Software Requirements Specification

for

Teaching Tasks

**Version 1.0 approved**

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**02/15/20**

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**Revision History**

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| --- | --- | --- | --- |
| **Name** | **Date** | **Reason For Changes** | **Version** |
| Blackbear Consultants | 02/25/20 | Revision before formal submission | 1.1 |
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# Introduction

## Purpose

Children with Autism Spectrum Disorder generally learn in non-conventional ways compared to children in a normal school setting. Because of this, new techniques and methodologies about how to effectively teach children with Autism Spectrum Disorder have been created. One such technique is Discrete Trial instruction. The purpose of our mobile application is to capture the technique of Discrete Trial Instruction and make it into a fun and intuitive game that children can use to learn material set forth by the Maine Early Childhood Learning Guidelines. Another purpose of the application, Teaching Tasks, is to help parents cut the cost of educating their children, as instructors and clinicians in the field charge high fees to help educate children with Autism Spectrum Disorder. This is the first release of the third revision of the SRS document, and its aim is to describe the application as a whole.

## Document Conventions

We have followed the standard conventions for the SRS using Times New Roman as the font with a size 14 for headings and size 11 for standard body text. For this document there has been a text color change to display the priority levels of tasks. Red reflects a high level task, Yellow for a medium level task, and Green for a low level task. In regards to determining our priority levels each task will have its own priority level assigned.

## Intended Audience and Reading Suggestions

This document is intended for developers, project managers, uers, testers, and documentation writers. For the developers, this document will describe the expected functional and non-functional requirements for this project. For project managers this document will detail the project overview along with scope and goal for the project. This document will assist users and testers by listing different features of the project for better understanding what the application is aimed for. In the case of documentation writers this document will serve to assist with understanding the application and scope of the project.

The rest of this document will describe the scope, references, description, requirements, functions, and features of the application.

## Product Scope

The software that Teaching Tasks is creating is an educational game for children with Autism Spectrum Disorder. This educational game is being created so that professionals that were trained to teach these kids can have another tool to help teach these children. Children with Autism Spectrum Disorder need one on one help, someone needs to be there making sure they know that they are learning and doing it correctly. So the goal of this application is to be able to aid these teachers, so that the kids can play this game and learn what they need to learn at the same time. We want these teachers to be able to give the game to the kid and they will be able to start learning, this could also be very useful for parents they could give this to their kid at home and they could continue to learn at home.

## References

<https://www.apa.org/>

This link contains the standards and guidelines that are followed throughout our application.

# Overall Description

## Product Perspective

This project is a new self-contained product. It comes with all new systems and subsystems designed to aid in the functionality of the application.

## Product Functions

* User Login
* Tasks that follow DTI guidelines
* Statistics based on user performance

## User Classes and Characteristics

User Class: General Users - Adults

Adults using the application will have access to the whole application, but will not be permitted to play games. Gameplay is strictly for children as it is used to educate them and track their progress. Adults will be assumed to have access to the same technology that the children do, with little expertise on how the functionality is but a good understanding of the statistics tracking the children. Generally, adults shouldn’t be using the product too much, as the main reason for the application to be open is for the children to play the game.

User Class: General Users - Children

Children are the primary users of the application. With little to no technical expertise, they will be accessing the productly solely to play the game and educate themselves on material from their grade category. They will also have the second most experience using the application over time as they play the game and are accustomed to the user interface.

User Class: Power Users

These users are the users with a vast amount of resources and access to development tools. Their primary use is establishing gameplay and functionality for the other users. They will initially be the primary users of the application and will over time use the application less and less as it becomes developed. There will be some cyclicality in the frequency of use as new features are brought up and implemented. They will have the highest security clearance on the application and the most experience using it.

## Operating Environment

Teaching Tasks will run on Android and all devices such as smartphones and tablets that support the latest version; currently Android 10. Teaching Tasks will be used in environments that include a one on one session between a child and the provider. These sessions are performed in well lighted rooms that are intended to decrease the number of distractions for the child so they can clearly and easily focus on the tasks at hand. Another environment we are pursuing with this app is anytime that a parent or guardian is available to monitor the child as they use the app. This type of environment will help the child outside of their typical learning environment and extend the parents or guardians ability to be involved in the child’s learning.

## Design and Implementation Constraints

An issue that Teaching Tasks faces is the inability to leave the child with the app. While the app locks itself into the Task mode when selected, this doesn’t disable the ability to leave the Teaching Tasks app. This is a software limitation. Another goal set by Black Bear Consultants is to help the child with writing, which can be limited by the devices hardware capabilities. Teaching Tasks also follows a strict standard for teaching called DTI, however, this isn’t limiting for the team due to the nature of the tasks. DTI focuses on very specific small tasks and slowly works up to more complex tasks as the child progresses. We’ve found this to be a great strength in developing the app as computers can be easily programmed to do small specific tasks.

## User Documentation

Popup “Welcome to Teaching Tasks!” tutorial on the user list page informs users of account creation and other application features.

## Assumptions and Dependencies

Assumptions: None at this time.

Dependencies:

* Python 3
* Node.js
* FlaskAPI
* React Native
* MySQL
* Android Studio
* react-navigation-native
* react-navigation stack
* react-native-reanimated
* react-native-gesture-handler
* react-native-screens
* react-native-safe-area-context
* @react-native-community/masked-view

# External Interface Requirements

## User Interfaces

Initially after opening the app, Teaching Tasks will allow the user to select from a list of accounts to login. The user selects an account by tapping on it, which prompts the user with a password requirement. Once logged into the app, the user is brought to the Task interface. At the bottom of the screen are the buttons for the Task interface, Statistics interface, and Settings interface in that order.



On the Tasks interface, the user will be brought to the last task they had been working on. At the top is the account user’s name, followed by the category the current task is in. For the image above, the current category is Matching and the current Task is matching the Square. The user can see the current progress this account has made on the task at hand which is being represented by the stars. A reference to the task is shown using an icon, in this example, it is the red square. The user will click the START button, at which point the task will begin. While in *Task Mode* the user will be required to enter the account password when trying to leave the Task interface. During the Task Mode, the user will be given tasks to complete with new tasks being generated after each completion of a task.



## Hardware Interfaces

Teaching Tasks will run on hardware, more specifically phones and tablets, that support the latest version of Android; currently Android 10. The main hardware interactions will be physical presses on the screen that will cause the software to alert the app of button presses and swipes.

## Software Interfaces

Teaching Tasks uses a RESTful flask API built with Python version 3.x.x, a React Native front-end version 0.61.5, MySQL database running version 8.x.x, NodeJS version 13.9.0. The app will use React Native as our front-end interface to communicate and receive information to and from the user. The front-end will request information from the database that our RESTful Flask API will serve to the front-end, creating a cycle of communication.

## Communications Interfaces

No external communication will be performed by the application. Internal communication will be primarily within a RESTful API, but also including sql communication to a database.

# System Features

## Account Registration

4.1.1 Description and Priority

Priority: High

Allows a user to register a new account within the system, including a name, password, and optional information such as color blindness to enhance their experience.

4.1.2 Stimulus/Response Sequences

The user taps a register button on the login page, which navigates to a registration page with text inputs for name and password, and checkboxes for color blindness and other information. After the “Create Account” button is tapped, the information is saved in a database and the account name is added to the account list in the login page. The user is returned to the login page.

4.1.3 Functional Requirements

REQ-1: The system shall perform a secure hash function on the given password before it is saved 100% of the time.

REQ-2: The system shall include basic diagnostics for each user to gauge where the user is at in their learning.

REQ-3: The system shall display recommended starting points for each user so that they can pick up learning from where they left off.

## Account Login

4.2.1 Description and Priority

Priority: High

Allows a user to access a registered account and use the application with that account.

4.2.2 Stimulus/Response Sequences

The user taps a registered account name on the login screen. A popup asks for the account password. After tapping the login button, if the password is incorrect the user is told and given 3 more chances to login before the account is locked for half an hour. If the password is correct the user is shown the game selection page.

4.2.3 Functional Requirements

REQ-1: The system shall allow the user to type in a password to access an account in the application.

## Game Selection

4.3.1 Description and Priority

Priority: High

Allows a user to choose a game type and lock the application to the game screen.

4.3.2 Stimulus/Response Sequences

The user chooses a game type, or simply taps play to proceed with their current track. The system moves to the game screen and if the option is enabled pops up a message about locking the app.

4.3.3 Functional Requirements

REQ-1: The system shall prompt the user to the next task upon completion of the current task.

REQ-2: The system shall recommend which task to start based on data stored for the client.

REQ-3: The system shall allow the user to choose which task to start prior to loading the game.

## Shape, Letter, Number Identification

4.4.1 Description and Priority

Priority: Medium

A game in which the user taps the shape they are prompted to, with trials following the Discrete Trial Instruction(DTI) model.

4.4.2 Stimulus/Response Sequences

The user is shown one or more shapes and told to tap one of them. If the user succeeds the system responds with a congratulatory screen paired with sound. If the user does not succeed, the system will follow DTI instructions, which may result in replaying the same game or a similar game.

4.4.3 Functional Requirements

REQ-1: The system shall use graphics to display colors as the client progresses through the tasks.

REQ-2: The identification section shall be easy to use so that children do not become overly frustrated while learning.

REQ-3: The system shall allow children a second try with added hints if they get something wrong.

REQ-4: The system shall revert back to an easier game task if the user gets a question wrong too many times.

REQ-5: The system shall play any audio cues formed by the game when prompted.

REQ-6: The system shall incorporate shapes into its identification sections to help children learn shapes easily.

REQ-7: The app shall provide users with a prompt telling them if they are right or wrong on a game task because it will help them reinforce the concept.

REQ-8: The system shall recognize any audio cues formed by the game when prompted.

## Shape, Letter, Numbers Matching

4.5.1 Description and Priority

Priority: High

A game in which the user taps the shape they are shown, with trials following the Discrete Trial Instruction(DTI) model.

4.5.2 Stimulus/Response Sequences

The user is shown a shape, paired with one or more shapes. They are then told to tap the matching shape from the second set. If the user succeeds the system responds with a congratulatory screen paired with sound. If the user does not succeed, the system will follow DTI instructions, which may result in replaying the same game or a similar game.

4.5.3 Functional Requirements

REQ-1: The matching section shall be easy to use so that children do not become overly frustrated while learning.

REQ-2: The system shall allow children a second try with added hints if they get something wrong.

REQ-3: The system shall use graphics to display colors as the client progresses through the tasks.

REQ-4: The system shall revert back to an easier game task if the user gets a question wrong too many times.

REQ-5: The system shall play any audio cues formed by the game when prompted.

REQ-6: The system shall incorporate shapes into its matching sections to help children learn shapes easily.

REQ-7: The app shall provide users with a prompt telling them if they are right or wrong on a game task because it will help them reinforce the concept.

REQ-8: The system shall recognize any audio cues formed by the game when prompted.

## Settings

4.6.1 Description and Priority

Priority: Low

The settings screen holds various global settings such as whether to show a popup reminding the user to pin the application before giving it to the child.

4.6.2 Stimulus/Response Sequences

The settings screen is a list of items that can be toggled on or off or edited with a dropdown menu. Each setting may cause changes throughout the application.

4.6.3 Functional Requirements

REQ-1: The system shall include settings for light adjustments so that users can adjust their sensory information to suit their needs.

REQ-2: The system shall include settings for sound adjustments so that users can adjust their sensory information to suit their needs.

## Statistics

4.7.1 Description and Priority

Priority: Medium

The statistics screen holds various account-based statistics such as trial progress and accuracy.

4.7.2 Stimulus/Response Sequences

The statistics screen is a list of information pulled from a database for each account.

4.7.3 Functional Requirements

REQ-1: The system shall be able to handle loading graphics that may be dynamic in nature.

REQ-2: The system shall display the collected statistics so that instructors can see how the child has progressed in an intuitive way.

REQ-3: The system shall display client’s progress for each task to indicate how the client is doing for the current task.

REQ-4: The system shall track progress on goals per trial as children play with 95% accuracy.

REQ-5: The system shall update progress on goals per trial as children play with 95% accuracy.

REQ-6: The system shall keep track of all statistics that adult users need access to in order for them to see how their child is doing.

# Other Nonfunctional Requirements

## Performance Requirements

The system will display data for clients upon request within 5 seconds, 95% of the time.

The system shall communicate with a local database to save account information within 3 seconds 95% of the time.

The system shall display progress on current goal per trial with 95% accuracy.

The system shall load the statistics window within 3 seconds 95% of the time.

The system shall display the statistics window within 3 seconds 95% of the time.

The system shall connect to a database within 2 seconds 96% of the time.

The system shall read a database within 2 seconds 96% of the time.

The system shall display the current progress before the task is started within 5 seconds of loading the game, 95% of the time.

The system shall handle graphics created in good quality 95% of the time.

The system shall load the game within 3 seconds, 95% of the time.

The system shall display the game within 3 seconds, 95% of the time.

The system shall accurately track how well a child is doing based on how much they get right or wrong 95% of the time.

The system shall handle rigorous calculations about how the user is doing at peak performance 90% of the time.

The system shall communicate with a local database to compare the hash of a given password to the stored hash within 3 seconds, 95% of the time.

The system shall recognize when a child is struggling on a game task 95% of the time.

The system shall load images from the device storage within 5 seconds, 95% of the time.

The system shall display images from the device storage within 3 seconds, 95% of the time.

The system shall allow the switching between tasks within 1 second, 95% of the time.

The system shall display the settings window within 3 seconds 95% of the time.

The system shall load the settings window within 3 seconds 95% of the time.

The system shall connect to a settings database within 2 seconds of settings being updated 97% of the time.

The system shall update a settings database within 5 seconds of settings being updated 97% of the time.

The system shall display the game selection screen within 3 seconds of an account being logged in 95% of the time.

The system shall load the game screen after selection within 2 seconds 90% of the time.

The system shall communicate with a local database to save account information within 3 seconds, 95% of the time.

## Safety Requirements

The system shall utilize safe color schemes so that users have a 5% chance of side-effects while completing tasks, 99% of the time.

## Security Requirements

The system shall not communicate any information externally.

The system shall not track geographic location.

The system shall be password protected so that collected data is safeguarded from third parties.

The data displayed shall protect local data through encryption.

The system shall comply with all HIPAA mandates.

The system shall perform a secure hash function on the given password before it is saved 100% of the time.

## Software Quality Attributes

The games shall be accessible to young children with ASD possessing little to no knowledge of how to operate a phone.

## Business Rules

The system shall inherit the doctrines of HIPPA, The Maine Early Childhood Learning Guidelines, and the VB-MAPP to deliver an effective tool to help children with ASD learn.

# Other Requirements

The only legal requirement our app might infringe upon is if we save user information, but we will not be saving user information therefore we will not store any information that could harm the user if someone were to get it.

**Appendix A: Glossary**

ASD: Autism Spectrum Disorder - A broad range of conditions characterized by challenges with social skills, repetitive behaviors, speech and nonverbal communication.

DTI: Discrete Trial Instruction - A highly structured instruction method developed specifically for children with ASD.

HIPAA: Health Insurance Portability and Accountability Act - A law that protects the privacy of medical patients.

**Appendix B: Analysis Models**

N/A

**Appendix C: To Be Determined List**

We don’t have any references that we need to track at the moment.