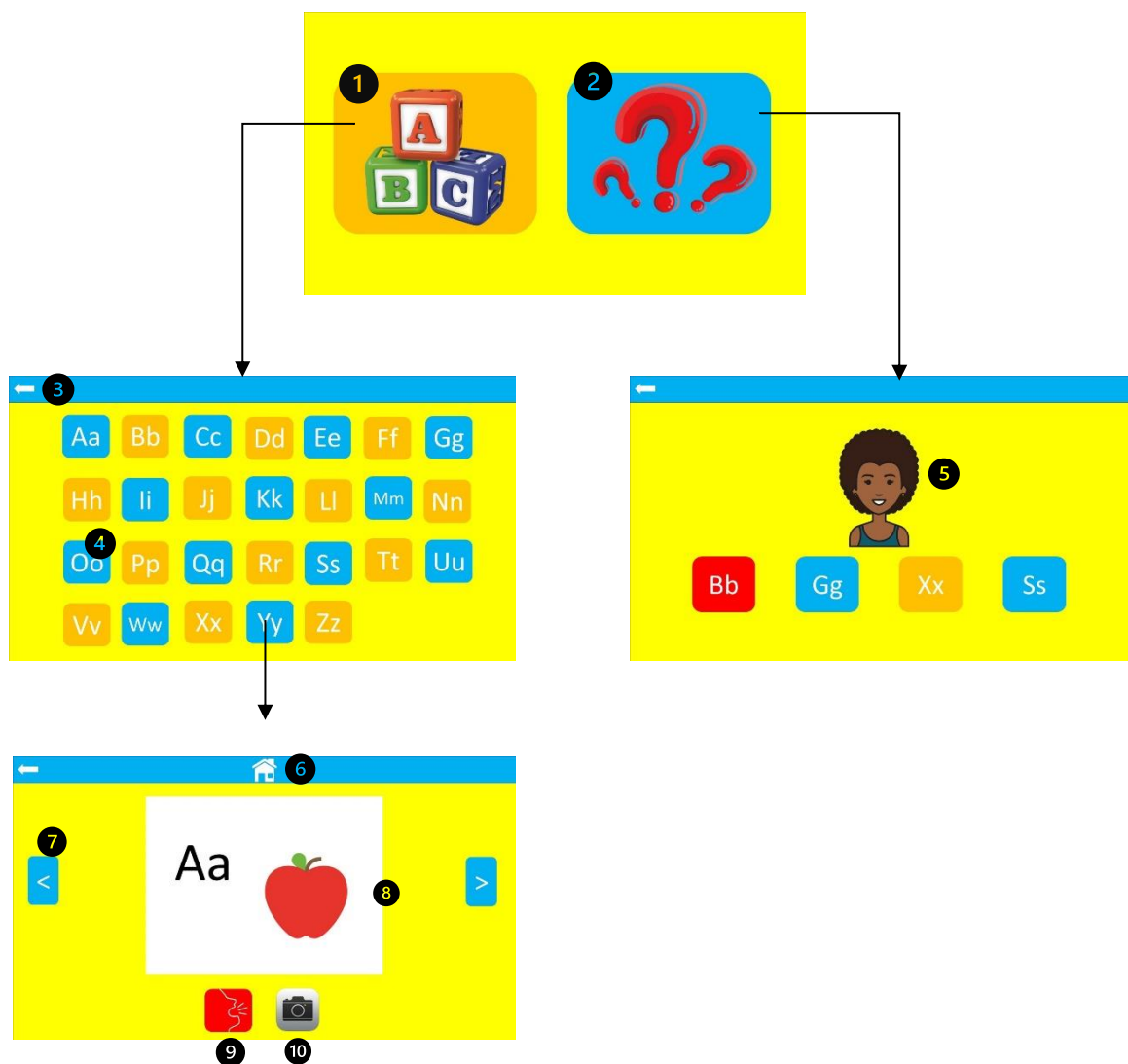
The application consists of the following components:

<u>Main Menu Page</u>

This is the first page that the user will see upon opening the application. It consists of an overview button (1), which leads you to the overview page, and a Quiz button (2), which leads you to the quiz page.

<u>Overview Page</u>

This is the page where the user chooses which letter of the alphabet they want to view. It consists of a back button (3),which takes the user back to the Main Menu, and letter buttons (4), which take the user to the letter page.

<u>Letter Page</u>

The letter page displays the letter and consists of many of the main features of the application. It consists of a back button, a home button (6) to go back to the main menu, navigation buttons (7) to go to the next/previous letter, an image (8), a text-to-speech button (9), and a camera button (10).

<u>Quiz Page</u>

The Quiz Page consists of a friendly avatar(5), which narrates the letters to the user and gives feedback when the user chooses a letter, and letter buttons.

A detailed view of the interface is provided later.

How The Prototype Was Created

In the first assignment, a prototype of this application was made that consisted of an overview page, and a letter page. In order to gain insight into features that could be added to the application, the following interviews were conducted:

Seeing as I do not know many children that fall within the target group(ages 2-3), I used purposive sampling. Over the span of a week, I interviewed one 2-year-old and one 3-year-old as follows:
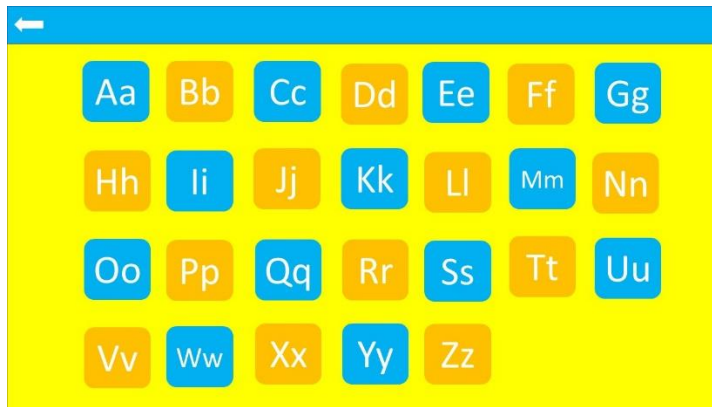
Design

According to Jakob Neilson in *Usability Inspection Methods*, it is proven that UI is more effective if it has an aesthetic and minimalistic design, thus being more appealing to the user. For this interview, a simple design of an overview, and a colourful design were prepared as follows.

Design 1
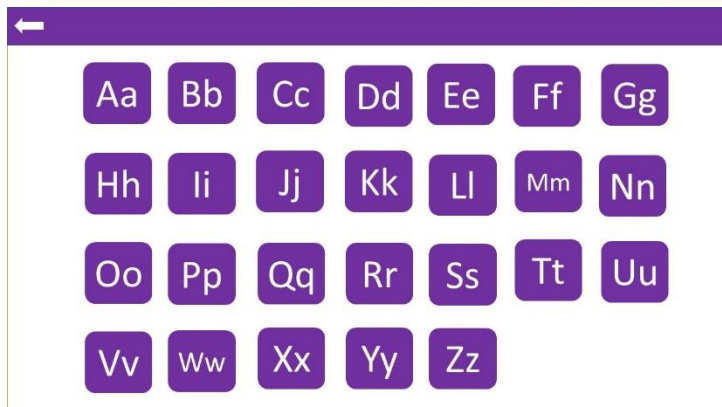
Design 2

The participants were asked which one of the two designs they prefer. As expected, Child A, Child B, Child C and Child D chose the second design. In conclusion, the colourful UI was more appealing and would be more effective with young children.

Additional Features

The application was built with the following additional features:

- A text to speech button
- A camera button for users to take their own pictures to replace the ones in the book
- A quiz button which allows users to quiz themselves on how much they know the alphabet.

The initial prototype was also kept in order to use in the interviews and observe whether the new features benefited the usability of the application or subtracted from it.

Interview 1

One child from each age group was provided with the initial prototype, and another with the improved prototype.

They were given no instructions and were only told to use the application until they felt satisfied. Child A (aged 2) and Child C (aged 3), who were given the initial prototype without any additional

features, stop using the application after 5 minutes, which is 15 minutes less than Child B (aged 2) and Child D (aged 3), who used the application for 20 minutes. This proved that the added features given to Child B and Child D kept the users more engaged.

Additionally, an automation was run during this interview that collected data from the buttons and ranked the buttons on each page based on which ones were used the most. The rankings were as follows (From most used to least used):

Main Menu Page: Overview button, Quiz button.

Overview Page: Letter buttons, Back button.

Letter page: Navigation buttons, text-to-speech button, camera button, back button, home button, A button, Z button.

Interview 2

In the next round of interviews, the children were to be given the application to use and be quizzed afterwards. After observing the children using the first prototype, it was noticed that when they did not know a letter, there was no other option but to skip it, as there was no assistance nor hints. On the other hand, the children using the improved prototype had the help of the text-to-speech feature, which would pronounce each letter at their command.

Afterwards, a quiz was conducted, where each child was shown a picture of the letters of the alphabet from A-Z and ask to name the letter. The results further proved the above statement, as the first group of children (using the initial prototype) answered an average of 15/26 of the alphabet correctly, whereas the second group of children (using the improved prototype) answered an average of 23/26 correctly.

Furthermore, the second group of children were more prepared for the quiz, as they had taken quizzes using the additional feature in the improved prototype. In a study by researcher Doctor Katherine Rawson at Kent State University, she found that "taking practice tests – particularly ones that involve attempting to recall something from memory – can drastically increase the likelihood of remembering that thing later."

With this information the following list of the **final features and their benefits to the application**, was created:

Final Features and Benefits

- Feature 1: Allowing the user to customize the book by taking their own photos. This allows the app to be more personalised for the user and adds interactivity. The user less likely to stop using the application, as they can always find new objects or letters in their environment to take pictures of , thus learning more about the alphabet in the process
- Feature 2: Text-To-Speech mode. This feature reads out the letters to the users which improves the user's likelihood to recall them. It also helps entry-level users who have no prior knowledge of the alphabet learn. Furthermore, it helps all users, whether experienced or not, recall the letters if they forget them. This provides a more effective way of learning.
- Feature 3: Quiz Mode. This is a separate page that consists of a friendly human avatar and 4 random letters. The avatar reads out one of the 4 letters and the user has to click the correct letter from the given options. This, as mentioned above, provides the user with a more efficient learning experience, as they are forced to recall the letters they know from

memory, and are corrected when they get letters wrong. This means that they are more likely to remember the letters in the long term.

Interface and Design

The following design changes were made:

Prototype 1
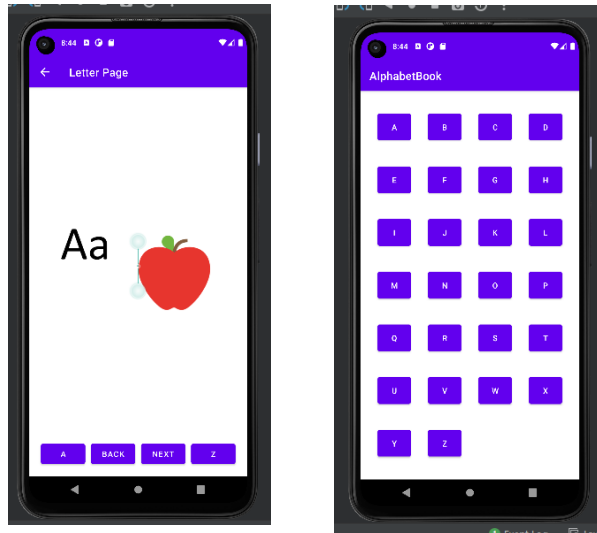
The initial prototype, as seen above was designed for small devices, however this was changed to suit a larger device, as 75% of children own tablets, rather than smart phones. Furthermore, it was seen in the first interview that the "A" button, which takes you to the first letter, and the "Z" button, which takes you to the last letter, were almost never used. As a result, these buttons were removed to make the page look minimalistic and prioritise frequently used buttons.

Prototype 2
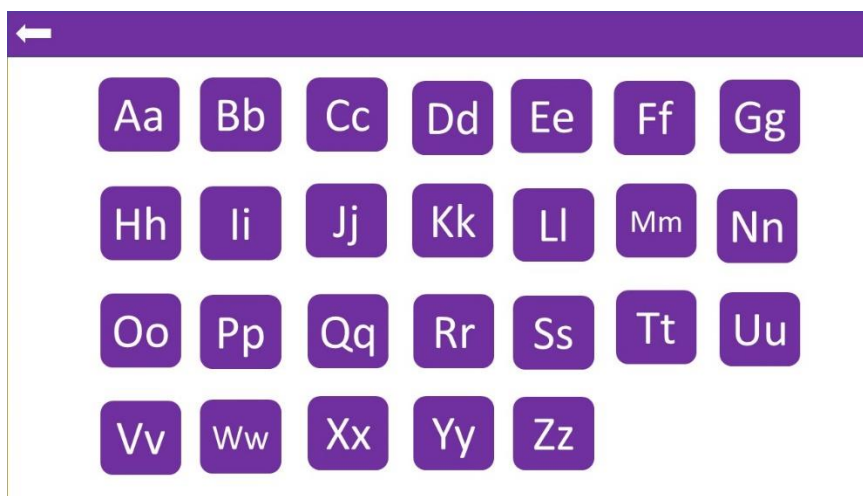
The interface was adapted for a larger device, however, as observed in the interviews, the UI was not appealing to the target audience. An A/B test revealed that the target audience prefers a more colourful interface.

Prototype 3 (Final Prototype Rationale and Design)

Main Menu Page

The Menu Page consists of the Overview Button(1) and a Quiz Button(2). Seeing as the target audience for the application is too young to read, the buttons are labelled with pictures.

The Overview button has a picture of building blocks with letters of the alphabet on them. This is an affordance based on the user's prior knowledge. Many children between ages 2-3 have played with similar toys and would recognise that the image is of the alphabet. The Quiz button has an image of question marks, hinting towards questions being asked.

Overview Page
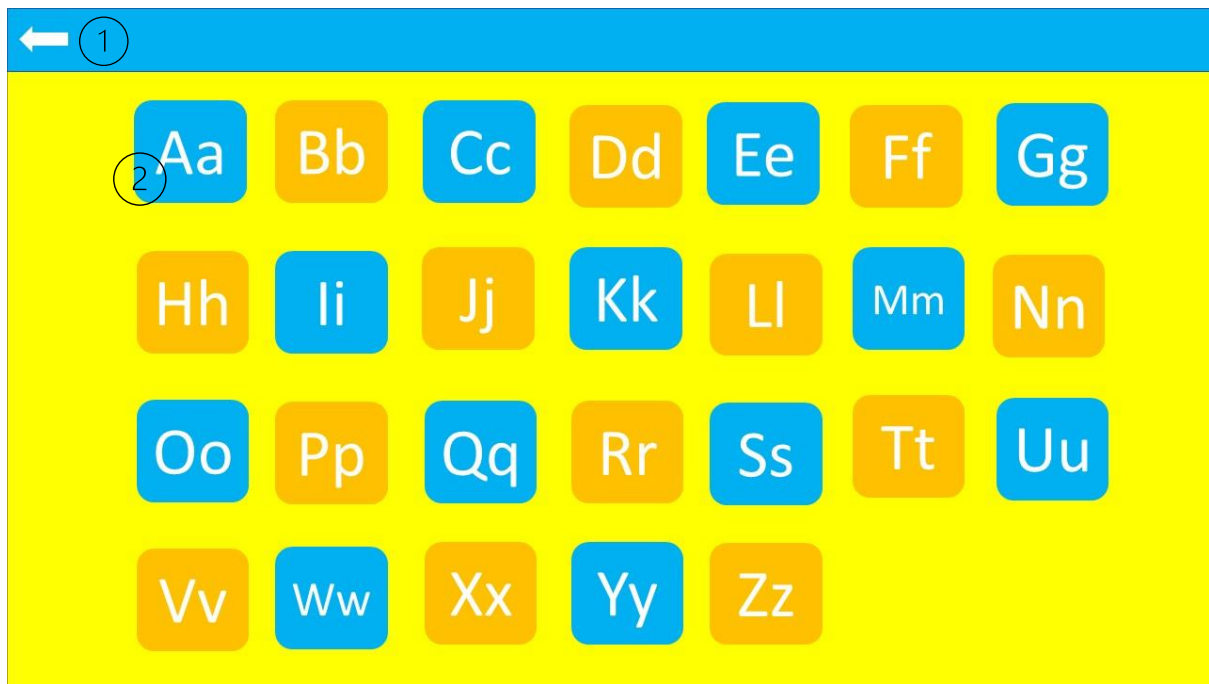
The overview consists of a back button(1) and letter buttons(2). The back button provides an easy way for the user to undo their action and go back to the main page. The letter buttons lead the user to the next page, which is the letter page. Each adjacent letter button has a different colour in order to be more appealing to the user, as it was shown in the interviews that children are attracted to combinations of bright colours.

Letter Page
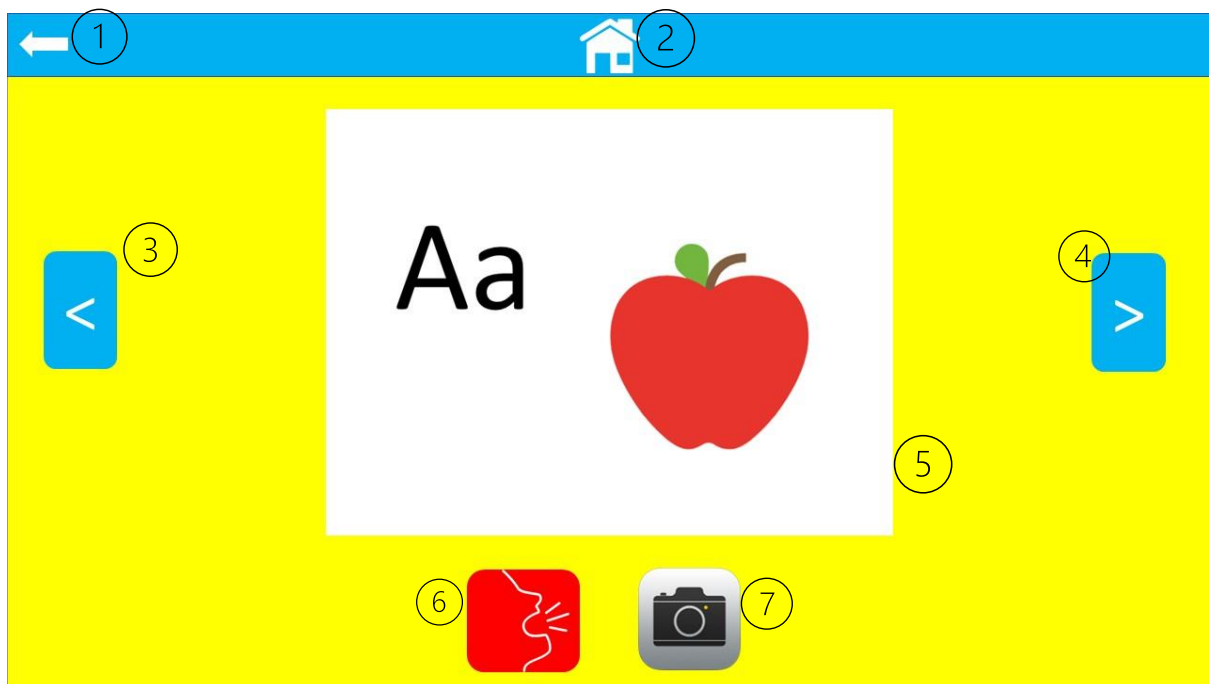
The letter page consists of multiple features, such as the back button (1), which allows the user to return to the overview page and choose a different letter. However, unlike the overview page, it also

contains a home button, as the user would have to press the back button twice to go to the main menu page. The home button promotes user friendliness and easy navigation by allowing the user to instantly return to the main menu.

There is also a previous button (3) and a next button (4), which allow the user to switch between letters displayed on the page. These buttons are the most frequently used buttons of the page and, as a result, are displayed on the edges of the interface. Seeing as this interface is meant to be on a large device, this makes it easier for the user to click the buttons because both hands will be on the holding the tablet on the left- and right-hand side. The user can also swipe on the image to display the next one if they prefer to do so as opposed to using the buttons.

There is also a text-to-speech button(6). This button reads out the displayed letter when it is clicked. The button uses a metaphor of a person shouting, which indicates that when you press the button, it will produce sound.

Lastly, there is a camera button(7). This button allows the user to take their own pictures and replace those in the alphabet book. The icon is a camera, also using a metaphor of a real-life object to relay its use to the user.
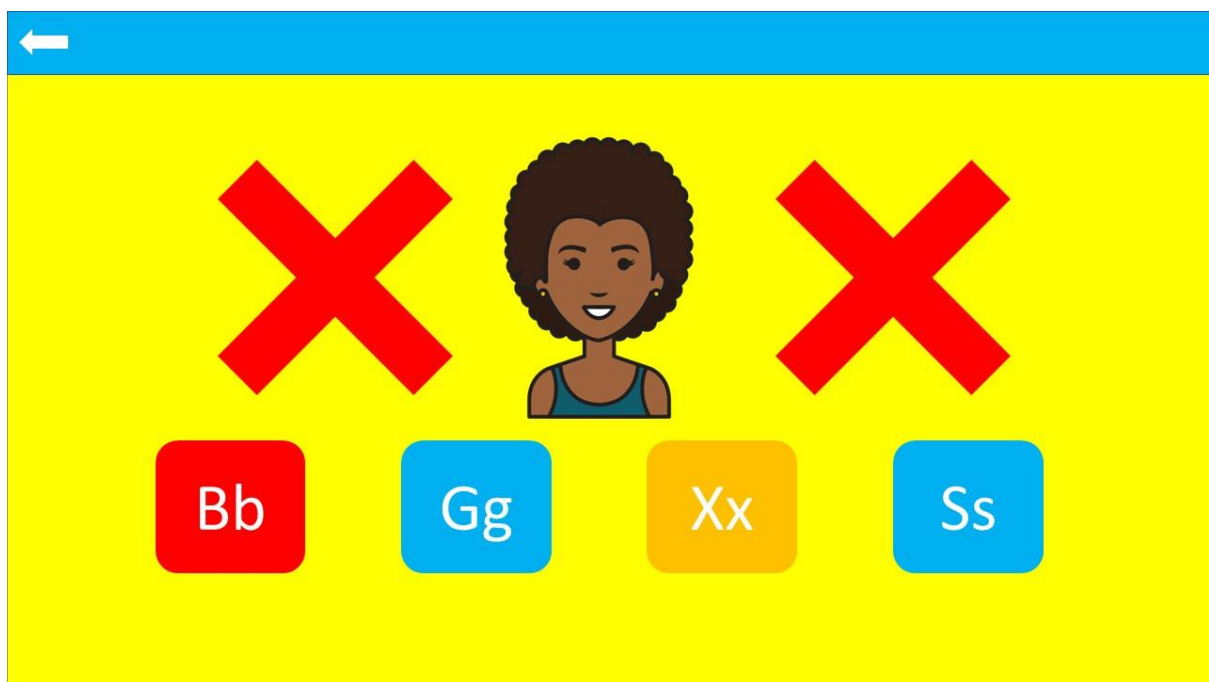
Quiz Page
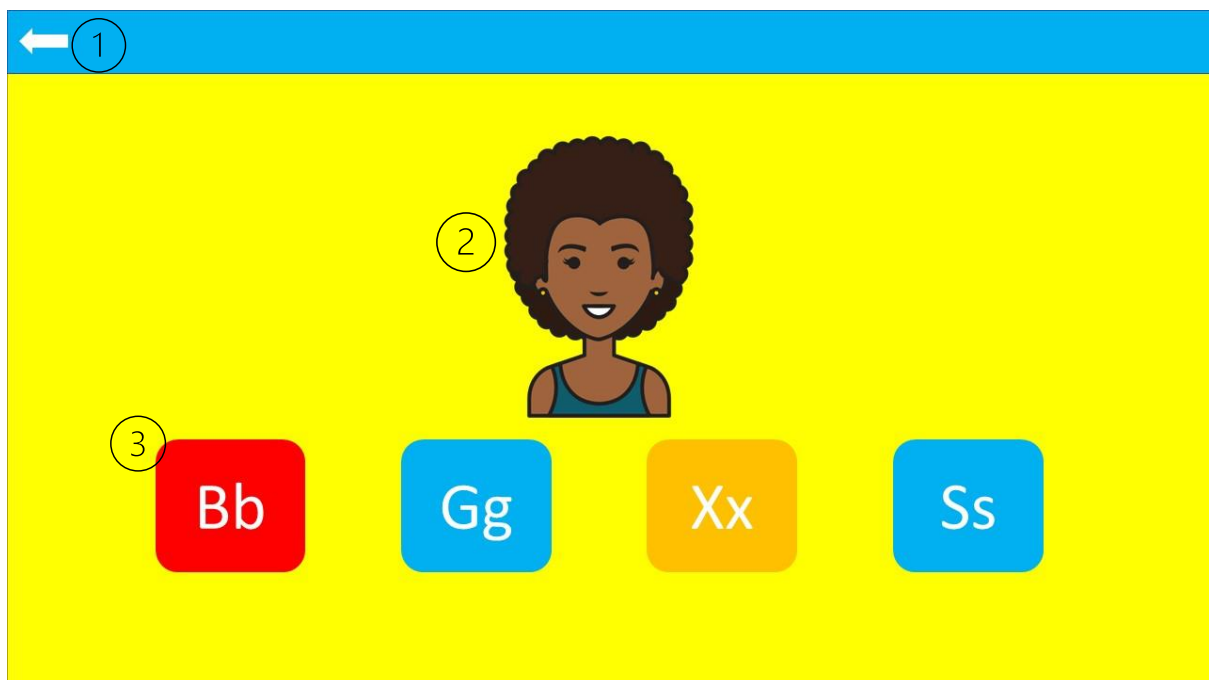
The Quiz Page consists of a back button(1), which takes the user back to the main menu page.

There is also an avatar(2) which reads out a letter to the user. The avatar is portrayed as a person, in order to resemble the environment of a classroom, where the user is being taught by a teacher.
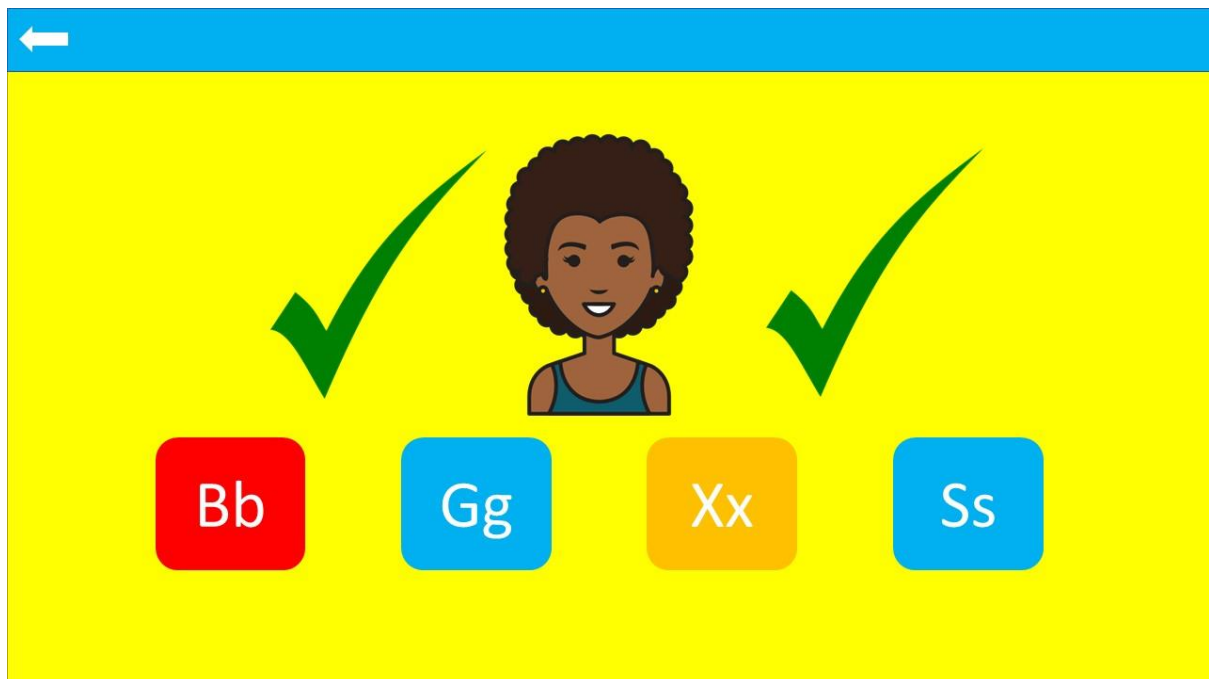
Lastly, there are letter buttons(3), from which the user has to click the correct one.

User Feedback

When the user guesses the wrong letter on the quiz page, the application displays red x's.

When the user guesses the correct letter on the quiz page, the application displays green checks and moves on to the next letter.


Providing such user feedback informs the user whether their answer is correct or incorrect, further improving their learning process.

Furthermore, when the user is inactive for 10 seconds, the application displays hints in the form of a hand showing them the buttons they can click.
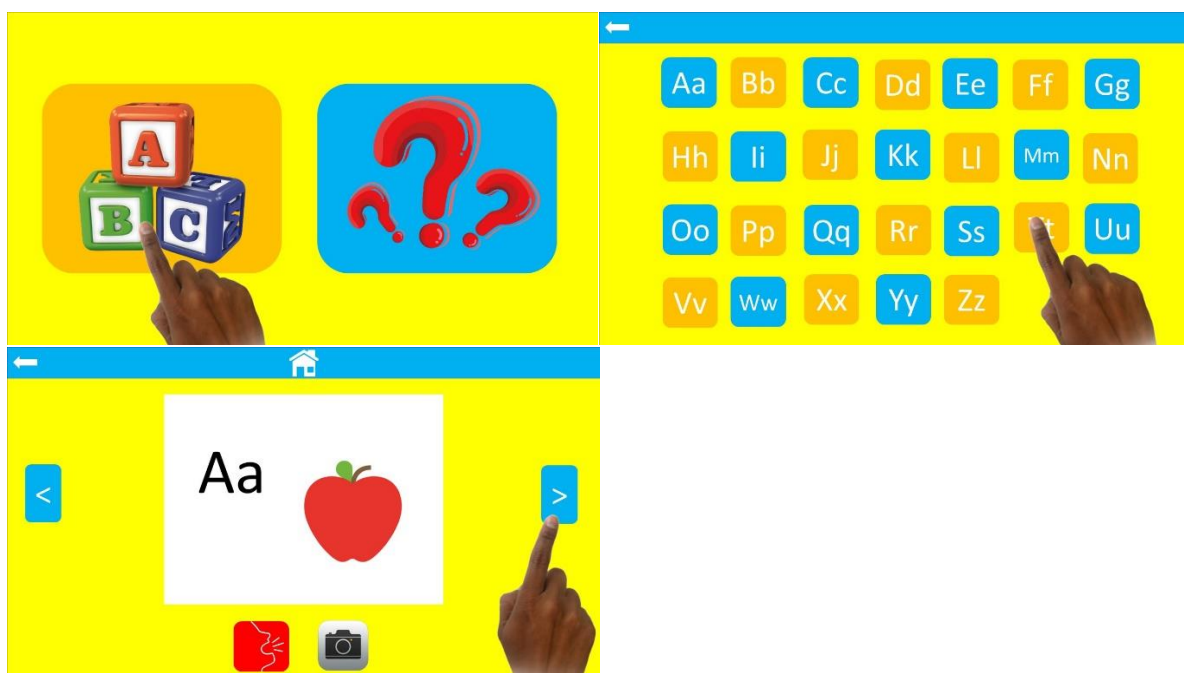
This serves as a substitute for text hints, as the user is assumed to not be able to read yet.

Error Prevention
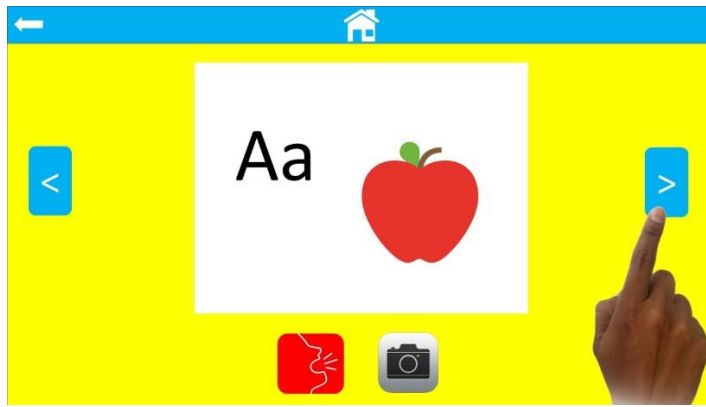
On the letter page, an index is used to keep track of the letter being displayed on the screen. Every time the previous or next button is clicked, the index is decreased or increased accordingly. In order to prevent indexOutOfBounds errors, there is an "if statement" preventing the index from being decreased when the letter is A, or increased when the letter is Z. This means that nothing will happen when you press the next button on the 26th letter or the previous button on the first letter.

Opposing Guidelines

According to Jakob Neilson in *Usability Inspection Methods,* it is important to provide help and documentation for the user in case they need help with using the system. Our application goes against this guideline, because the documentation will be of no use to the target audience. The application is made for children who cannot read; therefore, they would not be able to read the help and documentation. Instead, visual hints and affordances were added to the application to assist the user in the case that they do not know what to do.

Works Cited

Radesky, Jenny. "Young Children's Use of Smartphones and Tablets". Pediatrics, 2020.

Rawson, Katherine. "Why Testing Improves Memory: Mediator Effectiveness Hypothesis". Science, 15 October 2010.

Neilson, Jakob. Usability Inspection Methods. Wiley, 9 May 1994.