Quest for Research Excellence On Computing, Mathematics and Statistics

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Faculty of Computer and Mathematical Sciences

Quest for Research Excellence on Computing, Mathematics and Statistics

Chapters in Book

The 2nd International Conference on Computing, Mathematics and Statistics (iCMS2015)

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CHAPTER 36
Technology Assistance for Kids with Learning Disabilities: Challenges and Opportunities

Suhailah Mohd Yusof , Noor Hasnita Abdul Talib, and
Jasmin Ilyani Ahmad

Abstract. The development of various innovative teaching-learning tools in education is increasing surprisingly due to the emergence of technology. The gratification offered by technology aided tools can increase children motivation and participation thus allowing them to retain the learning process in longer period. Children who have disability in learning are difficult to maintain their learning attentions for long time span as their brain has problems to accept; process, analyze, or keep the information. Thus, it gives difficulties for children who having this problem to learn as quickly as someone who are not affected with learning disabilities. Children with disabilities should be given the same opportunities as children who otherwise normal in terms of learning and norms. A learning disability can be mild, moderate or severe which needed different learning approach since normal learning approach does not comply with them and will hinder their learning process. Despite their different capabilities with normal children, they can also learn best through appropriate methods and approaches so that they can understand and learn to live well in the future. Therefore, one of the methods that can be used to solve this issue is by using technology tools. The opportunity in technology tools to teach and learn is believed to assist the children to face their learning challenges. Hence, the purpose of this paper is to study the concept of learning disabilities and the involvement of technology as aided tools in helping the children that have problem in their learning process. The method of writing this paper is based on the analysis of previous researches and literature reviews. The findings of this paper are the challenges of dealing with children that having learning disabilities and opportunities that can be taken to help these children. As a conclusion, this paper provides appropriate technology tools to cater several challenges faced by the children who have disabilities in learning.

Keywords: disable kids, learning disabilities, learning opportunity, technology tools

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1 Introduction

As the technology evolved, the way of learning in education has also expanded. Despite of solely learning in the classroom, innovative electronic learning tools has become part of modern learning that use desktop or personal computer thus mobile devices. Using a traditional educational program, students with a disability cannot benefit fully because they have a disability that impairs their ability to participate in a typical classroom environment [1]. [2] stated that there are three categories of mild disabilities which include learning disabilities (LD), emotional/behavioral disorders, and mental retardation.

Technology assistance can help facilitate a broader range of educational activities to meet a variety of needs for children with mild learning disorders and enable children with severe disabilities to become active learners in the classroom alongside their peers who do not have disabilities [1]. Unfortunately, research has shown that a high percentage of assistive technology devices that are purchased, 35% or more, end up sitting around unused and abandoned [3][4][5]. This paper is focusing on challenges and opportunities of technology assistance for kids with LD.

The rest of this conceptual paper is organized as follows. Section 2 briefly explains about kids with learning disabilities. Section 3 describes the challenges faced by learning disabilities kids. Section 4 briefly explains about assistive technology. Section 5 describes the opportunity of assistive technology for learning disabilities kids and the final section concludes the paper.

2 An Overview of Kids with Learning Disabilities

Learning Disabilities (LD) are specific patterns or subtypes of neuropsychological assets and deficits that eventuate in specific patterns of formal (e.g., academic) and informal (e.g., social) learning assets and deficits [6]. LD can be group as Dyslexia, Dysgraphia, Auditory and Visual Processing Disorders, Dyscalculia and Non-Verbal LD [7]. Dyslexia LD is the most dominance LD where affects reading and related language-based processing skills. Kids with Dyscalculia LD are having mathematics difficulties such as trouble in solving arithmetic problems and understanding mathematics concepts. Dysgraphia LD will affects written expression where a person struggles to form letters or write within a defined space. For the auditory and visual processing disorders, they are having problems in understanding and using verbal or written language. For non-verbal LD the kids are having problems in interpreting nonverbal cues like facial expressions

or body language and may have poor coordination. Table 1 shows the types of LD and the related difficulties that might be faced by the kids.

Table 11. Learning Disabilities (LD) Types and the Difficulties

Types	*Difficulty*
Dyslexia	Reading
Dysgraphia	Writing
Dyscalculia	Mathematics
Auditory Processing Disorders	Differentiate sounds
Visual Processing Disorders	Understand visual
Non-verbal LD	Understand nonverbal sign

3 The Challenges Faced by Learning Disabilities Kids

Kids with learning disabilities (LD) are facing challenges and difficulties in doing their daily activities including in their learning process with school environment. [8] Some of them are categorized as different types of LD such as dyslexia, dyscalculia, dysgraphia, auditory processing disorders, visual processing disorders and non-verbal LD. Referring to Table1 kids with different types of LD faced different difficulties in their learning activities and processes such as in reading, writing, mathematics, listening and others.

3.1 Reading

Reading is an important skill as it is the primary source of knowledge [9]. Referring to [10], the purpose of reading is to understand and to construct the meaning from the text. The way people read and absorb the information will affect the amount of knowledge they can gain and the quality of understanding the information needed. Kids with Dyslexia Learning Disability are facing the difficulties in reading. The impairments for these kids concern either their accuracy or their reading speed [11]. They cannot recognize the letters and at the same time they also having problems in language-based processing skills. Kids with this learning disability are failed to achieve the expected results compared to the kids without this learning disability. [11].

3.2 Writing

Another issue that can be addressed in learning disabilities is writing. Difficulties in writing can be grouped in Dysgraphia category. According to The Free Dictionary [12] writing can be defined as a group of letters or

symbols written to transfer their ideas or concept on a surface such as paper. In general, writing involve a complex series of contracting muscles in the hand and arm, as well as fine motor and cognition skills to write a sentence. Writing disability can be distressing to a kids' education, and decrease their self-confidence. The kid is difficult in holding a pencil to form letters on a line, struggling with spelling and putting the ideas into words on a paper and has messy handwriting [13][14][15]. The kid who has this kind of learning disabilities is primary suspect to have Dysgraphia which is a state that a kid suffers in written expression [13]. However, other causes can affect kid writing disability which is dyspraxia and dyslexia. Due to this, kids always think that writing is quite challenging and they can dramatically limit what they can achieve in their future life.

3.3 Mathematics

Mathematics generally is a field with calculation and involving numerical characters. Kids with Dyscalculia LD are having problems in recognizing numerical characters and as well as calculation. They need different approach including supportive tools to assist them to challenge like others. Assistive tools are needed in developing fluency and proficiency with basic arithmetic combinations and to increase accurate and efficient use of counting strategies [16].

3.4 Listening

One of the important learning processes is listening. People learn something through their listening. Kids with Auditory Processing Disorders are hearing differences between sounds. So they are facing problems in listening to understand and to use verbal or written language. Furthermore, these kids are struggle with discussion and group work. [17] suggest technique such as reading aloud to children to help them in concept learning, vocabulary building, and practice in selective listening.

3.5 Interpreting visuals

Kids with Visual Processing Disorders failed to identify visual things. They are having problems in visualize something in front of their eyes. This kind of kids feels very difficult to interpret information on slide, board, overhead documents or textbook graphic. Moreover, these kids are also facing problems with web interface which consists of colors, graphics and animation [18].

3.6 Interpreting non-verbal cues

For non-verbal LD the kids are having problems in interpreting nonverbal cues like facial expressions or body language. They cannot understand people's body language or other expression that sometime are untold. Those kids are good in hearing compared to what they see. Kids with non-verbal LD are very verbal and may not have academic problems until they get into the upper grades in school. Often they are having problems with social skills. Kids with this disorder tend to do extremely well on reading and spelling task but struggle with mechanical arithmetic task[19].

4 An Overview of Assistive Technology

Assistive technology is needed in order to help kids with learning disabilities (LD) in improving their results and achievements in learning. These tools are developed and designed with specific functions based on LD types including tools for reading, writing, listening, mathematics and more. In order to teach and improve kids with LD in their learning process, parents and teachers can use the assistive technology as their guidance and learning tool. The assistive technology can be special equipments, software or system that might be applied and used together with users' computer or mobile devices such as laptops or smart phones.

5 The Opportunities of Assistive Technology for Learning Disabilities Kids

Kids with learning disabilities (LD) need assistance in order to help them in their learning process. They cannot use the normal and natural learning techniques as the normal children used. Parents and teachers should use different approaches and methods to handle and tackle this kind of children. As the technology evolved, the usage of it becomes broader. Most of the tools are based on computer technology as it can facilitate users' task especially in teaching and learning the kids with learning disabilities. Table 2 shows the summary of the assistive technology that is available for learning disabilities kids.

Table 2. Summary of Assistive Technology for Learning Disabilities Kids

Challenges	***Assistive Technology***
Reading	Audio Books and Publications Optical Character Recognition Paper-Based Computer Pen Speech Synthesizers/ Screen Readers Variable-Speed Tape Recorders
Writing	Portable Word Processor Proofreading Programs Paper-Based Computer Pen Talking Spell Checkers/Electronic Dictionaries
Mathematics	Electronic Math Worksheets Paper-Based Computer Pen Talking Calculators
Listening	Paper-Based Computer Pen Pressure-Sensitive Paper Variable-Speed Tape Recorders Individual FM Amplification Devices
Interpreting Visuals	Premier Assistive Technology Ultimate Talking Dictionary
Interpreting Non-Verbal Cues	Variable-Speed Tape Recorders

The assistive technology (AT) for reading will help kids with Dyslexia LD in reading as to understand the meaning. One of the AT is Audio Books and Publications. This tool is the recorded books that allow users to listen to text. Using this tool, the kids can listen to text that can be repeated many times and it can help to improve them in recognizing the text. Another AT that parents and teachers can use is the Optical Character Recognition. This tool allows users to scan printed material into a computer or handheld unit. The scanned text then read aloud via a speech synthesis or screen reading system.

Users also can use Paper-Based Computer Pen to assist kids with learning disabilities. This technology records and links audio to what a person writes using the pen and special paper. It allows the user to take note while at the same time recording speech. By using this tool, user can soon listen to any segment of his notes by touching the pen to his consequent handwriting or diagrams. This can increase the speed and accuracy of reading as the purpose is to understand it. By using this tool, users also can improve their writing, listening, memory and their mathematics learning process.

Speech Synthesizers / Screen Readers System can display and read aloud text on a screen including typed text, scanned text or text appearing on the Internet. This assistive technology can address the difficulties for Dyslexia and Dysgraphia kids, which are having problem in reading and writing.

For kids with difficulties in reading and listening, Variable-Speed Tape Recorders is one of the assistive technologies that they can use. Users can listen to pre-recorded text using tape recorders or they can record spoken information and can be playback in the future.

The usage of ICT changes the writing process by making it easier to develop and record, edit, publish and share ideas, with others. Software and hardware were designed and developed in order to assist user in completing their daily task. Some of these tools are also designed to assist disable people including kids with learning disabilities. For kids with Dysgraphia LD which are having problem in writing, they can use Portable Word Processor that is lightweight device that is portable and easy to bring anywhere. This tool is helpful for users that have trouble in writing by hand and prefer to use keyboard. This tool allows user to edit and correct his written work more efficiently.

By using Proofreading Programs, kids with writing difficulties may benefit from software programs that scan word documents and alert them to potential errors. Other than that, these kids also can use Talking Spell Checkers/Electronic Dictionaries assistive tool. This tool can help poor speller to choose correct word and it will read aloud the word so they can see and hear it.

For kids with mathematics difficulties, the assistive tools that they can use such as Electronic Math Worksheets and Talking Calculators. Electronic Math Worksheets can assist user to work with math problem.

Pressure-Sensitive Paper is a carbonless paper that allows the user to tear the copy of lecture notes to share with friends with note taking abilities. Individual FM Amplification Devices to isolate and amplify sound source to reduce noise and increase the quality of sound.

For kids with Visual Processing Disorders, program like Premier Assistive Technology can be used to translate text to audio in helping them interpret written material. Other programs like the Ultimate Talking Dictionary provides these kids access to a plethora of words that are read and highlighted to better help them with vocabulary.

6 Conclusion

This paper proposes several ICT tools that can be used to help and reduce burden of children who had learning disabilities. This paper also contributes to the study of the concept of learning disabilities and the involvement of

technology as aided tools in helping the children that have problem in their learning process. The purpose of this paper is achieved by providing appropriate technology tools to cater several challenges faced by the children who have disabilities in learning. This suggests that the proposed solution can be applied in education environment.

In brief, this conceptual paper can give extra reading information for parents that have kids with learning disabilities and act as guidance for them to provide better learning tools for their kids. Lastly, the society also can enhance their knowledge and support one and another in dealing with the kids that has problem in education learning.

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