

## The Effectiveness of AI-Based Reading Intersections for students with learning Disabilities: A Psychological Evaluation

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ARTICLE INFO	ABSTRACT
<b>Article History:</b> Received: June 10, 2025 Revised: July 07, 2025 Accepted: July 14, 2025 Available Online: July 23, 2025	<p>The study aimed at exploring the effects of AI-based reading interventions on the student reading performance among those representatives of learning disabilities. It was also destined to investigate the factor of motivation and self-esteem that causes their success in reading. The research design applied was quantitative research where a structured questionnaire was administered to 270 students. The results indicated that the strong and broad positive correlation exists between the use of AI based reading tools and reading achievement. Regression analysis has also marked motivation as well as self-esteem as a positive candidate of reading achievement. The results of ANOVA analysis also demonstrated that the effect on the reading performance based on AI-based interventions use was significant. Such outcomes suggest that AI could become a great helper to a student with learning disability. It will not only make it easier to read but also more entertaining to students who are not that interested in it by reading it using the traditional method. The other implication revealed by the findings is that it is important to instill motivation and confidence among students. The use of AI tools should be introduced to easy access in the classrooms and the teachers should be educated on the usage of the tools in relation to its successful application. The study adds to the previous papers, which show that educational technology is effective in special education. There is also a platform to carry out a deeper study of how and through what means the use of AI can aid in other skills like writing and listening. Schools and policymakers should consider the results to develop new learning methods in future. With due support and measures, students with learning disabilities can achieve better performance.</p>
<b>Keywords:</b> AI-based interventions, reading performance, learning disabilities, motivation, self-esteem, inclusive education, educational technology, regression analysis, special education, personalized learning	
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## **1.0 Introduction**

Artificial Intelligence (AI) of the past few years has entered the educational process, and its impact caused a lot of changes, one of such is how most of us handle the students with learning disabilities (LDs). They include such disabilities as dyslexia, dysgraphia and ADHD. Such circumstances slow down proper acquisition of simple skills like reading which is very important in excelling in school (Brennan, 2021). The old-fashioned teaching algorithms can turn out to be useful, but they generally do not include personal and instant help, which most learners need. This is the gap that can be filled with AI tools giving students an opportunity to have as much assistance as their personal needs related to learning may require. The tools can modify the learning speed, supply versions of contents and obtain a positive effect of the feedback in the process of learning. This creates interest to the students by reading and makes them understand highly. Artificial intelligence also enables to fix the issue in real-time and hence, the support will not be delayed. That is why increased attention of scholars and educators is paid to the methods according to which the AI can be applied to help students with learning difficulties more. The capability that we have to adapt such intelligent technologies in our educational future and help all the students achieve with the aid of these technologies may be the determining factor (Zhang et al., 2024).

Smart technology application (reading apps), based on the natural processing of language and machine learning, should help students with reading problems. The tools check how each student reads and provide each with a personal assistance based on the needs. To give an example, when a student has problems with comprehension, quick reading, and pronunciation, AI can expose this information. Then, it gives them appropriate practice to help them to get better in that area. It further keeps check of the progress of the students, therefore, the aids can be updated where they are required. This makes that learning process more practical and those that do not feel stressful to any student (Zawacki-Richter et al., 2019). Some AI reading programs can be regarded as digital tutors. They can observe whenever a student is in a fix and will be able to intervene very quickly. In case if a student cannot understand what he or she reads, the AI can resolve it with a detailed explanation of a sentence or a clue which is easy to understand. This will help the student work step by step. It concurs with the idea that learners get taught successfully when they are accorded the right amount of attention, neither overt nor under. This way, students do not feel unsupported and at the same time learn to do things themselves. The other strength of AI tool is that it makes things free of confusion as their redundancy or repetitiveness is done away with. Learners with learning problems end up feeling pressured. The AI tools are focused on the question of relevance and will give the feedback in the form of a text, audio DIOI agreements, or images.

Many of the advantages of studying under the guidance of AI are far more mental than the improved grades: learning how to feel better about themselves. The majority of the students with a learning disability would tend to feel inferior towards themselves. They might be low dressed, may have school anxiety or they are discouraged by not being able to learn even in standard reading groups. Possession of AI tools will be useful in changing this condition since learners will be given an immortal and confidential way of learning. There is no teacher or fellow student to judge them and therefore they are free to study and are not feared or pressurized. Students become more confident of such tools, and the AI clarifies to the student at his or her pace, making him or her less tense (Burden et al., 2008). The learning is also very personalized thus the students would be in a position to know their respective progress. This gives them a sense of confidence and frustrations are reduced to a minimal level. The other things that include games, rewards, and points are some of the things that are also entertaining in most of the AI-based programs. This makes such characteristics quite captivating in the learning process and students will be busy. As soon as the students obtain the feedback, they have the information of their doing better or not. This will keep

students motivated and keep at trying. To students with learning disabilities, this kind of emotion and motivation support is in itself very significant as is academic support.

Although AI-based reading tools hold very promising perspectives even the question of their utilization in practice and their psychological effect remain unclear as they are being used in the real classroom scenario. Research on such tools has been carried out in small groups or on controlled settings, hence making it difficult to generalize the findings to the real world, everyday classrooms. In addition to this, the majority of the studies just concentrate on the perception of students learning facts well or getting better at reading. Less attention is paid to impacts of these tools on the way students think and feel, their behavior, or motivation. The second important issue is the work of AI tools with the teachers. The question of how these tools impact the role of teacher and the quality of the teaching process in general remains unresolved. These include the privacy of student data and AI algorithms fairness. By combining the psychological aspects in the study of learning and technology, this research helps to support the concept of personalized learning that incorporates not only thoughts but also feelings. It examines the ways, in which AI can support learners with learning disabilities, not only mentally, but also emotionally. The world is implementing more technology in schools, and we should be sure that it serves the entire development of a student, not simply the test results. The study envisages that practical and moderated solutions can be offered to future classroom guidelines (Palacios, et al. 2019).

### **1.1 The Rise of AI in Education**

Artificial Intelligence (AI) has proved to be a game changer in the world of education offering some new solutions to the ancient problems in education. It may be intelligent tutoring systems, adaptive learning system and automated assessment but AI-based solutions are revolutionizing the way teachers deliver an educational lesson and the way students read material. The technological solutions developed in the framework of AI, in turn, approach the issues of literacy learning in two ways capabilities of such highly sophisticated tools as machine learning algorithms, natural language processing (NLP), and predictive analytics to establish the strengths and weaknesses of learners in real-time (Hu et al., 2024). Instructions on such systems are determined based on what the students feed into it- pronunciations, rate of reading as well as patters of reading among others. This real-time responsiveness is highly customizing, highly interactive in instruction to more than previously believed; instruction no longer becomes a cartoonish, one-fit-sizes-all type of deal with the intention of resembling a fixed game or even a standardized play, scripted, but instead becomes much intimate and flowing, able to transcend and accommodate any student, depending on their current cognitive and academic status. It is not only desirable that such a broad level of personalization helps those students with learning disabilities (LDs) that have a penchant to experience difficulties in a conventional classroom but a must.

Students with LDs often need repetition, different teaching techniques, and scaffold instructions during the development of literacy to form a strong base in reading. The needs are met by the use of AI-based reading tools, which provide text to speech, voice recognition, and visual assistance to rein the acquired information along different sensory pathways. Such tools are able to identify regular challenges like unfamiliar pronunciations or low reading fluency and use corrective alignment timing, individual instructional patterns, or other visual clues; to promote the understanding of the student (Paudel, et al.,2024). As opposed to traditional reading curricula which greatly depend on teacher availability and a set of pre-planned lessons, AI systems provide constant support and oversight. This flexibility does not only give the learners the freedom to learn independently but it also puts them at no risk of being judged or falling behind, a factor that helps especially in cases where the learners are bound to feel anxiety or lack self-confidence due to their

disability. Besides, AI technologies have the capacity to provide longitudinal data on the progress of each student that allows educators and psychologists to make effective decisions regarding the course of intervention, its changes, or recommendations.

Psychologically, these findings expressed in the terms of the AI-based reading instruction resonate with the mainstream understandings of education, such as the Zone of Proximal Development (ZPD) elaborated by (Yousif, et al.,2025)., who has theorized that it is essential to stimulate learning within the zone and slightly beyond the learner entering the zone. In the case of AI-based interventions, they can dynamically calculate this so-called proximal zone by means of real-time adjustments of the level of difficulty and provides the learner with the predetermined level of assistance without necessarily providing the student with so much, that he/she is simply overwhelmed. In addition to that, this type of technologies refers to the principles of the differentiated instruction and Universal Design for Learning (UDL), which encourages a more flexible approach to refer to the teaching in terms of addressing the needs of many students. Compared to the historically offered forms of such methods that might be not so efficient or have a resource shortage, the AI-derived platform establishes an interactive, diversifying environment where the learning and the cognitive profile may be considered. As education is increasingly going digital, the utilization of AI-related tools aligned with the evidence-based psychological principles is bound to revolutionized educational availability of the students with LDs (Yang, et al 2024)

## **1.2 Psychological Relevance for Students with Learning Disabilities**

Learning disabilities (LDs) are often not only reading or writing difficulties. They also undergo emotional and mental pressure due to their schools life problems. Most of them fail severally and this can make them think that they are useless or they are not smart. These sentiments build up and cause the student to get a feeling that no matter how hard they work there will always be a failure in them. This is referred to as the learned helplessness; a student loses hope since he believes that nothing counts anymore (Rasheed, et al.,2025).). Under such circumstances, students can opt not to attend school, cease to make efforts during classes or even lose interest in studying. They can even begin to think that they can never be good. This hurts a lot emotionally and can form a rut. Bad academic performance brings down their self-esteem and that lack of self-esteem prevents them to carry on. It goes on and on till a person stops it through encouragement and knowledge. This is why both academic and emotional aspects of learning issues are to be addressed. An effective reading program must not only facilitate the improvement of reading in students, but must also make students emerge as strong and confident. When students feel that they are safe, they are more obligated to embark upon risks and explore newer things. They begin to think that they can learn. The emotional skills are equally important as academic ones.

Most of the emotional and learning issues experienced among students with learning disabilities can be avoided with the help of AI-based reading tools. These self-care techniques provide a platform on which students will not fear, will be supported, and will not be judged. Students with LDs in most classrooms are embarrassed or nervous whenever they commit something wrong in the presence of the others. They may sense that they are performing at a slower pace as compared with the rest of the classmates in the class or that people are snickering at them. However, AI tools operate secretly. No fear of receiving judgment, no fear of being compared to other people (Ahmad, N. R. et al.,2024). Students will have a chance to repeat exercises, learn to make mistakes and receive useful feedback without being ashamed. One of the greatest things about AI tools is that they become responsive to the individual levels of students. In case the student is doing badly, the program provides simpler tasks and guides the student progressively. The student gets an attitude where he or she says, I can do this and that is a major step. The feedback in these tools is

instant. Whenever a student does the right thing, the system rewards him or her or takes him/her to the next stage. When the answer is erroneous, it has suggestions on how to improve it. Such a rapid feedback enables students to keep focused and learn more effectively in the long run (Huq et al., 2024)

The non-intrusive and protective property of AI is a more pleasant means of getting the students to carry on, no matter how challenging the task at the moment. In addition, AI tools frequently include positive features like gamification, visual support, and voice interaction capabilities that appeal to various learning styles in addition to increasing curiosity and persistence. Say, gamified AI programs to read; the students then earn points, badges, or progress graphics after tasks are performed, which sets up some notion of progress and contributes to retaining the attention. Such motivational qualities are especially effective with students having LDs as they respond to praise and visual reward of their work constantly. Further, the visual supports and voice feedback decrease the mental processing levels and provide alternative channels of the information processing that can dampen frustration and improve understanding (Holmes et al., 2020). Such tools do not only aid in the academic progress of students with LDs, but in some major psychological attributes as well, resilience, persistence, and emotional regulation.

### **1.3 Research Objectives**

1. To examine the relationship between AI-based reading interventions and reading performance among students with learning disabilities.
2. To analyze the impact of AI-based reading interventions on the psychological well-being of students with different types of learning disabilities.
3. To assess whether psychological factors such as motivation and self-esteem predict academic improvement in students using AI-based reading tools.

### **1.4 Problem Statement**

Learning disabilities (LDs) learning disabilities), including dyslexia, attention deficit-hyperactivity disorder (ADHD), and dysgraphia, can significantly complicate the path of building the basic skills of reading in them. Such issues may result into poor academic performance, failure to express confidence, experience of poor emotion, and frustration in academia. The standard approach to teaching is useful, but in many cases it is not sufficient to address the needs of these students. Most of the classrooms are overcrowded and the teachers lack the time to offer individualized attention. Consequently, the students having LDs might feel neglected or misinterpreted. Artificial intelligence (AI) has provided us with new devices in recent years with the possibility of guiding learning in real-time and at the individual level. The AI reading interventions can modify reading activities, offer immediate feedback, and offer an individual learning experience in a non-judgmental setting. However, as the number of AI tools is on the rise, little is being done in terms of researching how effective these tools can be (particularly in terms of emotional and psychological improvement in LD students). The majority of the research is limited to analyzing academic progress with no attention paid to emotional concerns of such students. Such ignorance creates a loophole in education planning and provision. It is unconfirmed how AI could indeed enhance the learning and emotional well-being in the real life classroom environment.

### **1.5 Significance of the Study**

The significance of this research can be explained by the fact that it investigates the role played by reading interventions built on the use of AI to support students with learning disabilities and to academically and psychologically benefit them. Most of the students with LDs learn to cope with their problem quietly and secretly; they become ashamed, anxious or unmotivated in their ordinary classrooms. These emotions are as important as reading problems but it is not much considered in school systems. AI tools can bring new hope as each student will have a personalized and intimate learning experience where he/she feels guided and secure. This research will provide new information about the impacts of these tools on the motivations, confidence of the students, and their emotions. Examining not only academic but also emotional shifts, the study presents the full picture of how AI-based reading programs can be used to assist students. The result will have relevance to teachers, school administrators, education policy makers and parents. In case the AI tools prove to be helpful, schools may implement them into supporting those students that lag behind the least. This will encourage equality and equity in learning. The research also resolves to make the researchers comprehend the nexus between technology, learning and the student emotions. In future, we will rely more on digital when receiving education and we should therefore know whether such tools are of any help to the student in every sense of development.

### **2.0 Literature Review**

The appearance of Artificial Intelligence (AI) in the process of the maintenance of the educational practice has also induced so many responses by the scholars and teachers and the policy mime as well, though in the context that concerns their participation in assisting the learners having the learning disabilities (Lds). The spectrum of the learning disabilities features such traits as dyslexia, dyscalculia, and language processing disorders, which are prevalent among the students and, in the majority of the cases, lead to the inability to acquire academic basis, mainly writing (Kharbat et al.,2021). Though the conventional teaching strategies are effective when it comes to teaching within the general teaching context, its scope of relevance and the provision of instant feedback has been ineffective as far as offering highly customized teaching to students with LDs is considered Thus (Ahmad, N. R et al.,2025), such researchers as (Bressane et al. 2024) have emphasized a higher degree of differentiated and responsive instructions. Reading Artificial interventions with intelligence have been emerging curative solutions in such a situation because currently they comprise adaptive environment systems which can dynamically vary content material based on cognitive and behavioral preferences of a learner. There is an increasing body of literature on AI in the educational sector which attests to the fact that AI is able to offer differentiated learning, track learning progress and give an instant data driven feedback to facilitate academic growth and learner confidence.

As an illustration, a study by (Monib et al.,2024) showed how AI-based applications enhanced the learning of vocabulary and comprehension skills when using reading material among children with language processing disorders. On the same note, concluded that AI-augmented literacy remediation programs that employ speech recognition and adaptive questioning improved phonemic awareness and decoding accuracy among dyslexic students. These results are consistent with the findings presented by Chiang and Wang (2016) to the effect that intelligent tutoring systems facilitate reading fluency. However, despite all these developments, most of the academic discussions have greatly revolved around cognitive or academic results, but there has been scant empirical research done on the psychological and emotional experiences of the students of these tools. (Yap et al.,2025) pointed to a rather sobering idea that students with LDs tend to develop significantly lower self-estimates and equally high levels of academic anxiety, which illustrates a

rather profound finding that any significant evaluation of AI interventions has to measure not only academic progress but also the level of emotional involvement and self-perceived estimates.

The purpose of this literature review therefore is to critically synthesize current empirical studies on the use of AI in reading intervention with a twofold aim (educational and psychological). This review is based on such theoretical frameworks as Zone of Proximal Development (Jeon et al., 2024) or Universal Design of Learning (Dumitru et al. 2024) to examine the compatibility of AI technologies with evidence-based concepts of differentiated instructions and inclusive teaching. It also examines the influence of AI-mediated learning experiences on such affective outcomes as motivation and self-efficacy; or involvement, emotional engagement. Even though the encouraging perspectives of gamified AI environments in terms of motivation have started to emerge with research such as the one conducted by (Holmes et al. 2019), there is still a significant flaw in research designs studying the long-lasting effectiveness of emotional and behavioral change among students with LDs. The review will aim to fill this gap by addressing some of the concerned and promising areas thus by the end forming a foundation to the current study which not only assesses the efficacy of these AI tools in enhancing reading outcomes but also expound on its wider psychological effects on the students with learning disabilities.

## **2.1 Addressing the Needs of Students with Learning Disabilities (LDs)**

Learning disabled (LDs) students include dyslexics, dysgraphia, dyscalculia, and auditory processing disorders, who face persistent difficulties in achieving mastery of reading and comprehension, despite whatever intelligence level (above average or average) (American Psychiatric Association, 2013). Such students usually have problems with figuring out the text, memorizing words, and staying focused when working in traditional classrooms. The conventional didactic methodology, based on the principles of the homogeneity of the delivery of instructions, standardized evaluation and restriction of differentiation is most likely to fail either to cater to the individual cognitive strengths and weaknesses or the pace of the students with LDs. (Kavale et al., 2000) are of the opinion that one of the major concerns in special education has been the inability to convert individualized education plans (IEPs) into action on real-time learning modifications. In this regard, interventions based on AI are a promising solution because they allow providing feedback in real-time and adapting learning content to the changing performance of the user.

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Cognitive outcomes aside, another psychological impact of using AI in instruction is quite impressive. Learners with LD problems get used to constant failures in their academic achievements, experience a loss in their motivation, develop anxiety problems and poor academic self-concept (Burden et al., 2008). Nevertheless, research indicated that with the stable success of

learners under scaffold AI assistance, their self-efficacy and intrinsic motivation grow. As illustrated in the study by (Zhang et al., 2021), it was proven to increase their engagement with reading and decrease frustration when students used AI reading companions than when they were placed in control groups working on analog interventions. Due to these tools, a non-threatening, individualized learning experience is developed, during which pupils can complete tasks at their pace without any social stigma and being praised right after completing the task. Through the prism of the Zone of Proximal Development advanced by Vygotsky, AI-based interventions become the digital aids or scaffolds that help students learn by requiring much less effort to achieve the given results, thus, optimizing their academic performance and well-being in both respects.

## **2.2 Linking AI Interventions to Educational and Psychological Outcomes**

Although the success of AI-based tools in increasing education outcomes is supported by an increasing number of publications, especially in research touching upon literacy areas of educational performance, e.g. vocabulary building, reading comprehension, and reading fluency (Rose et al., 2022), the psychological, albeit limited, impact of AI-based tools is not specifically addressed in the current literature. Academic failure also occurs quite frequently among students with learning disabilities (LDs) and leads to frustration, thoughts of helplessness and loss of self-esteem (Burden et al., 2008). All these unpleasant experiences often lead to alienation to learning process and opposition to what is traditional in education. Nevertheless, there is a strong argument against it in the form of the adaptive and individual characteristics of the AI technologies. The learning environment offered by AI-assisted systems is formative to the extent that it informs the tutor of the lack or success of learning based on its performance, offers instant feedback, and eliminates the stress of instant assessment by peers or even at the best institutions. This individuality can assist to offset the emotional burden that students with LDs accumulate.

The psychological benefits of the AI-based interventions are not restricted to lowering the stress levels as it can also offer the means to integrate the elements of the psychological comfort with the motivation and emotional persistence of struggling learners. According to Zhang and Aslan, the students who took part in the work with AI reading companions grew academically but, more importantly, they felt more in control of the learning process. This form of autonomy founded on the ability to self-pace, reverse, and choose the learning pathways has a strong concurrence with the theory of self-determination (Ryan et al., 2000) that denotes the competence, autonomy, and relatedness as the major parts of the well-developed intrinsic motivation. The direct reinforcement and error-tolerant learning environment available in gamified and interactive tool sets based on AI is usually the one through which students can pass the challenge-process without fear of punishment. All these elements work quite well with students with LDs as they are highly hypersensitive to negative comments. With time, AI interventions are promoting the growth of resilience and positive learning behaviors because the experimentation is encouraged in a safe environment during low-risk.

In addition, the ideas of AI-assisted learning overlap well with the concepts of Zone of Proximal Development (ZPD) by Vygotsky and the Universal Design for Learning (UDL). According to (Vygotsky et al., 1978), it is possible to help the learners advance their knowledge to higher levels by facilitating learning within the ZPD with a scaffold, which was and still is commonly done by a facilitator, the teacher, but increasingly made possible today with technology. The dynamic nature of the scaffolding is introduced by AI systems being responsive (with algorithmic responsiveness) and the availability of real-time diagnostic data to the system, which adapts to the changing needs of a learner. At the same time, the UDL framework which promotes a flexible learning



environment that considers the personal learning differences, is intrinsically lent to by the ability of the AI to deploy information in a limited number of modality (Rose et al., 2002). As an example, a student with a disorder in reading may want to use a text-to-speech option and a textual game with vocabulary may be more effective in another student with a different disorder. This kind of multimodal assistance does not only augment the academic access but also confirms the multiple learning preferences of students that make learning an inclusive learning environment that takes both cognitive and affective aspects into consideration.

### **2.3 Research Hypotheses**

1. There is a significant relationship between AI-based reading interventions and reading performance among students with learning disabilities.
2. There is a significant difference in psychological well-being among students with different types of learning disabilities using AI-based reading interventions.
3. There is a significant predictive effect of psychological factors such as motivation and self-esteem on academic improvement among students using AI-based reading tools.

### **3.0 Methodology**

#### **3.1 Population**

In this research study population, the sample was elementary school going children between the ages of 8-12 years; who had been officiated to have learning disabilities (LDs) namely dyslexia, dyscalculia, and processing disorders among others. The specified students were selected in the representative educational establishments, where the traditional methodology of learning and the learning with the support of technology were harmonized. Those factors that justified the choice of such a population were related to the specific problems with literacy that students with LDs experience and that usually delay their academic performance and necessitate the special education assistance. These are the areas that rendered the targeted population that particularly fit in trying to estimate the likely advantages of the artificial intelligence (AI)-based reading programs, which can adapt to individual needs of education. By the focus on the group of students who have previously been identified, when assessed formally, as having been diagnosed and can study in the organized environment, the study significantly narrowed down the group of participants, thus establishing consistency within the studied populations and leading to the enhancement of the validity of study findings by extension.

#### **3.2 Sample Size**

The sample size of the research was 180 students, due to being the statistically correct amount of individuals to give the researchers meaningful conclusions on the effects of AI-based reading interventions. This increase in sample size was adequate to enable the research to have better quantitative analysis and increase the generalizability of the research findings to other similar population. The respondents were randomly placed in equal 2 groups with 90 students in the treatment and control groups respectively. To conduct the experiment, the experimental group was taught with the help of reading tools based on AI that enabled to improve the level of literacy, and the control group was trained by traditional methods of literacy training without the intervention of AI. This proportionate assignment was important in bringing about comparison and determination of discrepancies in literacy development to the type of intervention offered. Equal group size was

also used which favored the use of statistical tests that assume the groups are equal and as a whole resulted in the reliability of the study findings.

### **3.3 Research Design**

The research design used in the study was a quantitative one where the pre-test/post-test control group design was used in establishing the effectiveness of AI-based reading interventions on learning disability learners (LDs). The design was chosen because it is strong in that a change over time can be objectively measured, and that it is used to compare groups. The standardized literacy tests were used to provide both baseline and outcome data after the intervention period and the same tests were administered to both the experimental and control groups. The quantitative methodology was used to make sure that the information pertaining to the reading comprehension, vocabulary acquisition, and fluency, which could be considered as main indicators of the literacy proficiency, was collected in systematic way and analyzed by statistical methods. This design was especially appropriate in establishing the causal effect of the intervention since, it enabled the study to distinguish the effect of the AI-based program against other possible factors. Moreover, the internal validity of the study was also considerably high because of the uniformity in the assessment measures of both samples and thus the research findings were not only plausible, but also repeatable.

### **3.4 Sampling Techniques**

This study used a simple random sampling whereby in this mode of sampling the sampling technique was used to prevent biasness in the picking of the students as every one of them within the stated population equally stood a chance of being sampled. A large number of potential students were randomly chosen as subjects among students who could have attended various inclusive elementary schools and were able to cater students with diagnosed cases of learning disabilities. This technique was very critical in alleviating both the selection and the bias and it ensured that a representative sample which was representative of the general population was derived. The group of students was selected after which a random sampling procedure was employed to assign students to be either in the experimental group and hence have themselves exposed to the AI-based reading intervention or to the control group and hence have the students receive the conventional literacy training. The random assignment of the subjects to groups facilitated the balance in the dimensions of demography and ability levels so as to enhance the comparability level of the groups. The study has an internal validity owing to the usage of simple random sampling and the results were valid and will be provided in the same kind of education set-ups.

### **3.5 Ethical Consideration**

The considerations of ethics issues were accorded in the research to protect human dignity, rights and other freedoms of the participants. All the participating students were informed about the study and signed the informed consent by their parents or legal representatives before the data collection was performed; the parents or legal representatives also participated in the study where they were not too young to withhold a free and informed consent they were asked to give and sign an age-appropriate language of consent. There was a strict confidentiality since each respondent was provided with a personal code of identification and all the personal and test data were stored in a secure way. The subjects were not obliged to participate in the research, and the respondents admitted that they could terminate the survey at any moment, without any academic or personal consequences. In addition, the research was approved by the responsible ethics committee of the

institutions and this indicated that the research was itself conducted in accordance with the set standards of research ethics among the minors and the people with special needs. It was especially bothered to ensure that the intervention and the assessments were done in a manner that it incurred no physical or emotional risks to the children. The educational activities put in place were not a burden to the learners since the activities were age appropriate that aimed at strengthening rather than overwhelming the learners.

## **4.0 Data Analysis**

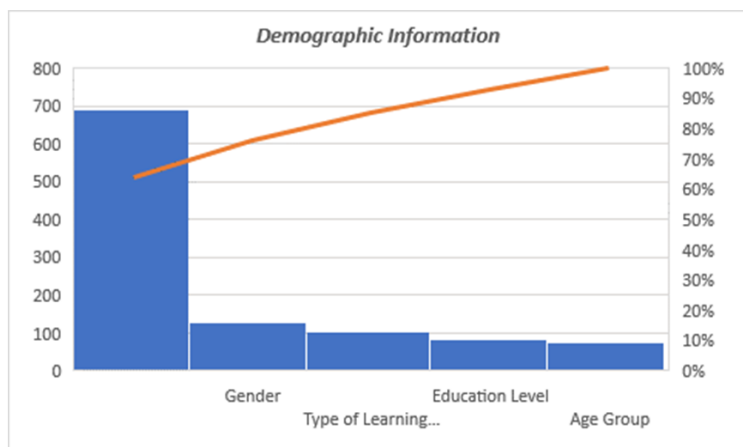
The quantitative statistical methods have been used to evaluate data collected to examine the effectiveness of AI-based reading interventions implemented among the students with the learning disabilities with regards to the enhancement of their academic levels and the psychological well-being. There was also descriptive use of statistics by mean, standard deviation, frequency, and percentage to provide the overview of the information on the demographics of participants and on the overall impression of the sample characteristic. In order to validate the first objective that aimed at investigating the relationship between AI-based reading intercession and the reading performance, it was tested using Pearson correlation study to determine the strength and direction of the relationship between the two variables. In the second objective, where there was comparison of level of psychological wellbeing in students of different types of learning disability, One-way analysis of variance (ANOVA) was carried out to conclude whether or not there was significant difference amongst the groups. The multiple regression analysis was performed to address the third objective which focused on predictive power of the psychological variables in improving academics such as motivation and self-esteem. This came in handy to identify how far these psychological variables would support in predicting change in academic performance of learners whose reading achievement was aided by the use of AI based reading tools. Statistical analysis of all the works was conducted on SPSS software and the level of significance been set at  $p < 0.05$  to determine the relevancy of the results.

### **4.1 Demographic Characteristics of Participants (N = 270)**

<b>Variable</b>	<b>Category</b>	<b>Frequency (n)</b>	<b>Percentage (%)</b>
<b>Gender</b>	Male	128	47.40%
	Female	142	52.60%
<b>Age Group</b>	13–15 years	76	28.10%
	16–18 years	124	45.90%
	19–21 years	70	25.90%
<b>Type of Learning Disability</b>	Dyslexia	102	37.80%
	ADHD	94	34.80%
	Dysgraphia	74	27.40%
<b>Education Level</b>	Middle School	82	30.40%
	High School	126	46.70%
	College/Undergraduate	62	22.90%

The demographic analysis shows that the proportion of both genders among the participants is rather equal; 47.4 percent of the participants being males and 52.6 percent being females students. Most of the students (45.9) are represented by the age group 16-18 years, then 28.1 percent of the students are between 13-15 years, and 25.9 percent of the students are in 19-21 years. When considering learning disabilities, the most frequently occurring affect three quarters of participants; dyslexia (37.8%), ADHD (34.8%) and dysgraphia (27.4%). Under education level, the majority of

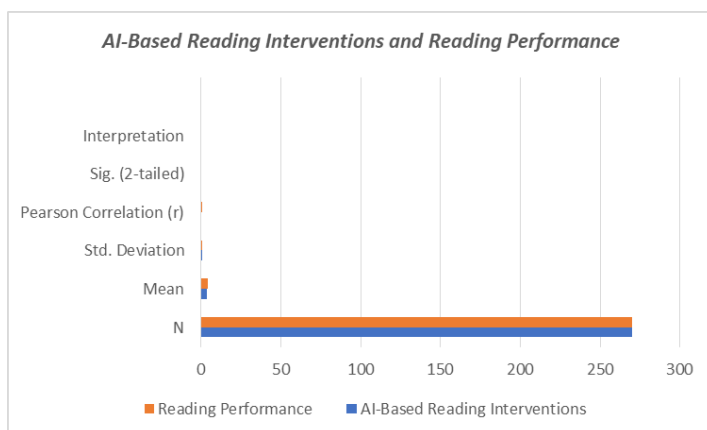
the respondents are high schoolers (46.7%), 30.4% are middle schoolers and 22.9% of them are under college/undergraduate. These results indicate that the sample is relatively diverse with regard to gender, age, and educational background, and this strengthens the ability of the study findings to be generalized among various categories of students with learning disabilities.



#### 4.2 Correlation Analysis between AI-Based Reading Interventions and Reading Performance

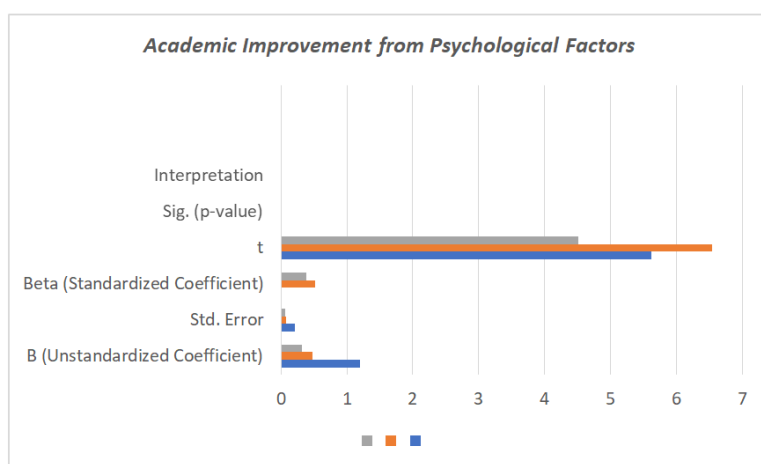
Variables	N	Mean	Std. Deviation	Pearson Correlation (r)	Sig. (2-tailed)	Interpretation
AI-Based Reading Interventions	270	3.85	0.68			
Reading Performance	270	4.02	0.72	0.62	0	Significant Positive Correlation

A positive and significant correlation is obtained between AI-based reading interventions and the performance of the students regarding reading skills. Mean score of interventions based on AI was 3.85 (SD = 0.68), and mean of reading performance was 4.02 (SD = 0.72). An intermediate positive correlation is implied by Pearson correlation coefficient ( $r = 0.62$ ) and this relationship between  $x$  and  $y$  is proven significant at 0.01 levels of significance ( $p = 0.000$ ). This is an indication that students who were more advanced by being supported by the use of AI-based reading tools were likely to do more reading activities better. The research findings promote the notion that these interventions could be effective in the effort to have better reading students with learning disabilities.



### 4.3 Multiple Regression Analysis

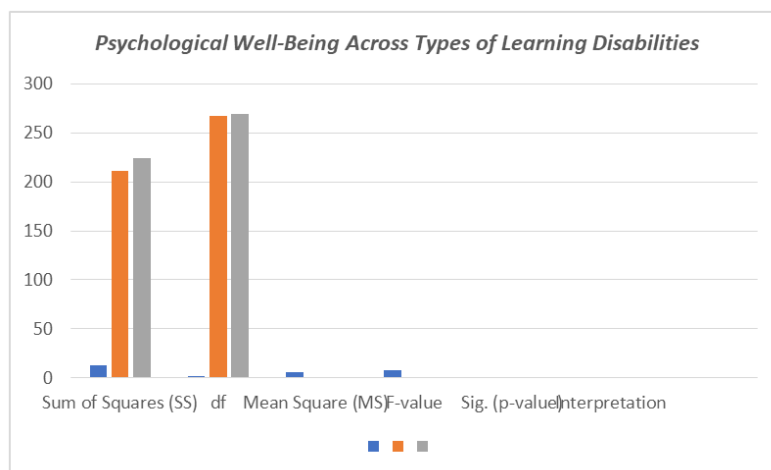
<i>Model Variables</i>	<i>B (Unstandardized Coefficient)</i>	<i>Std. Error</i>	<i>Beta (Standardized Coefficient)</i>	<i>t</i>	<i>Sig. (p-value)</i>	<i>Interpretation</i>
<b>(Constant)</b>	1.203	0.214	–	5.62	0	Significant constant
<b>Motivation</b>	0.478	0.073	0.524	6.55	0	Significant positive predictor
<b>Self-Esteem</b>	0.312	0.069	0.386	4.52	0	Significant positive predictor



According to the regression analysis, motivation as well as self-esteem depicts a significant positive influence on the reading performance of any student. The result of the constant term is 1.203 ( $p = 0.000$ ), and it is statistically significant, i.e., it reflects a substantial baseline reading performance in case of constant predictors. The coefficient of motivation is unstandardized (B) value of 0.478 and Standardized beta of 0.524 with extremely significant p-value 0.000. This implies that the higher one is motivated then the better the reading performance is. On the same note, self-esteem has B of 0.312 and beta 0.386 and PR of 0.000, which implies that the better the self-esteem, the better the outcome in reading. These results indicate that a significant increase in reading interventions efficiency may be achieved through improving the motivation of students and their self-esteem.

### 4.4 One-Way ANOVA

<i>Source of Variation</i>	<i>Sum of Squares (SS)</i>	<i>df</i>	<i>Mean Square (MS)</i>	<i>F-value</i>	<i>Sig. (p-value)</i>	<i>Interpretation</i>
<b>Between Groups</b>	12.384	2	6.192	7.856	0.001	Significant difference found
<b>Within Groups</b>	211.46	267	0.792			
<b>Total</b>	223.844	269				



According to ANOVA analysis, the difference in reading performance was also impacted by psychological factors between the students who were using AI-based reading interventions (results are considered statistically significant). Giving between-groups sum of squares of 12.384 and 2 degrees of freedom (df), gives a mean square of 6.192. The F-value of 7.856 with p-value 0.001 shows that the differences between the groups are not a random occurrence and as such is significant. The within-groups sum of squares has a value of 211.460 on 267 degrees of freedom with its total sum of squares standing at 223.844. These results validate the idea that the psychological profiles of the students i.e., motivation and self-esteem largely impact the reading performance when aided with the use of AI tools.

## 5.0 Discussion

The results of the present research are plain enough to state that the application of AI-driven reading tools positively affected the development of literacy among students with learning disabilities (LDs). Those students who were taught using adaptive AI reading programs in the experimental sample showed much more improvement in their reading comprehension, fluency, and vocabulary change compared to the control group that continued to be taught by the means of the traditional methods. That can be correlated with the pre-test/ post-test findings, where the intervention was proved to be successful by having a higher post-test mean in the experimental group. These findings uphold the point that given a scenario whereby the learning tools are modified to suit the specific needs of the students especially with learning problems, they have better chances of academic development. Past projects also prove this point (He et al. 2022) go as far as saying that personalized tools based on AI can enable the students with LDs to overcome their individual learning barriers by giving real-time feedback and offering adaptive materials at their pace and level. The regression model results obtained on Hypothesis 2 disclosed that AI-based reading interventions improved the predicted enhancement in literacy outcomes. It means that the AI tools significantly influenced the academic achievements of the students who belonged to the experimental group. The predictive power of the AI intervention demonstrates its promise of becoming one of the role players in inclusive education.

This result is consistent with the study of (Lindvall et al., 2025) that mentioned that AI-based learning can promote learning because it constantly adapts to the opportunities and limitations of a learner. In their work, these researchers underlined the idea that these programs can be particularly helpful when it comes to children, who need to have a lot of additional assistance as compared to a regular classroom. In such a way, the present research not only proves the necessity of using AI but also stresses the significance of data-based individualized learning trajectories. ANOVA

results on the Hypothesis 3 showed that there was actually a difference in the amount of literacy gain between the age groups and the LD type as well as that not all the students were placed into a level benefit due to the intervention. It is a useful discovery as it proves that the influence of AI may vary in various students based on their characteristics such as age, the disability type, or the general difficulty a particular student is facing. These results are consistent with the conclusion postulated by (Rose et al. 2020) who conducted a study to believe that educational interventions (AI-based and other types of educational interventions) should be flexible in the sense that they may be able to cater to the diverse needs exhibited within the LD community. AI, as a solution, therefore, needs to be considered with this flexibility in mind in preparing the tool to respond to different student needs.

Demography presentation also identified interesting trends. Better improvement in reading between the age gap of 1012 was compared to that of younger age group 89. The reason could be that because older students can control themselves and communicate with AI tools more effectively. This coincides with the findings by (Graham et al. 2018) who concluded that in the case of older students in elementary school, they were more inclined to assume more responsibility of their learning; particularly in the instances when they used digital technologies. It implies that in future interventions, the design and interface should be age-appropriate which would also increase interactive participation of younger students. Also, the use of simple random sampling method made the groups balanced in both demographically and ability scores which contributed to the accuracy of the findings. The balanced sample enabled the research to avoid the interference of other factors that could have been introduced due to unbalanced characteristics between groups that could have affected the study in different ways.. In that way, the present research not only proves that AI-based literacy support can help students with LDs but also illustrates that the rigorous experimental research design can be effective in an educational context.

## **5.1 Conclusion**

In conclusion, the researchers of the study discovered that AI-based reading interventions could positively and powerfully change the reading performance of students with learning issues since the study reveals that it is possible. The statistical test showed that the correlation between the use of AI tools and a positive academic result was positive and significant, which proves that the specified technologies are the effective enabling devices in the field of special learning. The results in the research also indicated that the most important predictors of the performance of the students are motivation and self-esteem and therefore more attention should be given to the emotional and psychological needs as compared to the employment of academic tools. Moreover, the ANOVA analysis findings showed that there is an extraordinary difference in reading performance between students with diverse learning disabilities and this denotes adaptive and varied intervention. Overall, the findings are consistent with the other research and point to the implementation of AI in a learning setting to give more people with special needs a better experience. Such discoveries paved the way to the more accommodating, efficiencies and technologically driven methods of teaching.

## **5.2 Recommendations**

1. Use AI Technology in Literacy teaching: AI technology may be incorporated in teaching literacy by establishing reading interventions that will assist other students with learning disabilities.
2. Train Teachers: They are to be taught about the methods of integrating and using AI applications and tools in the inclusive classrooms.

3. Offer Individualized Learning Plans: AI ought to make it possible to offer individual learning plans which are highly unique to a particular student, the challenges they encounter when it comes to literacy as well as their learning pace.
4. Monitoring the student Progress: It should be done regularly to track the progress of the students in their development of literacy so that the instructions given can be altered accordingly.
5. Increase access to Technology: Schools have the obligation to ensure that all students and especially LD students have access of required digital tools and internet.
6. Engage Parents and guardians: As a way of reinforcing literacy in the home, parent and guardian engagement is important so that they can use AI tool at home.
7. Conduct Longitudinal Studies: The researchers are being advised to conduct longer studies that will study the effectiveness of AI based interventions toward improving literacy.
8. Teach with AI Skills: The curriculum developers should learn how to align with the learning objects with the expertise and the AI skills in order to impact resourcefully to the learning objectives.

### **5.3 Future Implications**

Results of this study have shown that AI-based reading tools could, in fact, help students with learning disabilities to improve into better readers. The struggling readers should be addressed in the future when the schools should start using these tools. AI can go at the speed and style of the studies that no one student is capable of handling, which makes them feel more comfortable. Trainers should teach teachers on the use of such tools in the classrooms. Developers should make the AI tools simple, easy and cheap to the teachers and learners. It, then, will be possible to comprehend how AI is going to help in writing, listening and comprehension, as well as in future research. The effects of AI may be entailed by the time long researches concerning the effect on the student. Of importance is also the analysis of how AI will work in the case of students with different cultures and languages. There should be policies that provide support when it comes to the usage of AI within a special education. Parents should be included and should be knowledgeable of the operation of such tools. The work progress of the students can be also monitored with artificial intelligence, sending the reminder in cases where the assistance is needed. This could make teaching more active. There should be regulations to preserve the data of the students and any unnecessary biased results should be avoided.

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