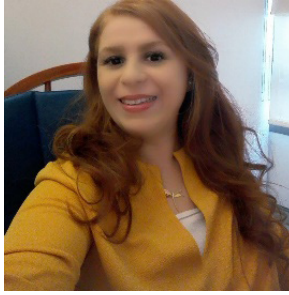# 1. Leveraging Technology in the Educational Paradigms to Aid Dyslexic Learners

استخدام التكنولوجيا في النماذج التعليمية لمساعدة المتعلمين المصابين بعسر القراءة

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Abstract

Technology prevails in today's world; it has the ability to alter people's lives. In the field of education, it has become an emblem of inclusivity and a beacon of empowerment. Universal access to equal opportunities in education becomes within one's

grip. Through the seamless and articulate embrace of assistive technology, parents, care givers, and educators can embark on a transformational journey in the lives of learners with special needs. People with dyslexia are among the numerous benefactors of technology progress and breakthroughs. This paper reviews the definition of dyslexia, its causes, symptoms, effects,explores how technology plays a pivotal role in facilitating the education of dyslexic learners and provides recommendations for future curriculum policy and pedagogical implications.

Keywords: educational technology – dyslexia – inclusivity - pedagogical implications

ملخص

تسود التكنولوجيا في العالم اليوم ولديها القدرة على تغيير حياة الناس. في مجال التعليم, أصبحت التكنولوجيا رمزاً للشمول ومنارة للتمكين اذ يصبح الوصول الشامل إلى فرص متكافئة في التعليم بمتناول الجميع. يمكن للآباء ومقدمي الرعاية والمعلمين الانطلاق في رحلة تحوليّة في حياة المتعلمين ذوي الإرادة الصلبة من خلال الاعتماد السلس والواضح على التكنولوجيا المساعدة. الأشخاص الذين يعانون من عسر القراءة هم من بين العديد من المستفيدين من تقدم واختراقات التكنولوجيا. تستعرض هذه الورقة تعريف عسر القراءة، أسبابه، أعراضه، آثاره، وتستكشف كيف تلعب التكنولوجيا دوراً محورياً في تسهيل تعليم المتعلمين المصابين بعسر القراءة وتقدم توصيات لسياسات المناهج المستقبلية وتداعياتها البيداغوجية.

الكلمات المفتاحية: التكنولوجيا التعليمية – عسر القراءة – الشمولية – التداعيات البيداغوجية

Introduction

It has always been a challenge to teach children with disabilities and to address their needs. The tenacious endeavour to enable these learners and make them capable, functional and ready to intermingle in a rapidly changing society has never been easy. (McMahon & Walker, 2019). Thanks in large part to educational technology, or EdTech, which helps to lessen social and educational isolation. It also gives children the opportunity to engage in activities in various educational settings and to benefit from a full school curriculum. This way learning at school is made easier and more prosperous for students with disabilities. (Lynch et al., 2024). It is children's right to thrive in school and feel included. (UNICEF, 2016). EdTech not only plays a pivotal role in children's access to learning, but also in assisting them to "build their self-esteem and flourish at school" (Lynch et al., 2024, p.407).

1.1 Definition of Dyslexia:

A neurological learning problem in reading and spelling is called dyslexia. The name dyslexia is composed of two words: lexia, which means words, reading, or language, and dys, which means not. (Hudson et al., 2018).

According to Paul (2012), a person suffering from dyslexia has a complicated condition that makes reading difficult for them. Dyslexia is commonly known as a learning impairment.

Cidrim and Madeiro (2017) defined dyslexia as a particular neu-

rologically based learning disability. Its main characteristics are the difficulty of fluency in reading, decoding, as well as affecting the spelling. All of those issues will result in a phonological problem in the language.

According to the International Dyslexia Association, dyslexia is a learning problem that is centered on language. It is typified by bad spelling, difficulty decoding, and poor word recognition. All of those will result in challenges with reading comprehension and experience, which will hinder background information acquisition for dyslexic individuals and impede vocabulary expansion (IDA,2017).

Causes of dyslexia

Phonological disorder. Numerous studies assert that "phonological disorder" is the primary cause of dyslexia. It indicates that they are the ones that struggle to identify language phonemes. When phonological deficiency is discussed, it becomes clear why dyslexic individuals struggle to separate words into their constituent syllables, link a letter's sound to its symbol, and mix sounds to form words (Villines, 2017).

Neurological differences. Through brain imaging studies, scientists are able to distinguish between the structure and function of a dyslexic individual's brain and those of a normal person (IDA, 2017).

According to Villaroman et al. (2013), in children with dyslexia, certain brain cells are located under the surface, whereas in chil-

dren with normal brains, these cells are on the surface. The term "ectopic" refers to such cells. They are located in the front and left areas of the brain, which are crucial for writing and reading comprehension.

The "mango-cellular" region of the brain is another part that is in charge of producing moving pictures. It is smaller in dyslexic children's brains, which makes it harder for them to distinguish words and letters quickly while scanning words and phrases. They will grow slower as a result and struggle with the reading process.

Genetic inheritance. According to Villaroman et al. (2013), genetic inheritance causes dyslexia. It is a learning disability that runs in the family, and according to some researchers it is accompanied with left-handedness. DCDC2 are the defects in the genes that cause the problem in a specific nerve cell in the brain.

1.2 Childhood Symptoms of Dyslexia:

Korne (2010) listed a few symptoms, including:

1. A decrease in reading competence and accuracy as well as speed.

2. A rise in spelling mistakes (normal children acquire sound-letter association in one year, but dyslexic children need two years to learn it).

According to Nordqvist (2017), childhood symptoms for dyslexia include:

1. Delayed acquisition of speech (late in speaking, mispronouncing words, difficulty in recognizing rhyming words and low

phonemic awareness).

2. Taking longer time to pick up fundamental abilities including walking, bicycling, talking, and even crawling.

3. Delayed learning of sets of data: slow in learning letters and their sounds, retrieving days of the week, and colors.

4. Less coordinated and clumsier than typical kids.

5. Don't know where you're going (left and right).

6. Difficulty in obtaining the spelling of every word.

7. Difficult phonological processing (spelling words with more than two syllables with specific sounds).

8. Difficulties arranging concepts in a logical or coherent manner.

9. Reading difficulties despite the fact that they are smart, have kind parents, and receive professional instruction.

10. A short attention span as a result of their difficulty digesting concepts mentally.

Effects of Dyslexia:

Emotional effects. Sako (2012) mentioned some emotional effects of dyslexia on children:

Self-worth or self-esteem. Every person's perception of themselves is shaped by their accomplishments as well as the remarks they get, both favorable and unfavorable, from others in their immediate environment, particularly those they see as significant. His strengths and weaknesses are key factors in shap-

ing this perception. Studies demonstrate the robust correlation between academic achievement and self-worth. The degree to which children succeed in their educational endeavors determines how positively they view themselves and how well-equipped they are to deal with setbacks and challenges.

People with dyslexia are known to experience low self-esteem due to their learning challenges; therefore, early detection of the condition is necessary to assist them overcome this feeling.

Frustration or Anger. According to Sako (2016), dyslexic children become dissatisfied when they fall short of their parents' and instructors' expectations because they perceive them as brilliant, active students who struggle with reading and writing.

Depression. IDA (2017) talked about depression as an emotional effect of dyslexia. They said that the frustration dyslexic kids experience together with their ongoing setbacks would cause them to become depressed. In order to hide their unpleasant emotions, those kids will act out or become hyperactive as a way to communicate their despair. Because they will have a pessimistic outlook on the world, it is unusual to witness them having fun.

1.2.1 Educational effects. Al-Lamki (2012) emphasized that Even if dyslexic kids are bright or mediocre students in their classes, they are limited in their ability to understand abstract concepts and can only handle tangible ones. They struggle to recount stories to others as well.

1.2.2 Children who are dyslexic may experience difficulties with digesting letters or reading words backwards, which can lead to delayed reading and word recall. Additionally, they struggle to understand what they're reading.

1.2.3 Social effects. Sako (2016) asserts that kids with dyslexia struggle socially since they seldom ever get jokes or can tell them. They also struggle to answer promptly, especially when they are familiar with the topic, and to find the correct words to explain themselves or wrap up discussions.

Research findings about learners with dyslexia

Four studies that looked into using technology to help dyslexic students were found. In Morocco, Benmarrakchi et al. (2017) assessed how well an interactive educational mobile learning game taught students ages 8 to 10 with dyslexia how to study and develop basic skills like reading, writing, comprehension, Arabic orthography, short-term memory, and concentration using tablets in a primary school. By concentrating on the actual design of an adaptive mobile learning game, which it says directly matches the learning patterns of dyslexic learners through the use of cutting-edge digital technology, the research offers details regarding the possible benefits afforded by the use of ICT for dyslexic

learners. Nevertheless, the report provides few data to back up these assertions. In a different research conducted in Malaysia, Mohamad et al. (2017) investigated the use of tactile letters—as an iPad application called LetterReflex Mobile Application Educational Software—for teaching the alphabet to four dyslexic children. It was stated that the software, with its attractive, engaging, interactive, and user-friendly game style, has assisted kids in overcoming typical letter reversals. Once more, further assessment-based evidence may support this assertion. The usage of Tangible Interactive Blocks (Tiblo Tiblo) with a group of 8–10 year old children in India was investigated by Pandey and Srivastava (2011). The children were able to record their own voices while using the blocks to solve problems. The e-blocks include programmable colors, sounds, and graphics. They may be physically joined to other similar blocks in any orientation and can record and replay up to 10 seconds of pre-recorded audio. Although the piece did not assess or report any learning outcomes, learners seemed to enjoy hearing their voices recount their story. (Lynch et al., 2024).

Interventions for Dyslexia:

Interventions involving teachers. The earlier,the better it is to diagnose and support dyslexic students. Teachers have to:

- Listen to children's feelings and help them use suitable words to express themselves.

- Encourage them and reward their efforts without giving the importance to the work but to the child.

- Choose suitable words even when misbehaving, since they already suffer from negative self-image.

- Guide those children to set attainable goals which will help them change the thoughts about failure. (IDA, 2017).

Interventions involving parents. (Al-Shidhan &Arora, 2012) added that appropriate counseling should be done for parents and children with dyslexia, to explain for them the characteristics of the problem and how best to deal with it. Parents should know that some actions worsen dyslexia; (a) loud noises, (b) reminding them of unpleasant experience, (c) asking them to read very small or faint print, (d) moving the house, (e) threats of punishment, (d) communicating with their kids which will improve self-confidence.

1.2.4 Classroom strategies. (IDA, 2017) also provided material as well as interactive instructional accommodations that help diverse students in the learning process.

- Make directions simple for them.

- Minimize the amount of work.

- Help them focus on the part the student is working on only.

- Highlight the important information if they have difficulty finding them.

- Ask students to repeat the directions.

- Use small-sequential steps for hard information.

- Always present verbal information with visual aids.

- Review previous knowledge when presenting new ones.

For dyslexic pupils, technology has emerged as a ray of hope, a powerful ally in education, providing creative ways to close the achievement gap between their difficulties and academic success. Technology has enabled dyslexic people to overcome obstacles in reading, writing, and understanding using a variety of tools and applications, promoting inclusion and leveling the playing field in education. This introduction lays the groundwork for discussing how technology has become a dyslexic student's lifeline, revolutionizing their educational journey and unlocking doors to their full potential.

According to Gottschalk et al. (2023), technology provides a wealth of resources and tools to help people with dyslexia overcome their difficulties with writing and reading.

Here are a few strategies for utilizing technology:

Text-to-Speech (TTS) software: it enables dyslexic people to listen to material rather than read it by translating written words into spoken ones. This can enhance understanding and increase accessibility to reading.

Speech-to-Text (STT) Software: This type of software allows people to transcribe their ideas and thoughts into written text. This can facilitate more fluid speech by assisting in overcoming spelling and writing challenges.

Dyslexia-Friendly typefaces and Formats: Certain typefaces, such as Open Dyslexic or Dyslexie, are made to make it easier for people with dyslexia to read. Furthermore, readability can be

increased by modifying text forms, such as adding colored overlays or increasing the distance between letters and lines.

Word Prediction Software: This technology makes word suggestions while a user types, relieving the cognitive strain of typing and facilitating more effective communication for dyslexic people.

Tools for Mind Mapping: Mind mapping software allows concepts to be visually organized, which is beneficial for dyslexic people who might have trouble with standard note-taking techniques or linear thinking.

Educational Games and Apps: A plethora of interesting and entertaining educational games and apps have been created especially to assist dyslexic learners. These games and apps cover phonics, spelling, and reading comprehension.

Electronic Reading Devices: Users may personalize their reading experiences for maximum comfort and understanding with features like customizable font size, spacing, and backlighting found in e-readers and tablets.

Screen Readers and Accessibility capabilities: To help dyslexic individuals navigate digital information, operating systems and web browsers frequently include with built-in screen readers and accessibility capabilities.

Online Learning Platforms with Accommodations: A lot of online learning platforms include text materials as audio recordings, different formats for assessments, and extra time for tasks to help students who struggle with dyslexia.

Personalized Learning Platforms: Using artificial intelligence, adaptive learning platforms customize the pace and substance of instruction to meet the unique requirements of each learner, offering dyslexic pupils focused help.

Conclusion

Dyslexic individuals can improve their reading skills, increase their access to educational materials, and enhance their education overall by utilizing these aforementioned technological tools and solutions. Dyslexia may provide serious challenges in the field of education, especially when it comes to writing and reading assignments. But a new chapter has begun with the development of technology, one in which dyslexic kids may now confidently and skillfully traverse their academic journey. Technology has completely changed the way dyslexic people learn, providing them with individualized support and the ability to express themselves more clearly. From customized typefaces and text-to-speech software to mind mapping tools and spell checks, technology has transformed the learning environment for dyslexic people. It's high time to design future curricula that incorporate these special learners who should not be marginalized and ignored. They should rather be embraced and helped to go aboard, conquer the barriers and face their educational challenges. Thus curricula developers should be officially informed to cater for these students by developing special programs and integrating the use of special learning tools that help them have access to data to further their expertise, self-assurance, and a variety of skills. (Lynch et al., 2024).

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