IT4010 – Research Project - 2024

Topic Assessment Form

Project ID: 24-25J-133

1. Topic (12 words max)

Mobile and Simulation-based Approach to Reduce Dyslexia in Children with Learning Disabilities

2. Research group the project belongs to

Software Systems & Technologies (SST)

3. Research area the project belongs to

Machine Learning (ML)

4. If a continuation of a previous project:

Project ID	
Year	

5. Brief description of the research problem including references (200 – 500 words max) – references not included in word count.

Dyslexia is a specific learning disability characterized by difficulties with reading, spelling, and writing despite normal intelligence. [16] These difficulties stem from underlying challenges in processing language, particularly the connection between sounds and letters (phonemic awareness). [17] Children with dyslexia often face frustration and struggle in school, impacting their academic performance and self-esteem. [16]

Early intervention is crucial for children with dyslexia. Traditional interventions involve specialized instruction and educational therapy to develop reading skills and address underlying processing difficulties. [17] However, these interventions can be resource-intensive and require trained professionals. [20]

Technology offers a promising avenue to support children with dyslexia by providing accessible, engaging, and personalized learning tools. Mobile applications specifically designed for dyslexia can offer several advantages:

Accessibility: Mobile apps are readily available on devices children already use, making learning opportunities more accessible and convenient.

Engagement: Interactive games and activities can make learning fun and motivating, fostering a positive attitude towards reading practice.

Personalization: Apps can be tailored to a child's specific needs and learning style, focusing on areas requiring the most support.

Data Tracking: Mobile apps can track a child's progress in real-time, allowing educators and parents to monitor improvement and adjust interventions as needed.

Studies show that technology-based interventions can improve reading fluency, word recognition, and phonological awareness in children with dyslexia. Mobile applications, which use gamified activities, have shown significant improvements in reading fluency and accuracy. These innovative approaches offer personalized, engaging learning support. [18] [19] [1] [21]

References

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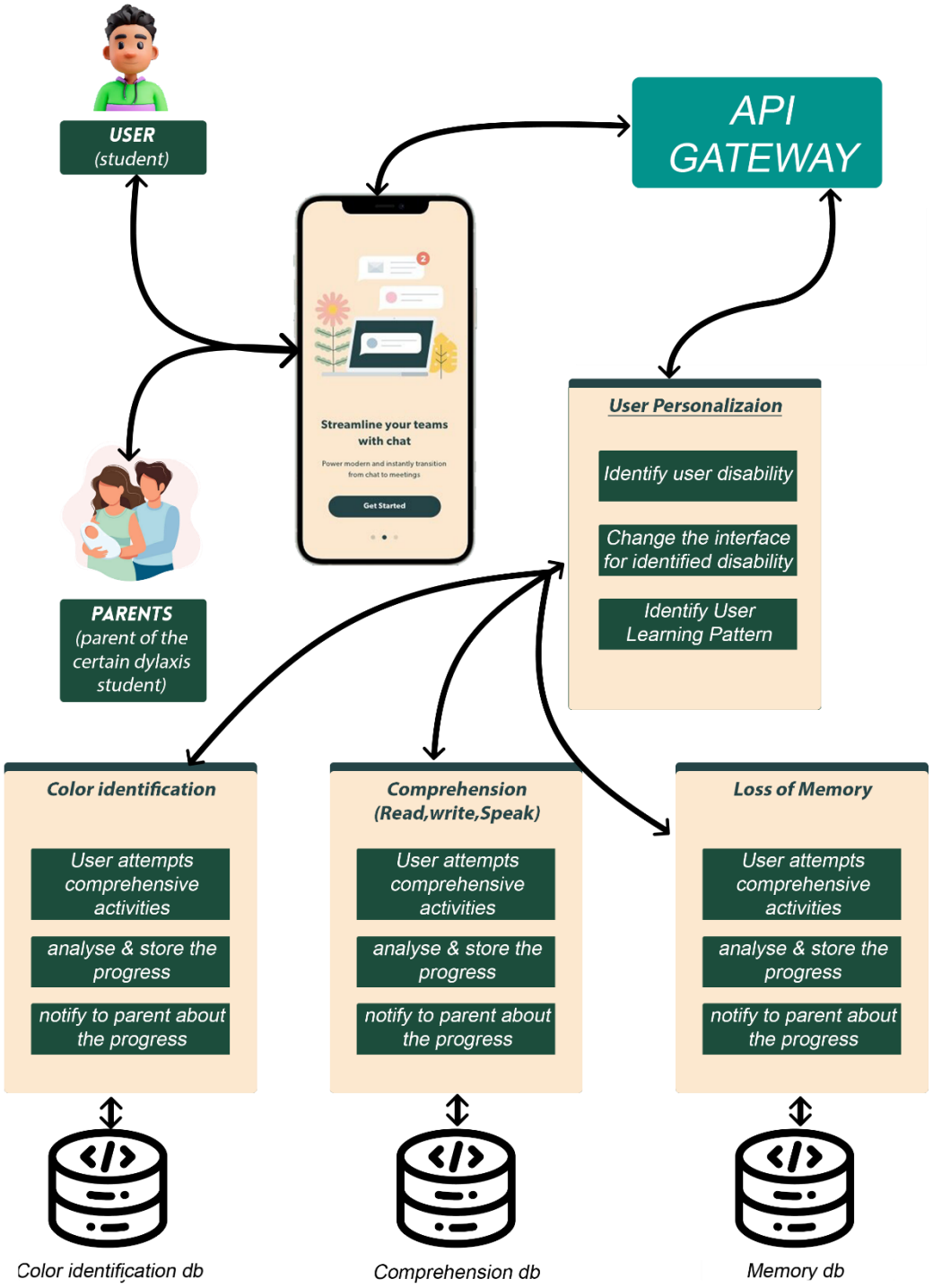
[21] S. Rahimi, "The Conversation," The Conversation, 14 05 2024. [Online]. Available: https://theconversation.com/students-with-dyslexia-face-challenges-transitioning-to-the-workplace-but-with-support-they-can-thrive-227656. [Accessed 12 06 2024].

6. Brief description of the nature of the solution including a conceptual diagram (250 words max)



This project proposes a mobile application designed to assist children with dyslexia in improving their reading, processing, and memory skills. The app will leverage various technologies and features to create a personalized and engaging learning experience.

Nature of the Solution:

- ✓ **Assessment**: The app will utilize initial and ongoing assessments to identify a child's specific strengths and weaknesses in areas like reading fluency, phonemic awareness, and visual processing.
- ✓ **Tailored Learning Modules**: Based on the assessment results, the app will provide personalized learning modules focusing on areas that require the most support.
- ✓ **Engaging Activities**: The learning modules will incorporate interactive games, activities, and exercises to make learning fun and motivating for children.
- ✓ **Multi-sensory Learning**: The app will integrate audio, visual, and potentially kinesthetic elements to cater to different learning styles.
- ✓ **Progress Tracking**: The app will track the child's progress in real-time, allowing parents and educators to monitor improvement and adjust learning activities as needed.
- ✓ **Feedback and Recommendations**: The app will provide regular feedback on a child's performance and suggest additional resources or strategies to further enhance learning.
- ✓ **Resource Library**: The app will offer a curated library of additional resources such as books, games, and other apps that can complement the learning experience.

7. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

Learning Disabilities and Dyslexia:

Understanding dyslexia, its subtypes, and the challenges faced by children with dyslexia is essential.

Effective instructional strategies and interventions are crucial for improving reading, processing, and memory skills in these children.

Familiarity with phonemic awareness training, multisensory learning techniques, or assistive technologies is important. Keeping updated on recent research and technological advancements can enhance the app's design and functionality.

Educational Technology and Mobile App Development:

- ✓ Expertise in designing engaging and interactive mobile applications for children is necessary, understanding child development, user-centered design, and creating age-appropriate interfaces.
- ✓ Knowledge of UI and UX design principles helps create accessible apps, featuring clear navigation, adjustable text sizes, and alternative input methods.
- ✓ Incorporating educational best practices and gamification elements promotes effective learning, including spaced repetition, progress tracking, and integrating game mechanics to motivate children.

Data Management and Assessment:

- ✓ Developing child-appropriate assessments within the app to evaluate reading skills and phonemic awareness is crucial. Expertise in designing engaging assessment formats for mobile platforms is needed.
- ✓ Ensuring data security and privacy is essential for safe data collection, storage, and use, adhering to regulations.
- ✓ Understanding data analysis methods helps track progress, identify areas for improvement, and personalize the learning experience, using visualized progress data to inform recommendations.

Data Requirements:

The mobile application will require access to the following types of data:

- ✓ The app requires user data (name, age, grade level) for personalization and tracking.
- ✓ Assessment data (scores and performance metrics) helps identify strengths and weaknesses.
- ✓ Learning activity data (progress, accuracy rates, time spent) tracks progress and tailors future activities. Ensuring compliance with data privacy regulations and prioritizing the security of children's information is crucial.

It's crucial to ensure that all data collection practices comply with data privacy regulations and prioritize the security of children's information.

8. Objectives and Novelty

<table>
<tr><td colspan="4">Main Objective
• Aims to Develop a mobile application that utilizes innovative solutions to support children with dyslexia in improving their reading, processing, and memory skills.</td></tr>
<tr><td>Member Name</td><td>Sub Objective</td><td>Tasks</td><td>Novelty</td></tr>
<tr><td>Sanjeeva N</td><td>Enhance Reading Skills [1] [2] [3] [4] [5]</td><td>1. Design interactive learning modules focusing on phonemic awareness, phonics, fluency, and comprehension.
2. Integrate features like text-to-speech, word highlighting, and personalized reading materials.
3. uses quizzes and games to assess reading abilities and identify weaknesses.
4. suggests targeted exercises based on identified weaknesses to improve specific reading skills.</td><td>• Utilizing a <u>Natural Language Processing (NLP)</u> to process and provide instant feedback on reading and pronounce in reading activities.</td></tr>
</table>

Shangeeth V	Improve Color Identification [6] [7] [8] [9] [10]	1. Research color identification and processing difficulties in children with dyslexia, focusing on visual processing issues and the impact on learning. 2. Create a model to personalize color identification activities and games based on a child's performance data (e.g., accuracy in color matching games, completion times). 3. Collect and analyze data to understand children's strengths and weaknesses in color identification. 4. Adjust the difficulty levels and color combinations in future exercises based on the analysis to improve learning outcomes.	• Utilizing **machine learning** to dynamically adjust difficulty levels and tailor color combinations in identification activities based on a child's performance, enhancing overall color recognition skills and providing a more engaging learning experience.

Asmitha T	Enhance Short-term Memory [11] [12] [13] [14] [15]	1. Research dyslexia's impact on short-term memory, focusing on sound-letter association, reading comprehension, following directions, and math problems. 2. Create a model to personalize memory training exercises based on performance data (e.g., accuracy rates, recall times). 3. Collect and analyze data to identify areas needing improvement in children's short-term memory. 4. Personalize memory exercises based on analysis, adjusting item numbers and task types to strengthen short-term and working memory.	• Utilizing **machine learning** to dynamically adjust the difficulty and complexity of memory training exercises, tailoring tasks to target specific weaknesses, and providing a data-driven approach to effectively improve short-term memory skills for children with dyslexia.

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IT4010 – Research Project - 2024

Topic Assessment Form

9. Supervisor checklist

a) Does the chosen research topic possess a comprehensive scope suitable for a final-year project?

Yes	✓	No	

b) Does the proposed topic exhibit novelty?

Yes	✓	No	

c) Do you believe they have the capability to successfully execute the proposed project?

Yes	✓	No	

d) Do the proposed sub-objectives reflect the students' areas of specialization?

Yes	✓	No	

e) Supervisor's Evaluation and Recommendation for the Research topic:

I recommend this project.

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Dr.	Kapila	Dissanayaka	Dissanayaka K.P.
Co-Supervisor	Ms.	Rivoni	De Zoysa	
External Supervisor				

IT4010 – Research Project - 2024

Topic Assessment Form

<u>This part is to be filled by the Topic Screening Panel members.</u>

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes (should be followed up by the supervisor) *	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

The Review Panel Details

Member's Name	Signature

*__Important__:

1. According to the comments given by the panel, make the necessary modifications and get the approval by the **Supervisor** or the **Same Panel**.
2. If the project topic is rejected, identify a new topic, and follow the same procedure until the topic is approved by the assessment panel.