



DyslexicAll

HCI Winter Semester 2023 - 2024

Phase 3 Report - Second Prototype and User Evaluation

3LEIC10 G05

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Part I - User and Task Analysis

Project's idea description

DyslexicAll, an app for all the dyslexics.

DyslexicAll is an application that strives to support individuals with dyslexia by offering a comprehensive set of activities and features designed to enhance their daily lives. Our ultimate objective is to deliver a service that reduces the impact of dyslexia and enhances their capabilities.

Using our application, users will be able to handpick between different tools that help with their dyslexia, based on their needs and what they enjoy doing to minimize the impact of their dyslexia.

Related Services

Our app, DyslexicAll, is designed as a fusion of various related applications that offer resources for individuals with dyslexia. The primary goal is to simplify their search for assistance while eliminating the need for multiple services that consume both space and time. To gain a deeper understanding of the market landscape concerning our app and to identify potential competitors, we conducted some research on websites and the PlayStore. After a thorough analysis of our findings, we honed in on two applications for a comprehensive examination: MYdys and Dyslexia- Cognitive Research.

Related Service- MYdys



MYdys primarily focuses on **text-to-speech** functionality, allowing users to **photograph text**, customize fonts and spacing for improved readability, and convert it to audio. DyslexicAll, on the other hand, not only provides text-to-speech in the same manner as MYdys but goes beyond that. In addition to photo-based text conversion, our app offers alternative methods for converting text to speech. Users can employ DyslexicAll on **websites** or **upload text files** from their devices, with all content seamlessly transformed into audio. This comprehensive approach ensures a superior and more versatile solution to cater to our users' diverse needs.

Related Service- Dyslexia- Cognitive Research

Dyslexia- Cognitive Research mainly focuses on gathering information to contribute in scientific studies to further develop the knowledge about dyslexia. In order to do that the app contains two main features, one to determine the grade of dyslexia a person has and the other is a **games' section**, where it is possible to play some games. Similarly, our app will also have a section with games, however the ones on our app will be more geared toward the target audience, since we will be using the information gathered from our questionnaire to determine which games would be a better fit for the app.



Questionnaire - Highlights

To gain a deeper understanding of potential DyslexicAll users, we devised a questionnaire comprising approximately 12 questions, available in both Portuguese and English. We solicited responses from various sources, including friends, family, course group chats, and participants at a session of the European Youth Parliament in Spain.

The questionnaire garnered responses from **17 individuals** with dyslexia, consisting of 12 Portuguese and 5 foreigners. Most were **diagnosed** between the ages of **7 and 10**, with over 70% falling within the **15 to 23-year age range**, while the remainder were older.

To ascertain their experiences with dyslexia-related support, we inquired whether they received assistance and how they rated it. Out of the 17 respondents, **10 had received help**, either from professionals or family members. Notably, there was a distinction between the Portuguese and foreign respondents, with the former rating their assistance between 4 and 5, the latter giving ratings of 2s and 4s.

Among the features we envisioned for our app, the most favored and highly voted ones were the **spelling check**, **text-to-speech** functionality, and **web page reading**.

Furthermore, the questionnaire's final question, which was optional, invited suggestions for additional features beyond those already mentioned. Respondents provided intriguing ideas, including **scientific articles** about dyslexia, **methods** for managing it, profiles of **famous individuals with dyslexia**, and a **word-meaning game**. Such a game, they noted, would aid in comprehending words more effectively, aligning with the needs of dyslexic individuals.

PACT Analysis

The PACT analysis framework serves as a valuable tool for human-centered design. The acronym PACT represents People, Activities, Contexts, and Technologies, and it is grounded in the contemporary landscape that pertains to our target audience for the app.

The "**People**" in this context, to whom we directed our questionnaire, encompass citizens aged six and older who grapple with dyslexia, whether they've been recently diagnosed or have carried the diagnosis for some time.

As for the "**Activities**", which signify the strategies these individuals employ to mitigate the challenges posed by dyslexia, they involve the use of various apps and books to address reading and writing difficulties and other related issues.

These activities transpire within different "**Contexts**", primarily within the confines of their homes, educational institutions such as schools and universities, and public spaces.

Lastly, the "**Technologies**" harnessed to facilitate these activities comprise the aforementioned books and a multitude of apps accessible on mobile phones, computers, and tablets.

Personas

"A Persona is a user archetype you can use to help guide decisions about product features, navigation, interactions, and even visual design" - Perfecting Your Personas by Kim Goodwin

We crafted two personas, drawing from various insights derived from our questionnaire, with the intent of making them distinctly unique to foster familiarity and empathy. Since our questionnaire was not only answered by Portuguese individuals but also by foreigners, one of our personas is a foreigner. Both personas fall within the most prevalent age bracket, spanning from 15 to 23 years.

Persona 1 - Rui Alexandre Soares



Rui Alexandre Soares is a **22-year-old Portuguese** university student who also holds a part-time job. His **dyslexia diagnosis** came about when his **second-grade** teacher, noticing a high frequency of errors in his Portuguese exams, discussed the possibility with his parents. This led to a **relatively swift diagnosis** by a therapist, and support from his elementary school teacher. Due to the **quality of assistance** he received, the **consequences of dyslexia** have had a relatively **minor impact on his life**.

Rui shares his life with a charming companion, a pet ferret named Oscar, who has become his closest friend. His determination to prove his parents wrong, who feared he might use his diagnosis as an excuse for reduced effort, has transformed him into a diligent and studious individual.

Rui's **primary challenges** lie in **reading and languages**. He occasionally grapples with **concentration issues** and struggles with **left-right distinctions**. Consequently, Rui seeks tools to convert **text to speech**, allowing him to listen rather than read. He also requires an **automated text translation** feature and engages in **games** that help **improve his concentration** while offering entertainment, such as memory games, soup of letters, and fill-in-the-gap painting activities.

Persona 2 - Lucía Gutiérrez

Lucía Gutiérrez is a **15-year-old student from Spain** who received a **dyslexia diagnosis** at the tender age of **10**. Her journey with dyslexia was marked by initial resistance, as she **struggled to come to terms with being different from her peers**. This inner conflict sometimes bred feelings of envy toward other children. Unfortunately, due to financial constraints, she **couldn't access professional help** for her dyslexia. Instead, the school psychologist was recommended, but Lucía's reluctance to accept her diagnosis **led to her declining these appointments**.



Within her family of six, Lucía has two older sisters, Laura and Lola, both of whom do not have dyslexia, and a 9-year-old younger sister, Letizia, who is beginning to show signs of dyslexia. The awareness of her **younger sister's diagnosis** is slowly **helping Lucía accept her own condition** and become more open to discussing it. Although she still endeavors to keep it concealed from others, **she has come to terms with her dyslexia** and is eager to address her specific challenges.

Lucía's **primary hurdles** lie in **writing and spelling**, which have impacted her performance in language-related subjects, causing a two-year developmental delay, particularly in writing. She also experiences **difficulties distinguishing left from right**. In light of these challenges, Lucía seeks tools for spell correction in her writing and desires to acquire strategies to cope with her dyslexia, enabling her to manage it more discreetly. In her leisure time, she thoroughly **enjoys engaging in word searches** and takes pleasure in **playing hangman**, as she finds it beneficial in improving her understanding of word structures and spelling.

Activity Scenarios

Personas are tailored to reflect their personality traits and personal history, illustrating how they engage with our application to fulfill their requirements. In that way, personas are complemented by some activity scenarios, which serve as depictions of the environments in which a particular task takes place using the product.

Activity Scenario 1

Rui wants to be able to relax while learning and improving his knowledge of his own language. He wants to access the games section and choose from a variety of games that also help him achieve his goals.

Activity Scenario 2

Lucía wants a quick solution for both spell-checking her writing and having the text she wrote read out loud to her so that she can confirm that everything is as she wishes. She accesses the tools' section, granting her the option to select either the spell-check function or the text-to-speech function and help herself.

Functionalities and tasks

DyslexicAll boasts a diverse array of features designed to cater to various user needs. Beyond offering a spell-check function, the app facilitates the conversion of text from multiple sources—be it photographs, web pages, or text files—into speech through the text-to-speech tool. It also empowers users to do the reverse by utilizing the **speech-to-text** tool, seamlessly transcribing spoken words captured through the device's microphone.

DyslexicAll's game section adds an element of fun and concentration improvement, featuring memory games, painting activities, a rhyme game elucidating the distinctions between rhyming words, and a **soup of letters** that provides word meanings. Users can delve into a section dedicated to scientific articles, offering valuable insights into dyslexia and methods to mitigate its impact.

As an engaging feature, DyslexicAll spotlights a "**Famous Person with Dyslexia**" every week, enriching users' understanding by showcasing the achievements of successful individuals who have thrived despite having dyslexia.

Part II - First Prototype and Heuristic Evaluation

Project abridged description

DyslexicAll is an application that strives to support individuals with dyslexia by offering a comprehensive set of activities and features designed to enhance their daily lives. Our ultimate objective is to deliver a service that reduces the impact of dyslexia and enhances their capabilities.

For this phase of the project, we chose three main functionalities that could represent the dimension of our application, being those in different categories of our application, Famous Person of the Week, Soup of letters and Speech-to-Text.

The Famous Person of the Week, where every week a famous personality with dyslexia is displayed, which would allow the users to identify themselves with known people that have or had the same condition as them. These came with inspiration from a suggestion that we received in our questionnaire where someone affirmed that they would like to have a section where they could learn more about people with dyslexia. This feature is mainly displayed in the Famous Person Page but also appears on the main page.

The Soup of Letters, as the name suggests, is the famous game where one must find the correct words on a grid full of letters. However, we added a twist: when a user finds a word, the game allows this word to be clicked so that the user can learn more about it.

Lastly, the Speech-to-Text functionality that allows the user to record an audio and the app will write what is said.

The tasks corresponding to these functionalities are:

1. Get to know better the Famous Person of the Week
2. Find a word in the Soup of Letters
3. Record an audio

The functionalities and tasks are further explained in this report.

Prototype's Wireflow

Task 1 - Get to know better the Famous Person of the Week

The first task chosen allows the user to get to know better one different celebrity with dyslexia every week and it is featured on the Famous Person functionality but also on the main page. As explained on the app's description, the Famous Person functionality provides information about known people that have or had the same condition as the user which will allow them to identify themselves with those personalities.

To help better understand how this task and the corresponding functionality work, we created 2 different exclusive prototypes.

As said before, on the main page there is a section reserved for the famous person of the week with dyslexia. In this section, the user can read a short summary about the person, who can be identified through their name and cartoon photo. It also allows the user to listen to the information, by clicking on the audio button on the top right corner.

If the user wants to learn more about this celebrity, they can click on the “More about ...” button. In this particular case, our person is Albert Einstein, so the user should click on the “More about Einstein” button which will make the ‘famous person box’ extend downwards in order to open a new page (the famous person page).

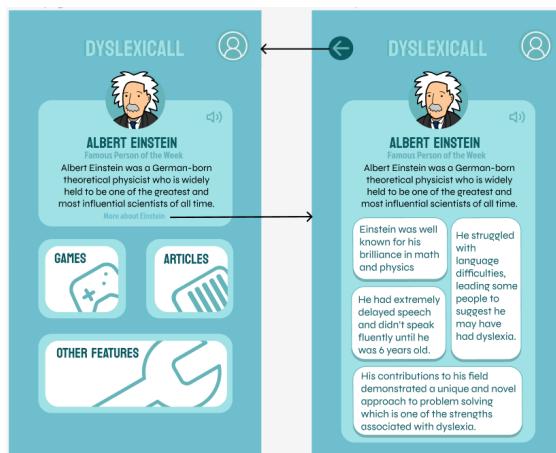


Figure 1- Famous Person flow

In this page is displayed more information about the celebrity, divided in small boxes. Furthermore, there is a back button available for the user if they want to return to the main page again.

Task 2 - Find a word in the Soup of Letters

The second task chosen allows the user to find a word in a soup of letters, being therefore featured on the Soup of Letters functionality. As explained on the app's description, the Soup of Letters functionality is the game where one must find the correct words on a grid full of letters but with a twist, which is the fact that you can know more about the word you found.

To help better understand how this task and the corresponding functionality work, we created 5 different exclusive prototypes, excluding the main page which was not specifically designed for this task but that is also used and therefore also represented on this section.

On the main page, when the “Games” button is clicked, it will present us with another page where a user can select between a variety of games, being those the memory game, the rhyme game, paintings and Soup of Letters. We can then select the “Soup of Letter” button, which will lead us to a game introduction page, where we are presented with 2 options, the “Continue” button and the “New game” button”.

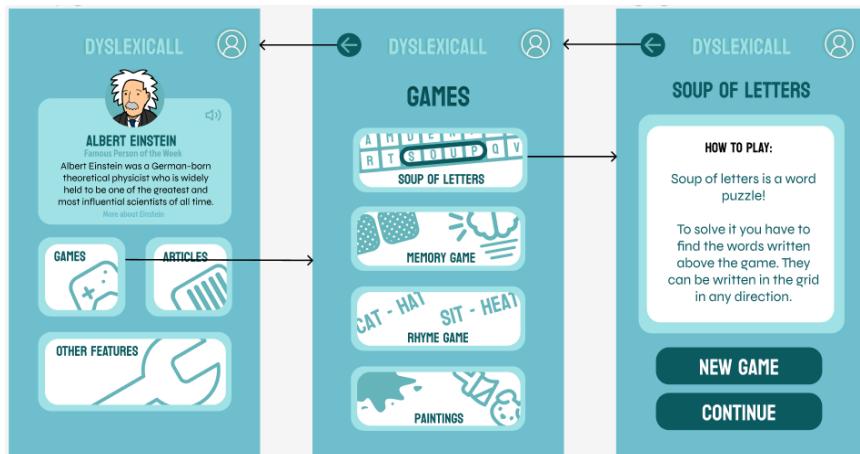


Figure 2- Soup of letters flow

The “New game” button will create a new game from scratch, with a new board and new words to find while the “Continue” button will go back to an existing game that was not ended. After selecting one of them we are taken to the actual game, where we are presented with a board of letters where we have to find the words displayed at the top of the page.

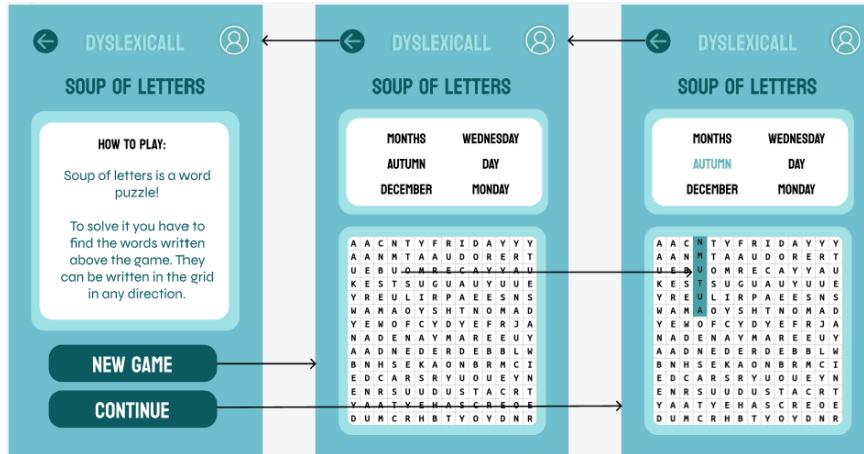


Figure 3- Find word flow

We also implemented an additional task, which focuses on finding the meaning of a word in the Soup of Letters. Once we find and select a word, it will become shaded and we can now click on that same word on the top of the page, which will hide the board and present a short information screen about the word that was found. To make the board appear again and continue playing, the user can click on either the same word again or they can click on the button to go back, located at the top left of the page. This last button is also present in all of the pages shown until now, having the exact same behavior in all of them, this being to return to the page the user was previously on.

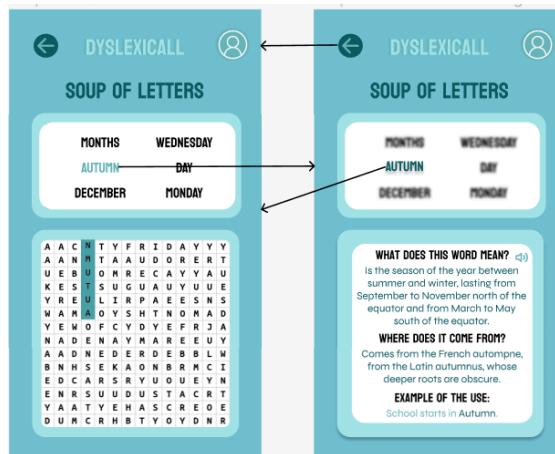


Figure 4- Show meaning of word flow

Task 3 - Record an Audio

The third and last task chosen allows the user to record an audio on the app and it is featured on the Speech-to-Text functionality. As explained on the app's description, the Speech-to-Text functionality allows the user to record an audio on the app so that the text will be written there.

To help better understand how this task and the corresponding functionality work, we created 4 different exclusive prototypes, excluding the main page which was not specifically designed for this task but that is also used and therefore also represented on this section.

While on the main page, if we click on the “Other features” tool, we are redirected to the Tools page, where there are displayed three different buttons with the functionalities that our app will further have, being those the spell-check, the text-to-speech and lastly the speech-to-text. For this task, one must click on the last button to be redirected to the functionality page, where we are able to see a microphone button with the instruction “Tap to Record” and below that an empty text box.

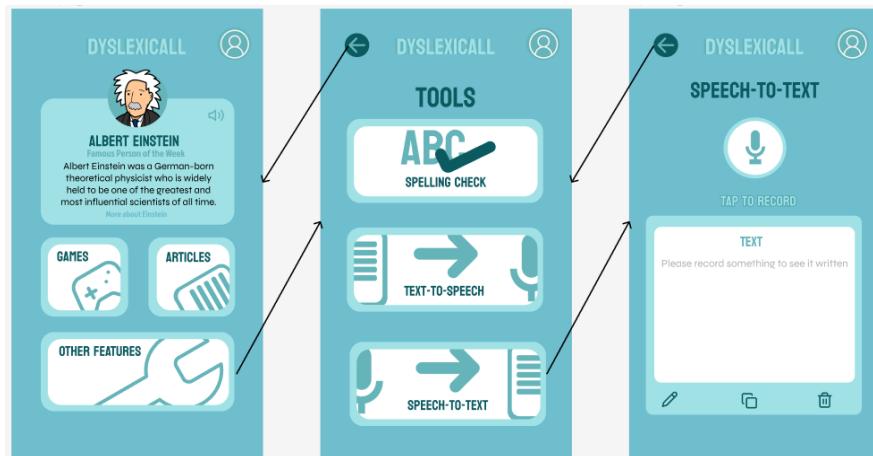


Figure 5- Speech-to-text flow

To perform this task, the user must click on the microphone button and talk. While talking, the text will start appearing within the text box. On the bottom of this one are three not yet implemented buttons, which will allow the user to copy, edit and delete their text.

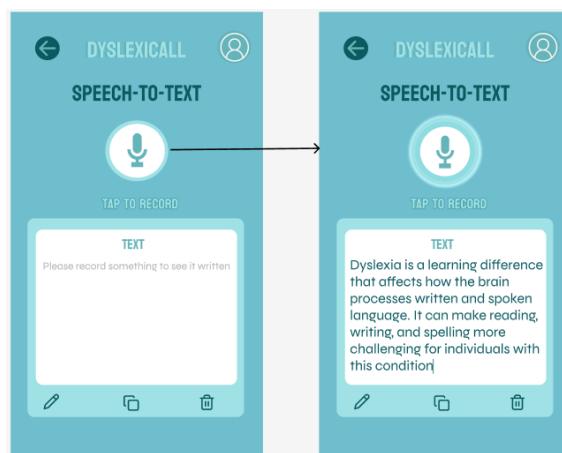


Figure 6- Record text flow

If a user intends to leave the page but the text box is not empty, there will appear a warning that will let the user know that their process will be lost so that they can take the precocious measures wanted, such as copy the text to their clipboard. Within this warning, the user has the option to return to the Speech-to-Text page or to leave and return to the Tools page.

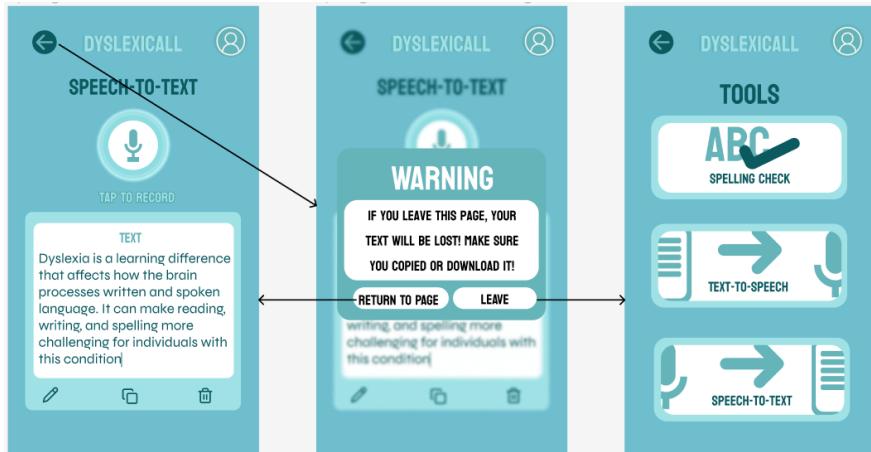


Figure 7- Warning flow

Note that this warning only appears if the text box is not empty, since there is no need to warn the user if there is nothing to copy.

Heuristic Evaluation Results

Our prototypes and workflow were evaluated by two groups in our class, and in terms of Heuristic Evaluation Results they combined in 9 different problems. After carefully reviewing the evaluation reports, we separated the problems into four different groups that correspond to the functionalities or tasks those are associated with, being those the Speech-to-Text, the Famous Person, the Warning and the Main Page.

Theme Group 1 - Speech-to-Text Issues

In the Speech-to-text group, 4 problems were found, which were identified in the table below as Problems 1, 2, 3 and 4.

The first problem that was brought up mentions that users should be able to tap on the "record button" so that they could talk again, in order to add more content, without having to exit the page and re-enter it. However, there is also another way to talk again, that being eliminating the text that was said and saying another one.

This issue corresponds to the Heuristic 6, "Recognition Rather than Recall", which claims that the user should not have to remember information from one part of the dialogue to another and instructions for use of the system should be visible or easily retrievable whenever appropriate. In summary, it says that we should minimize the user's memory load by making objects, actions, and options visible. This problem was associated with a severity of level 3.

The second problem mentions that the 3 icons presented on the "recorded text box" are not aligned.

This issue corresponds to the Heuristic 4, "Consistency and Standards", which claims that users should not have to wonder whether different words, situations, or actions mean the same thing and follow platform conventions. This problem was associated with a severity of level 1.

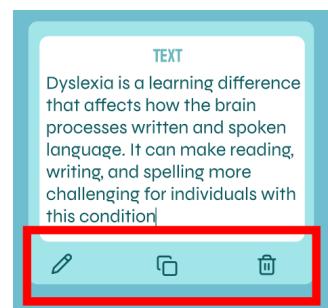


Figure 8- Icons not aligned

Figure 9- Tap to record text



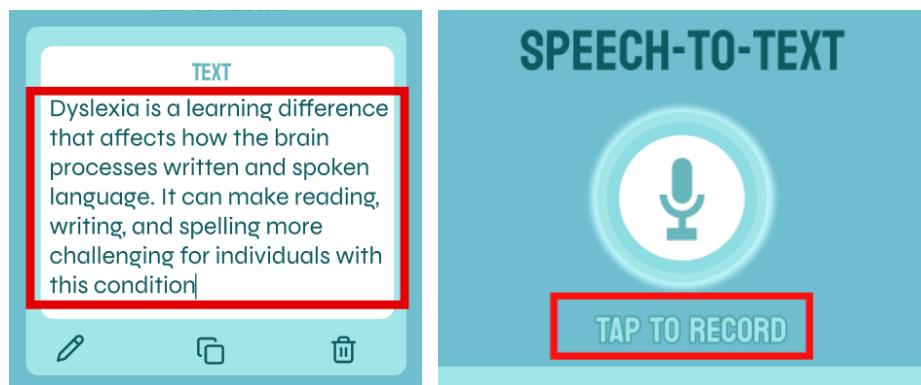
The third problem mentions that the "tap to record" text below the record button should be "hold to record" instead.

This issue corresponds to the Heuristic 2, "Match Between The System and the Real World", which claims that the system should speak the user's language, with words, phrases, and concepts familiar to the user rather than system-oriented terms by following real-world conventions and making information appear in a natural

and logical order. Besides this, they should recall the conceptual model. This problem was associated with a severity of level 2.

The fourth problem mentions that the recorded text should be darker or more visible because the purpose of this feature is to convert the audio to text. However, as that text meets the requirements above and regarding what we discussed with the group that brought up this problem during the class, we think that what they wanted to say was that the “tap to record” text below the record button should be darker or more visible.

This issue corresponds to the Heuristic 4, “Consistency and Standards”, which, as said before, claims that users should not have to wonder whether different words, situations, or actions mean the same thing and follow platform conventions. This problem was associated with a severity of level 1.



Figures 10 and 11- Wrong text mentioned and text that should've been mentioned

Theme Group 2 - Famous Person Issues

On the Famous Person group, one problem was detected, being identified in the table below as Problem 5. This problem was brought up by both groups, which affirmed that the text had

a bad format and should be organized better. Both groups denoted that those problems made the information hard to read.

Even though their evaluations of this issue were combined into one, the two groups chose to identify it with different heuristics and severities. One of the groups made it correspond to the Heuristic 7, “Flexibility and Efficiency of Use”, which claims that accelerators, unseen for the novice user, may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users and allow users to tailor frequent actions. This issue was associated with a severity of level 2. The other chose the Heuristic 8, “Aesthetic and Minimalist Design”, which claims that dialogues should not contain or rarely needed and every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility. This issue was associated with a severity of level 1.

Figure 12- More information about the famous person

information that is irrelevant to the user. This issue was associated with a severity of level 1.

Theme Group 3 - Warning Issues

In terms of the Warning group, there were 3 problems reported, which were defined as Problems 6, 7 and 8.

The issue number 6 was regarding the buttons "Return to Page" and "Leave", where it was mentioned that they should be more intuitive making use of colors, such as red for the "Leave". This problem was associated with Heuristic 6, "Recognition Rather than Recall", which, once again, claims that the user should not have to remember information from one part of the dialogue to another and instructions for use of the system should be visible or easily retrievable whenever appropriate. In summary, it says that we should minimize the user's memory load by making objects, actions, and options visible. This issue was associated with a severity of level 2.

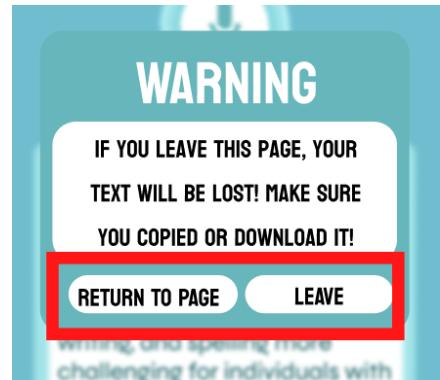


Figure 13- Warning buttons

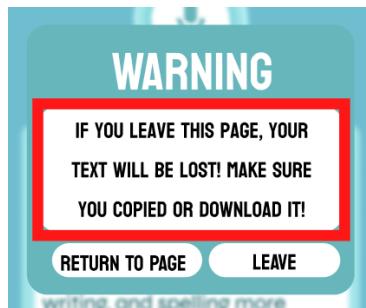


Figure 14- Warning text

According to problem 7, the warning text should be more appetitive since it is a warning, possibly by adding colors or bold text. However, our text in the warning was already bold. The corresponding heuristic was Heuristic 1, "Visibility of System Status", which claims that the system should always keep users informed about what is going on through appropriate feedback within reasonable time. They should report what is going on clearly and objectively, in proper time. This issue was associated with a severity of level 2.



Figure 15- Download doesn't exist

Theme Group 4 - Main Page Issues



Figure 16- Famous Person of the week text and More about Einstein text

Within the main page group, there was an issue regarding the main page, where the colors of the text were lighter than it should be, which made it difficult for the text to be read. This problem was identified with the number 9 and associated with the Heuristic 8, "Aesthetic and Minimalist Design", which claims that error messages should be expressed in plain language, no codes, precisely indicate the problem, and constructively suggest a solution. This issue was associated with a severity of level 3.

Below there are two tables with this information resumed, separated by theme groups.

Theme	Problem	Description	Heuristic	Severity
Speech-to-text	1	The functionality should allow users to tap to talk again without having to exit the page and return to add more content.	6	3
	2	The 3 icons related to the text created are not aligned.	4	1
	3	The text below the record button should say hold instead of tap.	2	2
	4	The text below the record button should be darker or more visible.	4	1
Famous Person	5	Bad format of texting which does not make it intuitive/better organized	7 and 8	2 and 1

Table 1- Speech-to-text and Famous Person Heuristics

Theme	Problem	Description	Heuristic	Severity
Warning	6	The “return to page” and the “leave” button should be more intuitive, possibly using colors (ex. red on “leave”).	6	2
	7	Text should be more appellative, possibly by adding colors or bold text.	1	2
	8	Text says copy or download but no download button is present.	4	1
Main Page	9	Lighter colored letters in the main page are not very visible because of the background.	8	3

Table 2- Warning and Main Page Heuristics

Corrections to perform in Phase 3

In terms of corrections to perform in phase 3, after analyzing the heuristic evaluation results and the current prototype and after some chatter between the group, we decided to change something in nearly every page, both in order to fulfill the requests made in the heuristic evaluation and some mistakes that were not mentioned in said evaluation.

Main Page Corrections

In the main page we plan to make the color of the subtitle as well as the color of “more about ...” more vibrant to improve the contrast between the text and the background, possibly by making said color the same as the color of the title, resolving problem 9. This change carries on to the famous person page, seeing as this page is an extension of the section that was changed in the main page.



Figure 17- Famous Person on main page corrections

Famous Person Corrections

In the famous person page, beyond the change mentioned in the last paragraph, we will also change the layout of the page, removing the multiple boxes and turning them into a single, big box, which will also occupy more space on the left and right of the page, which was previously left a bit empty. The text contained inside the boxes will also be changed to topics, in order to make it an easier read for the user, which combined with the last change, plan to solve problem 5, which was mentioned by both groups.

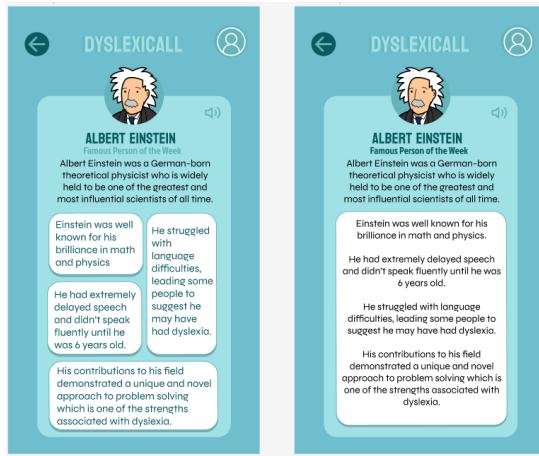


Figure 18- Famous Person more info corrections

Warning Corrections

In the warning page, we plan to add a small shadow to the text that explains the reason for the warning, in order to make the text more appealing, solving problem 7. We also plan to add another shadow, this time a bigger one, to the buttons on warning, as well as giving them colors corresponding to their functions, which results in solving problem 6.

Another change we plan to make is removing the mention of the option to download the text in the warning text, seeing as we decided to cut that feature, solving problem 8.

Finally, we also plan to add an outline to the box of the warning, making it more distinct from the background. This was not mentioned in the heuristic evaluations, but after analyzing we decided that it would be better to do that, since it doesn't catch your eye enough and blends with the background more than it should, seeing as it is a warning.

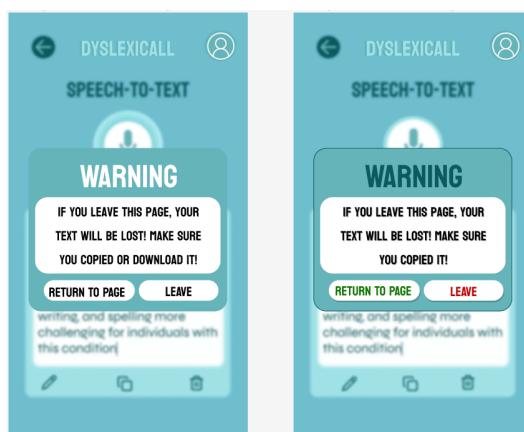


Figure 19- Warning corrections

Speech-to-Text Corrections

In the speech-to-text page, we plan to change the text below the button, both by changing its color to a more vibrant and noticeable one and by changing the text according to the action the user is doing, changing the text to “Tap again to stop recording” and changing back again to the “Tap to record” text once the user ended recording for the first time, solving both problem 1 and 4. Still relative to the text, we decided to keep it as a tap, contrary to what problem 3 reports, since we came to the conclusion it would be easier for the user to only tap once to record and not be forced to keep on holding the screen while talking. Finally, we will also change the alignment of the buttons in the bottom of the page by giving equal spacing between the side of the box and each of the buttons, solving problem 2.

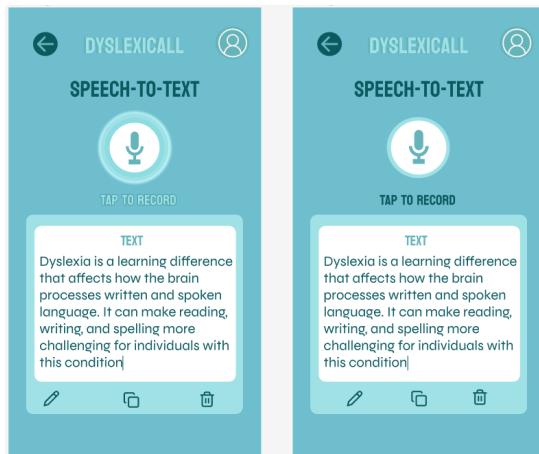


Figure 20- Speech to text page corrections

In our presentation, we were asked about the size of the letters as they appear to be a bit small, but we had previously tested our prototypes on a smartphone and the letters were big enough to be understandable and had the right size. According to that experiment, we will maintain the size of the letters.

Part III - Second Prototype and User Evaluation

Changes to Parts I and II

For the last phase of our project, in what respects the prototype, the changes made were the ones mentioned at the end of Part 2, and are briefly represented in the wireflows below. Besides these modifications on the existing prototypes, we created a new one, regarding speech-to-text, that represents the possibility of continuing the recording of the audio when you stop the current recording.

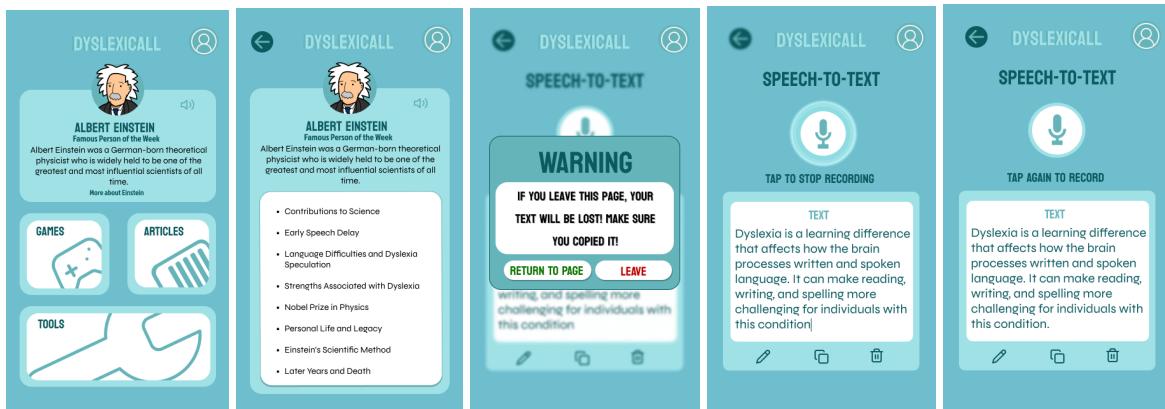


Figure 21 - Changes

Prototype's Wireflow

Task 1 - Play a new game of Soup of Letters and find the word "AUTUMN", then find the meaning of the word

For this task to be completed, the “Games” button on the main page had to be clicked on, passing to the “Games” page, where the user came across four different games. The “Soup of Letters” button when clicked showed an instruction page with the options to start a new game or complete a game. When the first option was clicked, the soup of letters appeared and the user had to find the word autumn, being this one highlighted when found. After that, to complete the task, they had to click “autumn” either on the soup of letters or on the header with the words to find to open the meaning of the word, as explained in the instructions page.

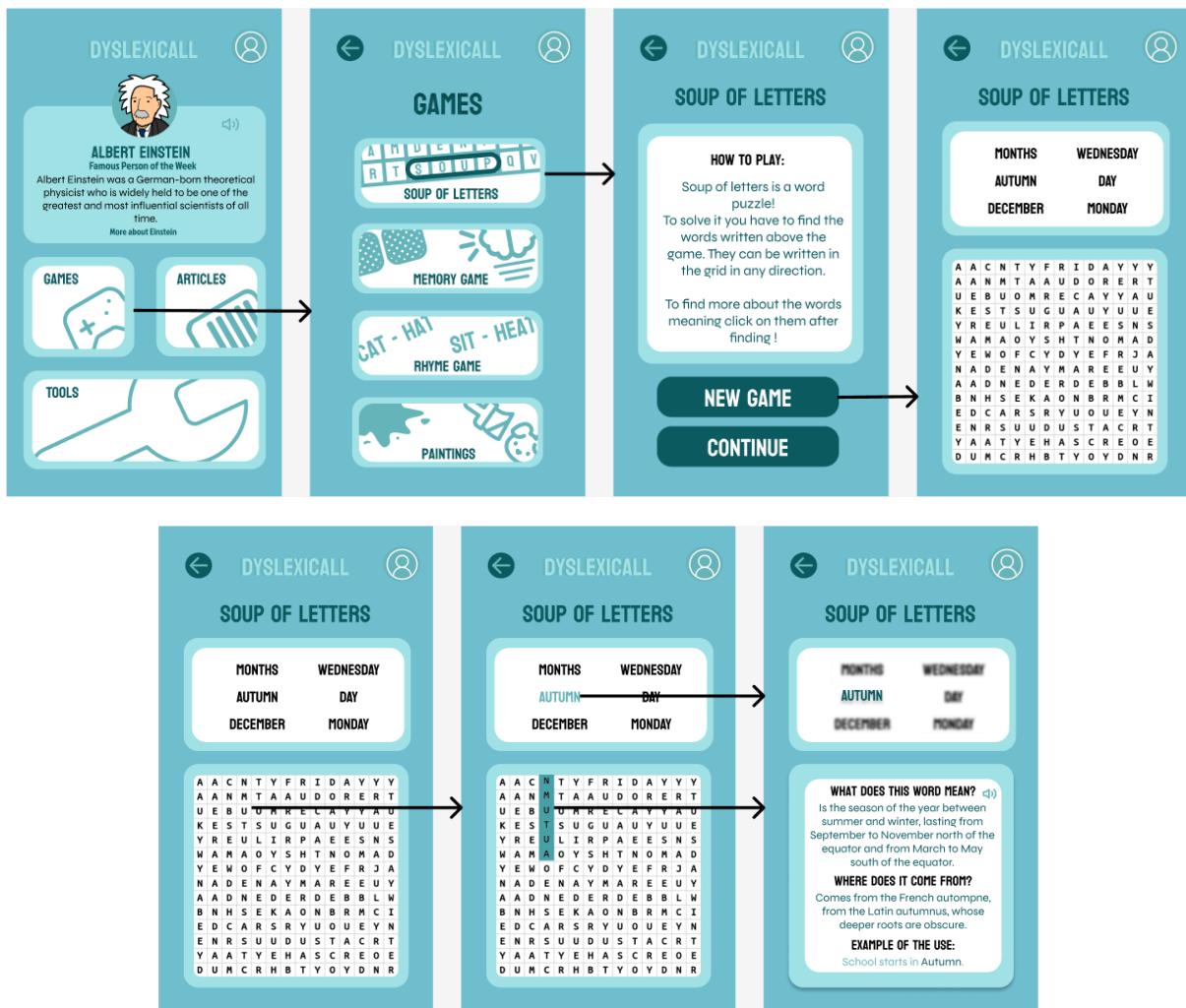


Figure 22- Wireflow task 1

Task 2 - Transform voice into text, and then leave the page.

The second task asked the user to "Transform voice into text, and then leave the page", warning them that this task was only a representation of how the application would work and therefore no audio would be recorded.

For this task to be completed with complete success, the user had to follow the path below, Figure 22- Wireflow task 2. Starting on the main page, the tool box must be clicked and it will redirect the user to the Tools page, which shows three different functionalities, being the last one the functionality Speech-to-Text, which was the one to be clicked on. When the user does that, the functionality page opens and the user comes across with a button with the description "Tap to Record", and when the user does so it passes to a page representative of the recording occurring. The same button, now with a description "Tap to stop recording" must be tapped again for the recording to stop. When the user reaches this point, then can either leave the page clicking on the arrow on the top left side of the page and the task is fully completed, or can click again to record and then to stop recording, clicking in the arrow only after that. Both paths were accepted.

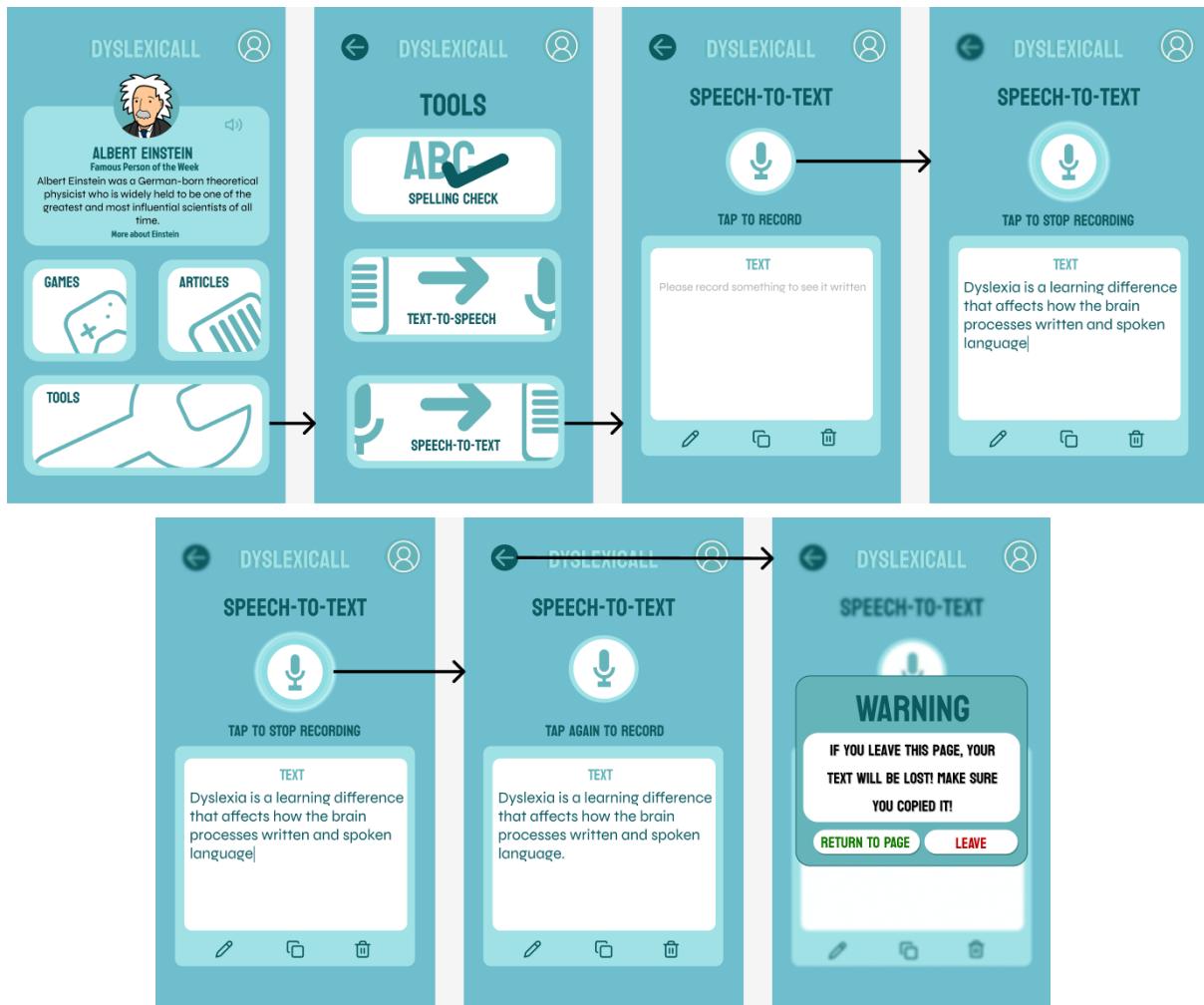


Figure 23 - Wireflow task 2

Task 3 - Learn more about the Famous Person of the Week.

For our last task, the user also starts on the main page and only has to click on the “More About Einstein” button. To improve the aspects of the previous phase, we have darkened the color of this button, for it to caught the user’s attention better, and changed the layout of the additional information about the famous person.



Figure 24 - Wireflow task 3

User Evaluation Protocol

Objective

DyslexicAll is an application that strives to support individuals with dyslexia by offering a comprehensive set of activities and features designed to enhance their daily lives so in order to develop a usable interface we did user evaluations. The main purpose of the evaluation was to understand the user's vision of our product and the efficiency of use in each task, in order to have a better understanding on the aspects to improve if our application was to be developed further.

These evaluations were made in two different ways, being those in person or online. In the evaluations made in person, we had the chance to analyze the efficiency, efficacy and satisfaction of each participant in each task, being able to see how they reacted to our application and better understanding their difficulties. On the online evaluation, we analyzed only the efficiency and efficacy of each participant in each task through the maze app that shows the user clicks, which cannot fully represent the user's experience as we lose valuable information on the reasons for clicks, errors or time spent.

These evaluations were divided into 2 samples, dyslexic people and non dyslexic people, with two versions, Portuguese and English.

There are 4 moments in this evaluation with an estimated duration of 5 minutes total.

The first moment is a survey about biological data such as age, gender and nationality so that we can identify which group of people may have more difficulties using DyslexicAll.

The second moment is the reading of our app's description as well as the explanation of the maze's purpose, including each task description. We made sure to inform the users on this screen that all the answers were anonymous. As noticed both in the in person evaluation and on the time spent on this screen on the online one, this screen was mostly ignored and most people didn't take time to read it, which may have influenced their results.

The third moment is the realization of the 3 tasks where we can extract information about the user's performance such as the time spent on each screen and task, the number of errors and the number of clicks in each task.

The fourth moment is the opinion section where the users can opine about their experience with the three tasks, in order for us to better understand what they felt and how to improve it. This moment was not mandatory.

Users

For our evaluation, we firstly gather information and answers only from people with dyslexia as they were the aim population for our application. Seeing that we could only gather 12 answers from people with this condition and we wanted a wider range of information, we were advised to extend the evaluation to everyone. Therefore, we decided to create a second questionnaire only for people without dyslexia, so that we can see if dyslexia affected the results or not.

The most common ages were between 15 and 23 years old, being followers by the over 23 years old age range and the gender was mostly male on the dyslexic people sample and female on the non-dyslexic people sample. However, we know for fact that the people over 23 years old were older on the non-dyslexic people sample.

We recruited these people through friends and family in a volunteering form by sending them a link with the evaluation or asking in person.

Method

Our evaluation had the following structure:

1. Survey about biological information like age, gender and nationality;
2. Description of our app with explanation of the maze's purpose, including each task description;
3. Task 1: Play a new game of Soup of Letters and find the word "AUTUMN", then find the meaning of the word;
4. Task 2: Transform voice into text, and then leave the page;
5. Task 3: Learn more about the Famous Person of the Week;
6. Opinion section about the usability of our app.

This evaluation allowed us to gather enough information to do the statistics of our application. With the gathering of biological information, we can identify which group of the society had more difficulties using our application. The tasks helped us to extract information about the user's performance like the time spent, the number of errors and the number of clicks in each task. Lastly, the opinion section allowed us to know what we needed to improve.

Tasks

Task 1 - Play a new game of Soup of Letters and find the word "AUTUMN", then find the meaning of the word

In this task we want the user to play a new game of soup of letters, having the purpose to find the word autumn, ignoring the other words, and to discover the meaning of that specific word after finding them.

Before initiating this task, the main page is shown with the different options.

We aimed for the user to start a new game and not continue an existing one.

Task 2 - Transform voice into text, and then leave the page

In this task we want the user to record an audio so that it can be converted to text. They can record it more than once, following the instructions and then leaving the page.

Before initiating this task, the main page is shown with the different options.

Task 3 - Learn more about the Famous Person of the Week

In this task we want the user to learn more about the famous person of the week. If the information on the main page is not enough, they can go to another page with more information.

Before initiating this task, the main page is shown with the different options.

Measures

Data collected

After the realization of the tasks, we measured quantitatively 3 parameters:

- number of errors/misscliks done during each task
- number of clicks in each task
- total time for the conclusion of each task

This analysis allows us to check the efficiency and efficacy of each task.

Task 1 - Play a new game of Soup of Letters and find the word "AUTUMN", then find the meaning of the word

To assess the efficiency and effectiveness of this task, we estimated values for our quantitative parameters. The total estimated time for completing this task was 75.0 seconds. The estimated number of errors during each task was 3. Finally, the estimated number of clicks required for this task was 8, including possible errors.

The comparison with the averages of these parameters will be analyzed in a further section of this report.

Task 2 - Transform voice into text, and then leave the page

To assess the efficiency and effectiveness of this task, we estimated values for our quantitative parameters. The total estimated time for completing this task was 40.0 seconds. The estimated number of errors during each task was 3. Finally, the estimated number of clicks required for this task was 10, including possible errors.

The comparison with the averages of these parameters will be analyzed in a further section of this report.

Task 3 - Learn more about the Famous Person of the Week

To assess the efficiency and effectiveness of this task, we estimated values for our quantitative parameters. The total estimated time for completing this task was 9.0 seconds. The estimated number of errors during each task was 2. Finally, the estimated number of clicks required for this task was 3, including possible errors.

The comparison with the averages of these parameters will be analyzed in a further section of this report.

Questionnaires

User Profiling

The biological information about the users allowed us to have a better profile of who was answering.

The majority of people with dyslexia that participated in our evaluation were males between the ages of 15 and 23 years old with Portuguese nationality being the lead, followed by Spanish nationality. We had a total of five different nationalities.

The majority of non dyslexic people that participated in our evaluation were females between the ages of 15 and 23 years old, being all of those portuguese.

Satisfaction

Regarding the qualitative analysis, we made a question at the end of the maze asking for opinions about the app. In general the feedback was more negative than positive, allowing us to have very constructive criticisms that we can use to improve the app.

Results

Sample characterization

As mentioned before, we have two different samples which can be characterized in different ways and that correspond to a total of 29 answers, being 12 from people with dyslexia and the 17 from people without dyslexia.

The first sample is composed of people who have dyslexia, mostly males aged 15-23 with the most predominant nationality being Portuguese, but being closely followed by the Spanish. These responses were obtained through sharing the link on different platforms, resulting in the tests being realized without any member of our group being present.

Meanwhile the other sample is composed of people without dyslexia, mostly females aged 15-23 and all Portuguese. The objective of this second sample is for us to be able to be present during the testing in order to have more accurate results and also to have a sample to understand the impact of dyslexia in the use of our application.

Statistical analysis

Statistics may have errors since the device users are using may try to go to sleep and users are forced to click the screen or the maze app itself sometimes rejects clicks that are correct, probably due to holding the screen for too long, resulting in maze considering it a hold instead of a tap.

We use the confidence interval in each of the 3 parameters in every task, these being errors, clicks and time taken, and each one of the tasks will also have two confidence intervals, one for the dyslexic people results and one for the non dyslexic people results. We decided to use a confidence level of 95%, which means our alpha value will be 0.05. The results were obtained using an excel sheet, which is available in the annexes. If the expected value is within the confidence interval obtained then we can confirm the efficiency of the task with 95% of confidence.

Task 1 - Play a new game of Soup of Letters and find the word "AUTUMN", then find the meaning of the word

In respect to the number of errors in this task, we obtained the confidence interval of [6.4;27.4] errors and [5.4;13.8] errors. Comparing these values to the expected 3 errors, we cannot guarantee with 95% confidence the effectiveness of this task for dyslexic people and for non dyslexic people.

In respect to the number of clicks in this task, we obtained the confidence interval of [13.6;34.5] clicks and [11.4;20.7] clicks. Comparing these values to the expected 8 clicks, we cannot guarantee with 95% confidence the effectiveness of this task for dyslexic people and for non dyslexic people.

In respect to the total time of this task, we considered two different situations, one considering the total time of the task and another corresponding to the time of the task without the soup of letters, since this part depends on each user and not the application itself.

In the first case, the values we obtained the confidence interval of [49.1;100.4] seconds for dyslexic people and [90.4;160.7] seconds for the non dyslexic people. Comparing these values to the expected 75.0s, we can guarantee with 95% confidence the effectiveness of

this task for dyslexic people, however we cannot guarantee the same thing for non dyslexic people. In the second case, the values we obtained the confidence interval of [31.5;65.9] seconds for dyslexic people and [39.0;103.1] seconds for the non dyslexic people. Comparing these values to the expected 45.0s, we can guarantee with 95% confidence the effectiveness of this task for dyslexic people and for non dyslexic people.

With this data we can conclude that we got the time we expected, at least without counting the soup of letters time, however the places on where to click should be more intuitive, seeing as the amount of clicks and errors is higher than what we expected.

Results

Task 1	Errors	Clicks	Time	Success
	3	8	33,6	direct
	64	71	141	indirect
	20	25	167,5	dnf
	46	50	90,2	dnf
	13	19	84,3	dnf
	2	6	63,2	indirect
	1	17	16,3	indirect
	12	12	58,3	direct
	6	27	86	direct
	22	27	101,2	direct
	4	4	11,64	dnf
	10	23	43,4	direct
Confidence Interval	(6,4;27,4)	(13,6;34,5)	(49,1;100,4)	

Figure 25 - Confidence Interval for sample 1 with Soup of Letters

Task 1	Errors	Clicks	Time	Success
	8	13	284,5	direct
	4	17	132	indirect
	18	24	283,1	indirect
	27	32	99,9	dnf
	12	23	114	indirect
	0	5	40,1	direct
	2	7	172,9	direct
	2	7	65,6	direct
	2	7	31,9	direct
	23	28	137,1	direct
	2	6	61,2	indirect
	8	13	139,3	direct
	4	7	27,1	dnf
	4	9	161,2	direct
	28	37	139,3	indirect
	10	16	84,8	dnf
	9	22	163,9	indirect
Confidence Interval	(5,4;13,8)	(11,4;20,7)	(90,9;160,7)	

Figure 26 - Confidence Interval for sample 2 with Soup of Letters

Task 1	Errors	Clicks	Time	Success
	2	6	21,14	direct
	63	69	106,83	indirect
	19	23	52,47	dnf
	46	49	82,25	dnf
	13	19	84,3	dnf
	2	6	63,2	indirect
	1	17	16,3	indirect
	11	10	31,99	direct
	2	6	31,08	direct
	22	26	66,26	direct
	4	4	11,64	dnf
	0	4	16,91	direct
Confidence Interval	(4,6;26,2)	(9,0;30,9)	(31,5;65,9)	

Figure 27 - Confidence Interval for sample 1 without Soup of Letters

Task 1	Errors	Clicks	Time	Success
	1	4	63,82	direct
	3	15	57,92	indirect
	18	24	283,1	indirect
	26	30	83,02	dnf
	11	20	59,05	indirect
	0	4	26,85	direct
	0	4	12,98	direct
	0	4	30,46	direct
	0	4	9,57	direct
	22	26	112,79	direct
	2	6	61,2	indirect
	8	12	31,79	direct
	1	3	18,17	dnf
	0	4	14,64	direct
	28	36	134,81	indirect
	9	14	51,52	dnf
	8	20	156,62	indirect
Confidence Interval	(3,6;12,5)	(8,6;18,5)	(39,0;103,1)	

Figure 28 - Confidence Interval for sample 2 without Soup of Letters

Task 2 - Transform voice into text, and then leave the page.

In what concerns Task 2 related to the Speech-to-Text functionality, we calculated the statistics for both samples, according to the time, possible errors and interface clicks.

For this task was expected a maximum of 3 possible errors, which makes us guarantee with 95% of confidence the efficiency of the task for people with dyslexia, being aware that their confidence interval is [2.6, 20.4], but not for non-dyslexic people, which interval was [7.0, 16.6].

There were a maximum of 10 expected clicks on the interface, already counting on the possible errors. We can guarantee with 95% of confidence the efficiency of the task for

people with dyslexia, being aware that their confidence interval is [6.7, 32.8], but not for non-dyslexic people, which interval was [11.6, 23.5].

Lastly, the task was expected to be concluded in 40 seconds maximum. As the figures below show, the confidence intervals were [16.2 , 90.7] and [30.4 , 123.5] for dyslexic and non-dyslexic people respectively. Therefore, it is assured with 95% of confidence the efficiency of this task in what respects the time.

Results

Task 2	Errors	Clicks	Time	Success
	10	18	18,4	dnf
	9	15	48,7	direct
	4	6	17,9	dnf
	20	27	47,4	direct
	6	12	66,2	dnf
	3	9	37,8	indirect
	3	8	11,3	direct
	7	12	21,4	direct
	12	19	39,5	direct
	2	11	52,1	indirect
	61	94	265	indirect
	1	6	15,7	direct
Confidence Interval	(2,6;20,4)	(6,7;32,8)	(16,2;90,7)	

Figure 29 - Confidence Interval for sample 1

Task 2	Errors	Clicks	Time	Success
	33	42	214,1	indirect
	14	21	100,4	indirect
	9	18	92,5	indirect
	29	40	359,3	indirect
	5	9	42	dnf
	16	22	48,2	dnf
	9	16	23,1	direct
	0	5	15,4	direct
	2	7	23,8	direct
	16	21	28,9	dnf
	12	23	107,5	indirect
	18	21	56,3	dnf
	1	1	3,16	dnf
	12	16	36,7	dnf
	1	1	3,21	dnf
Confidence Interval	(7,0;16,6)	(11,6;23,5)	(30,4;123,5)	

Figure 30 - Confidence Interval for sample 2

Task 3 - Learn more about the Famous Person of the Week.

In this task, we expect a number of errors equal to 2. In the first sample, people with dyslexia, the average number of errors done in this task is not within their confidence interval [3.3;28.5]. Therefore, we cannot guarantee with 95% confidence the effectiveness of this task. However, in the second sample, non dyslexic people, this average is within the confidence interval [1.6;5.3] so we can affirm with 95% confidence the effectiveness of this task.

As far as the number of clicks is concerned, 3 clicks were expected. As we've seen before, in the first sample the average number of errors done in this task is not within their confidence interval [4.3;33.4]. Therefore, we cannot guarantee with 95% confidence the effectiveness of this task. However, in the second sample this average is within the confidence interval [2.5;7.7] so we can affirm with 95% confidence the effectiveness of this task.

Lastly, the expected time taken to complete it was 9s. Therefore, in the both samples, the average time spent in this task is within their confidence intervals, respectively [5.6;47.6] and [7.3;27.0]. This statistics allows us to guarantee with 95% confidence the effectiveness of this task for people with and without dyslexia.

With this data we can conclude that we got the time we expected, however the places on where to click should be more intuitive, seeing as the amount of clicks and errors is higher than what we expected for dyslexic people.

Results

Task 3	Errors	Clicks	Time	Success
	3	4	5,6	direct
	2	2	7,68	dnf
	3	4	25,5	direct
	2	2	6,44	dnf
	11	12	14	direct
	27	36	23,7	dnf
	2	3	2,1	direct
	28	32	42,1	indirect
	13	14	24	direct
	77	88	133,1	dnf
	7	10	8,3	indirect
Confidence Interval	(3,3;28,5)	(4,3;33,4)	(5,6;47,6)	

Figure 31 - Confidence Interval for sample 1

Task 3	Errors	Clicks	Time	Success
	0	1	17,3	direct
	1	2	5,3	direct
	9	14	48,8	indirect
	7	10	49,6	indirect
	3	6	25,9	dnf
	7	10	11,3	indirect
	0	1	2,8	direct
	0	1	2,6	direct
	1	1	3,93	dnf
	4	4	4,32	dnf
	6	6	17,4	dnf
Confidence Interval	(1,6;5,3)	(2,5;7,7)	(7,3;27,0)	

Figure 32 - Confidence Interval for sample 2

Conclusion

Our journey in creating an application to support individuals with dyslexia has been marked by iterative design and user evaluations, encompassing multiple phases. The evolution from the initial concept to the second prototype, along with user feedback, has shaped a more refined and user focused solution.

To get such feedback from the users, wireflows were created, which made it possible to test tasks such as playing Soup of Letters, transforming voice into text, and learning more about the Famous Person of the Week, being those the three tasks selected by us to implement.

User evaluations were conducted both in person and remotely, involving dyslexic and non-dyslexic individuals in both Portuguese and English versions. The evaluations were structured to gather insights across various dimensions, from biological data to task performance and user opinions.

The results of the evaluations offered valuable quantitative and qualitative data. Statistical analysis provided insights into the efficiency and effectiveness of each task. User profiling highlighted demographic trends, emphasizing the diversity within our user groups.

In the broader context, the iterative design process has been instrumental in refining our application. The initial phases allowed us to understand the unique challenges faced by dyslexic individuals, shaping our approach to inclusivity and accessibility, making use of a questionnaire about the difficulties of the group our application wants to reach. The wireflow allowed us to be able to present the app to a group of people, in order to get the user evaluations, which are a pivotal part of our development. They unveiled both successes and areas for improvement. While certain tasks met expectations, others highlighted the need for more intuitive design. The feedback, though predominantly critical, provided constructive insights crucial for further refinement.

Our commitment to inclusivity extends beyond specific user groups to create an application that is globally accessible. The lessons learned from these phases contribute to a broader understanding of designing for diverse user needs, transcending linguistic and cultural boundaries.

In a nutshell, in part 1 of our project, namely User and Task Analysis, we concluded that this phase was very important in gathering information about users in order to develop appropriate functionalities for them. This analysis allowed us to move on to the next phase.

In this next phase, namely First Prototype and Heuristic Evaluation, we were able to identify the usability problems of our system through the realization of low-fidelity prototypes and the heuristic evaluations of our colleagues. This phase allowed us to look at the project with fresh eyes and improve it.

In relation to the course itself, we learned a lot relative to the creation of a project of any type, from things we didn't think had much relevance like the collection of information even before the beginning of the project, to some phases we didn't know required so much work, like the collection of feedback from multiple different sources, in our case both our colleagues in phase II and the target user itself in phase III. We also learned some tricky things about project development, such as understanding what the user really is perturbed by in the app, since a lot of them don't really know how to explain what they dislike in the app, and how to properly approach a potential user to test our app, in order to not scare them or make them feel uncomfortable during the test itself. The different phases also allowed us to further our understanding about some areas we already had some experience

with, for example the creation of prototypes and the creation of a design to the application, by introducing us to different tools that aid in the creation of such tasks.

In conclusion, our application development journey has been a dynamic process of learning, refining, and adapting. The global perspective gained through user evaluations, wireflow design, and iterative improvements turns our application into a tool not just for dyslexic individuals but for diverse users worldwide. The insights gathered could guide efforts to in the future create an inclusive, user-friendly, and impactful solution for individuals facing challenges associated with dyslexia.

Annexes

Part I

- a. [Questionnaires](#)
- b. [Summary of results](#)

Part II

- a. [Heuristic Evaluation from group 01](#)
- b. [Heuristic Evaluation from group 06](#)

Part III

- a. [Statistics](#)
- b. [Final Prototype Live](#)