

# The Efficacy of Artificial Intelligence-driven Immersive Reader for Dyslexic Students in Special Schools: A Case Study

*Hannah Shirley. M & B. Monika Nair*

## ABSTRACT

*Dyslexia is an intellectual learning disability that hinders an individual's ability to read and write in a language and to math. This research examines the significance and effectiveness of AI-based reading intervention for dyslexic students. The conventional approach of one-on-one instruction takes an extended period. Early intervention with AI assists students in overcoming the problem. Eighteen students with dyslexia were randomly assigned to an experimental group from a private dyslexia centre; the students got AI-based assistance. The study's findings demonstrated that dyslexic children in the experimental group enhanced their reading speed and precision. These findings suggest that AI-based interventions can be an effective tool for supporting dyslexic students in language learning.*

**Keywords:** Dyslexia, AI, Intervention, Reading, Special needs.

## Introduction

Dyslexia is an intellectual disability where individuals have difficulties in reading and writing, which can substantially impact their academic and social lives. Conventional dyslexia interventions include one-on-one teaching with a teacher or a reading expert. However, conventional methods can be time-consuming, and may not be available to all the students. Recent advancements in AI technology have opened up new avenues for personalized learning, such as using AI-based reading interventions for students with dyslexia. This study's focus is to look at the efficacy of an AI-based reading intervention "Immersive Reader" for dyslexic students.

Dyslexia, characterized as a learning disability, has two important characteristics. Firstly, Dyslexic students have weaknesses in one process of language acquisition rather than the overall process (Grigorenko et al., 2019). The common difficulty in a dyslexic student is the lack of phonological awareness be it processing of

language in written or oral form. Secondly, reading is an unexpected problem (Fletcher, Lyon, Fuchs, & Barnes, 2019). The various tools on reading difficulties such as IQ-achievement discrepancy, inadequate response to instruction (RTI), and patterns of strengths and weaknesses (PASW) state an alternate method or approach for representing alternative approaches for implementing unexpected underachievers.

Since the seventeenth century, there has been documentation of cases of individuals with dyslexia (Grigorenko et al., 2019). The first few individuals were with acquired dyslexia. Acquired dyslexic individuals are adults who can read but after a hemorrhage in the brain or stroke, they could no longer do so. Whereas, Individuals with developmental dyslexia were unable to read even though they were not affected by any brain injury. Dyslexic students can encounter significant academic challenges since their reading and writing issues can severely influence their performance in various areas.

Recently, there has been an increase in interest in researching the potential of artificial intelligence (AI) in assisting dyslexic students. AI is a rapidly emerging need with the potential to transform education by offering students with personalized learning experiences. AI technology such as Natural language processing and speech recognition may be used to build creative tools and applications.

This research article explores AI Microsoft Immersive Reader's potential for supporting dyslexic students in their language learning journeys. The result will provide an overview of the advantages of using AI for dyslexic students, the challenges associated with implementing AI in language learning, and future research directions in this field. The article will also present a case study investigating the effectiveness of an AI-based tool Microsoft Immersive Reader as an aid to improve the reading skills of dyslexic students.

### **Literature Review**

Dyslexia is a challenging learning issue that hinders people's ability to correctly read, write, and spell words (Fletcher, Snowling, & Scanlon, 2004). Dyslexia is a neurological disease caused by variations wiring and function of the brain (Shaywitz&Shaywitz, 2005). Dyslexia affects around 10% of the global population, making it a common learning disorder(Lyon, Shaywitz, &Shaywitz, 2003).

Dyslexic pupils frequently struggle with reading and writing skills, affecting their academic performance and self-esteem (McArthur, Eve, Jones, Banales, &Kohnen, 2012). Traditional teaching techniques may be ineffective for dyslexic students who need more personalized and focused interventions (Snowling& Hulme, 2011). As a result, there is a growing desire for

innovative and practical approaches.

Artificial intelligence (AI) is an evolving technology with immense potential in various disciplines, including education. AI technology such as natural language processing (NLP), speech recognition, and machine learning algorithms might be used to create innovative tools and apps to help dyslexic students overcome language learning challenges. AI-powered tools may deliver personalized and adaptable learning experiences, as well as rapid feedback and the ability for students to practice at their speed and in their own time (Seo et al., 2021).

The Orton Gillingham Online Academy, which employs NLP to analyze students' reading problems and offer focused feedback, is one example of an AI-based solution for dyslexic pupils. Another example is the ReadSpeakerwebReader, which employs text-to-speech technology to assist dyslexic children in reading and comprehending digital materials.

However, there are specific difficulties in using AI in language acquisition for dyslexic students. One of the most significant problems is the requirement for correct and dependable data to train machine learning algorithms (Zingoni et al., 2021). Another difficulty is the lack of accessible and user-friendly interfaces that can meet the different demands of dyslexic pupils (Zingoni et al., 2021). Furthermore, further study is needed to assess the usefulness of AI-based solutions for dyslexic children in real-world educational settings (Snowling et al., 2019).

AI offers enormous promise for assisting dyslexic pupils in their language-learning endeavours. AI-powered solutions may deliver personalized and adaptable learning experiences, as well as rapid feedback and the ability for students to practice at their speed and in their own time. But when

AI-based solution is administered to dyslexic students for language acquisition, they tend to face barriers such as the need for reliable information and accessible interfaces, to evaluate its efficacy in real-world educational settings.

## **Methodology**

### **Sample**

The sample for this study comprised students in grades 4 and 5 at one of Chennai's special schools. The whole population consists of ten male and eight female students. A significant number of the students are from Chennai and speak Tamil as their first language. They have the same social, cultural, and economic backgrounds. They were all English as a second language students. According to the instructors' reports, the pupils have been diagnosed with dyslexia. The sample was chosen as a convenience sample by their professors to participate in the study for the following reasons: the participants will be chosen conveniently and purposefully.

### **Questionnaire**

The questionnaire was distributed to the educators from the special school and included questions on what students with dyslexia needed to learn, what abilities they lacked, how they enjoyed studying, and the degree of skills they needed to gain in English. The background information was used to determine the content of the intervention. It was necessary since the program's goal was to target students with dyslexia for learning English as a second language.

### **The pre and post-test**

The pre-and post-test was utilized as a quantitative technique to assess the participant's reading and listening skills progress. According

to Shivaraju et al. (2017), the pre and post-tests aim to measure the information gained in class from various students with varying learning styles and educational backgrounds. The assessments mainly reflect how the pupils learn in the course. The data would indicate students who needed more assistance and teaching and learning approaches that needed to be altered or enhanced.

This case study was based on the observation of each student based on the following criteria for pre and post-test

1. Word Recognition
2. Fluency
3. Decoding
4. Spelling
5. Phonological Processing

### **Immersive Reader and Implementation**

Microsoft Immersive Reader is well-known for its ability to assist students with their reading tasks. It reads literature loudly and highlights the word as it is being read. Furthermore, this tool caters to the needs of students of all ages to know more about literature. It also acts as an acquaintance to first-time readers in learning and acquiring new vocabulary.

Microsoft Immersive Reader allows customized narration speeds and voices. Students may alter the word spacing and font size and highlight critical sections of phrases such as nouns, adjectives, verbs, adverbs, and more. It also allows users to syllabify the text, listen to recorded voices of each word pronounced in several languages, translate words, and view new words displayed as graphics. Readers of all ages can examine the written word, including children, adolescents,

adults, older people, the visually impaired, dyslexics, and readers who speak a language different than the one in which the text is written, to mention a few. Words are written to convey information. Some words will teach you something, while others will make a person laugh. To illustrate, consider the importance of a label on a computer program button, which is crucial for understanding how to use it.

For example, if we get a message that says “jsfh talk ask,” you must select one of two options: “kjh” or “jklj.” We are prone to become annoyed if the text needs to make sense. However, Immersive Reader comes as a blessing in disguise. Immersive Reader is a technology that can play the written text as sound, making the earlier text difficult for others to read and comprehend. It is also capable of translating the original text into another language. Its characteristics assist in reading materials in a way that increases your reading speed and comprehension, changes the font size and style, changes the word and sentence spacing, and alters the background colours.

While reading, listen to the text being read aloud, and feel free to alter the voice and adjust the playback speed as needed. Each phrase should be highlighted as spoken, improving reading speed and comprehension. We have to switch on and personalize a reading ruler. It also helps to see text in other languages and switch between English and another language. It identifies nouns, verbs, and adjectives and looks up dictionary meanings. This acts as a teacher or a helping hand for students with dyslexia, dysgraphia, and other difficulties.

The experimental group employed the AI tool daily, dedicating 30 minutes during each class,

and continued this practice for a month. The reading tool was only available to the experimental groups. The researcher validated this by downloading and examining all the general readings for note-reading inclusion. Students were eager to check out the instrument. The dyslexic students in the experimental group used the tool on their own. The researcher could watch the pupils individually because at most ten individuals were in the group. The tones are played simultaneously, and the pupils attempt to read along with the voice at their own pace. The pace, colour, and voice may be customized to the student’s liking. The researcher delivered the pupils their first instructions. Students in the experiment group soon participated fully in the tool’s use and were eager to expand its use to other Microsoft apps.

### **Pre and Post-test Results**

The researcher noted that the experimental group of students enjoyed using the tool, especially its multi-sensory features. The skills included navigating between levels and changing the size of visuals or words on the file. Students rapidly got over the excitement of using a new tool and were eager to learn more at the start of the sessions. The experimental group progressed through various stages of desired development in reading and listening abilities. As seen in Figure 1, there was a drastic change in word recognition after using the tool. The students showed improvement in their fluency, spelling, decoding, phonological processing and listening skills. Immersive Reader can be used in schools in the primary segment as a reading intervention tool for dyslexic students. This would reduce stress and help dyslexic students learn according to their difficulty levels.

## FINDINGS AND IMPROVEMENT

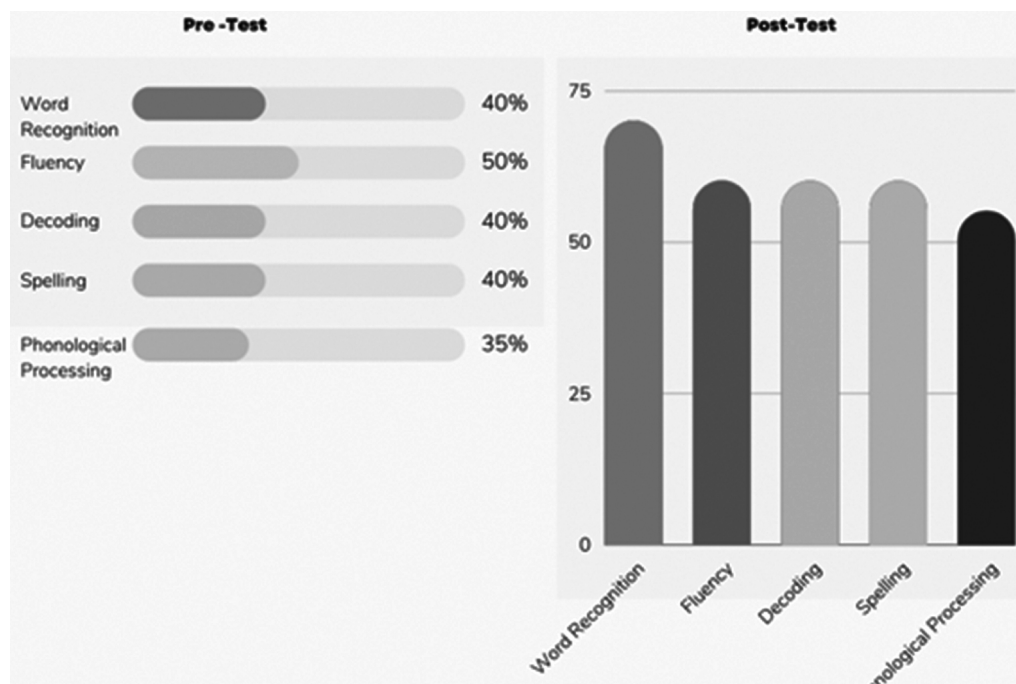


Figure 1 : Findings and Improvement

### Conclusion

The study suggests that AI-based intervention can potentially improve reading and listening skills in dyslexic students. The AI-based intervention *Immersive Reader* catered to the needs of students based on their levels of difficulty and that contributed to its effectiveness. Future studies should explore the long-term effects of AI-based intervention on dyslexic students and examine the specific features of AI-based programs that contribute to their effectiveness.

In conclusion, this research article investigated the potential of AI-based interventions in *Immersive Reader* for overcoming the difficulty and enhancing the reading and listening skills of dyslexic students. The results showed that the experimental group, that received AI-based instruction, had a significant improvement in their reading and listening skills. These findings suggest

that AI-based interventions can be an effective tool for supporting dyslexic students in language learning.

Future studies could further explore the effectiveness of AI-based interventions for dyslexic students, including larger sample sizes and extended intervention periods. Additionally, the research could investigate the potential of AI to provide additional support in other areas, such as speech and language therapy. As artificial intelligence advances, assessing its potential for enhancing educational outcomes for young learners with learning difficulties is critical.

### Reference

Shivaraju, P. T., Manu, G., Vinaya, M., & Savkar, M. K. (2017). Evaluating the effectiveness of pre-and post-test model of learning in a medical school. *National Journal of Physiology,*

*Pharmacy and Pharmacology*, 7(9), 1. <https://doi.org/10.5455/njppp.2017.7.0412802052017>

Lyon GR, Shaywitz SE, & Shaywitz BA (2003). A definition of dyslexia. *Annals of Dyslexia*, pp. 53, 1–14. dx.DOI. 10.1007/s11881-003-0001-9 [CrossRef] [Google Scholar]

Seo, K., Tang, J., Roll, I., Fels, S., & Yoon, D. (2021, October 26). The impact of artificial intelligence on learner–instructor interaction in online learning. *International Journal of Educational Technology in Higher Education*, 18(1). <https://doi.org/10.1186/s41239-021-00292-9>

Shaywitz SE, Escobar MD, Shaywitz BA, Fletcher JM, & Makuch R. (1992). Evidence that dyslexia may represent the lower tail of the normal distribution of reading ability. *New England Journal of Medicine*, pp. 326, 145–150. DOI: 10.1056/NEJM199201163260301 [PubMed] [CrossRef] [Google Scholar]

Snowling MJ, & Melby-Lervåg M. (2016). Oral

language deficits in familial dyslexia: A meta-analysis and review. *Psychological Bulletin*, 142(5), 498–545. DOI: 10.1037/bul0000037 [PMC free article] [PubMed] [CrossRef] [Google Scholar]

Zingoni, A., Taborri, J., Panetti, V., Bonechi, S., Aparicio-Martínez, P., Pinzi, S., & Calabrò, G. (2021, May 19). Investigating Issues and Needs of Dyslexic Students at University: Proof of Concept of an Artificial Intelligence and Virtual Reality-Based Supporting Platform and Preliminary Results. *Applied Sciences*, 11(10), 4624. <https://doi.org/10.3390/app11104624>

**Ms. Hannah Shirley. M**, Research Scholar, Department of English and Foreign Languages, SRM Institute of Science and Technology, Kattankulathur - 603203

**Dr. B. Monika Nair**, Assistant Professor, Department of English and Foreign Languages, SRM Institute of Science and Technology, Kattankulathur - 603203