School of Computing
CA326 Year 3 Project Proposal Form

SECTION A
Project Title: Trace 'N Learn

Student 1 Name: Dzastina Laukaityte   **ID Number:** 20703845

Student 2 Name: Malavika Shanker   **ID Number:** 20102232

Staff Member Consulted: Hyowon Lee

Project Description

The idea is to create an app version of the Trace 'N Learn books where children can learn how to draw the English alphabets (26 letters) based on the dotted lines on the touch screen of a device.

The user can use their fingers to draw along it or use a stylus depending on the availability. The user will also have the ability to switch the swipe to a desired colour of their choice. Based on whether they hit the coordinates of the letters on the touchscreen or not they are given a score for the accuracy. This score is not meant to make the kids feel pressured - but for more to share the learning score with the parents so that they can understand their child's learning growth. The learning scores will be stored in a database for a month after its last accessed so as to show their performance over a month.

We will be assigning each letter a difficulty score such that once that letter has been drawn with say x level of accuracy, we will input it into an algorithm which will suggest another letter based on the x level of accuracy. If the x level of accuracy is low or high, the application will suggest an easier or harder letter as the next challenge.

The application will have two different sections where the user can trace words or letters based on their mode selected. It will be able to rank words based on the difficulty level and divide them into categories of easy, medium and hard where the learning scores will be different for each category. For example, a user might have a 90% accuracy rating for letters in the easy section, 75% in the medium and 30% in the hard category. The words for each category will be decided by the difficulty level of the letters in the words as per the resource linked below from the National Library of Medicine.

[1] Dimensionality and Reliability of Letter writing in 3-to-5-Year-Old Preschool Children, September 2, 2015.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4557880/#:~:text=Graham%20et%20al.,u%20were%20the%20most%20difficult

On top of this, if time permits the application will also have a parameter of how far the line is from the correct coordinates. It will add this to the algorithm to bring about dynamic-ness in the accuracy of the strokes for the letter/word. Provided the same with respect to time, the application will also have a free play section where a user starts off with letters and then

increases the difficulty level (for say 5 letters). Based on the accuracy of the tracing the user will be recommended words which also increase in difficulty.

The application will have modes for sensory feedback like vibrations, coloured lines, and sound. We understand that for some children sensory stimulation works while for others it may not. These modes can easily be turned on or off depending on the child's mood and/or situation.

The design of the UI will be kept as simple as possible to not overwhelm the children with too much art and colours. The application will consist of neutral colours. It will also consist of a colour blind-friendly mode to assist user's with visual impairments.

We do understand that there are ethical concerns with respect to the application as it is made for children. We will ensure that all of the ethical requirements are met before allowing children to access the application for testing.

Division of Work

Designing of the UI/UX of the application – This component will be completed together. This will involve the creation of the colour scheme for the application as well as the overall design which includes buttons and any other features available.

Application Authentication – This component will be completed by Dzastina. This will involve ensuring that the user's data is safe, secure and encrypted.

Firebase Backend Integration – This component will be completed by Malavika. This will involve being able to store the user's results and swiping accuracy.

Dashboard Learning Profile – This component will be completed by Malavika. This will involve being able to display a user's progress and accuracy scores with each letter.

Tracking Movement of the User's Swipe – This component will be completed together. This will involve being able to track the movement of a user's swipe on the screen to gain the accuracy percentage and determine if the user has successfully completed the letter with their swipe.

Letter Tracing Feature – This component of the application will be completed together. We will allocate 13 letters each making the 26 letters of the alphabet.

Sensory feedback - This component will be completed by Dzastina. This will involve the application being able to give visual, auditory and tactile feedback.

Letter Difficulty & Suggestion Algorithm - This component will be completed by Malavika. This will involve being able to recommend the user the next letter difficulty based on the user's previous letter swipe accuracy.

Swipe Accuracy Rate Percentage – This component will be completed by Dzastina. This will involve calculating the user's swipe accuracy based on how the user swipes across the screen as well as how

Colour Blindness Feature - This component will be completed by Dzastina. This will involve ensuring the applications supports users with visual impairments. This will be a toggle on/off feature.

Sensory Feedback Feature - This component will be completed by Malavika. This will involve ensuring that the device can provide sensory feedback such as vibrations, sounds, and visual effects.

Programming language(s)
Java or Kotlin
XML

Programming tool(s)
Firebase (database)
Firebase authentication
Android Studio

Learning Challenges

1. *User's swipe* - Learning how to detect the user's swipe on a screen when drawing the alphabet letters.

2. *Swipe Accuracy Rate Percentage* - Learning to calculate the user's swipe accuracy based on how the user swipes across the screen. As well as how well the user swipes in the letters formation.

3. *Programming Tools* - Learning how to use various programming tools like Android Studio and Firebase.

4. *Developer Settings* - Learning how to use and develop with developer settings on an Android application.

5. *Database Integration* - Learning how to store the user's learning data in a database.

6. *Authentication* - Learning how to implement authentication to ensure that the user's data is safe, protected, and encrypted.

Hardware/software platform
Android
Mac
Windows

Special hardware/software requirements
N/A