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TECHNOLOGY FOR TEACHING WRITING INAN INCLUSIVE CLASSROOM

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Abstract
Writing skill is critical for the success of students with disabilities in inclusive classroom. Students with disabilities experience difficulty with writing; it is therefore, necessary for them to work closely with competent teachers that have access and use technology in teaching students with disabilities how to write effectively in the classroom. This paper notes that technology facilitate and support the development of writing skills of students with disabilities. By incorporating theses resources like word processing, multimedia software and graphic organizers into writing instruction for the students with disabilities, teachers can enhance their achievement in writing. This paper discussed the technological tools that students with disabilities could access and use in becoming effective and confident writers in an inclusive classroom.

Keywords: Technology, Writing Skills, Disabilities, Inclusive, Classroom

Introduction

Inclusion is an important aspect of equal opportunity in education. Demands for inclusive education have increased and fostered major changes to schooling and education. Students with disabilities are educated alongside their peers within the local community; therefore, mainstream schools are required to adapt to accommodate a diverse group of students with a variety of needs (O'Gorman, 2005). All learners have a right to education, regardless of their individual characteristics or difficulties. This means that all students in an educational setting, regardless of their strengths or weaknesses in any area, attend mainstream schools to increase their learning opportunities through

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interaction with peers and to encourage their participation in the life of their communities.

However, students with learning disabilities experience many difficulties in learning, such as dyslexia, attention deficit/hyperactivity disorder, dyscalculia, dysgraphia and processing deficits, which can be permanent, recently acquired, fluctuating, or circumstantial. The barriers to learning encountered could be social, economic, and physical. The external social barriers can be caused by the society's unwillingness and/or inability to meet the needs of people with disabilities and to allow them to take part in the life of community while the internal social barriers are caused by the perceptions of persons' disability influenced by cultural and ideological vision. The external economic barriers are caused by the inability of society and/or the state to accommodate the needs of persons with disabilities in order to allow them to exercise their abilities while the internal economic barriers are caused by impossibility for persons with special needs to get access to education by the reason of their limited finances. The external physical barriers are caused by the inaccessible and unsafe design of environments while the internal physical barriers are caused by the physical, mental, sensory, and other impairments of a person. These barriers must be considered when developing education initiatives for students with physical, cultural and educational needs, to play appropriate roles in the modern society, thus contributing to future knowledge society.

Information has become a social necessity and a fundamental aspect of human rights, in which students with disabilities should not be excluded from it. They should be provided with the chance of being involved in the society through having access to information like every other member of the society. As such, technology is needed for their learning and must be accessible to them so that they can enjoy the information, services, entertainment, and social interaction offered by Information and Communication Technologies (ICTs). ICTs have been introduced into the teaching/learning process in order to improve quality, support curricular changes and new learning experiences. In this way, it is possible to meet the specific learning needs of different learner groups, including students with disabilities. ICT application is very important as it plays an essential role in providing high quality education for students with disabilities. Turner-Smith and Devlin (2005) supports that ICT for special educational needs assists the different types of disabilities with assistive technology. Assistive technology is an adaptive technology specially designed for improving the functioning of a person with a disability (Ellis, 2016). The use of technologies as a technical assistance allows students with special educational needs to take active part in the process of interaction and communication. Equally, teachers assist students with disabilities in inclusive classrooms, when they acquire knowledge and skill for the utilization of technologies.

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Inclusive Education

Inclusive education refers to an academic system that allows students with disabilities to become included in mainstream classes alongside their peers. Inclusive classrooms can benefit many special-needs children. According to UNESCO (2007), inclusive education means that the school provides good education to all pupils irrespective of their varying abilities. All children will be treated with respect and ensured equal opportunities to learn together. There is need, therefore, for development of inclusive education at all levels required to meet special educational needs, and also the involvement of ICT technologies. Benefits of inclusive education include an opportunity for students with disabilities to learn team work skills while heightening their sense of belonging in the school community. In order to make high quality education accessible for students with disabilities, government, school administrators and policy- makers must focus on the following necessary conditions:

a. establishment of appropriate ICT infrastructure satisfying the principles of usability, accessibility, flexibility, affordability, and cost-effectiveness;
b. modification of curriculum components (including methods of content creation and delivery, ways of students' progress assessment) with due account for educational needs of students;
c. training and retraining of ICT specialists in special education to satisfy quality standards of professional teachers' excellence (including excellence of special needs teachers) and meet the technology standards of teachers' excellence.

An inclusive classroom requires trained teachers and other professional staff because students with disabilities have different impairments that impedes them from getting a sufficient level of knowledge. These impairments include physical, visual, hearing, language and speech, cognitive, and special learning impairments. Some may have a combination of impairments (multiple impairments). As a result of lack of sufficient level of knowledge, they are underestimated by the teachers. The teachers involved in an inclusive classroom, therefore, have to master different vocational knowledge and skills to analyze carefully every learning situation, choice of objectives, applications of educational means and methods, monitoring and evaluation of learning progress, and personal or collective reflection of the process because he or she is dealing with different abilities. Also, modern technological devices applied in inclusive education, to improve the learning outcomes require the teacher's experience and qualification to be enriched continually to provide for individual-based education due to the existence of individual abilities. Special programmes to train and retrain teachers involved in inclusive education are of paramount importance to keep them informed on progressive inventions and

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abreast with world developments. There is need to organize the training of teachers to acquire the knowledge and skill to enhance the effectiveness of inclusive education. It is very important to monitor and evaluate the teachers' training programmes continually to ensure that they meet up with existence of new technologies for instruction.

Students with disabilities can manifest in a variety of different ways. From mild disabilities to debilitating problems, these problems affect the students' ability to learn and take part in classroom activities. For this reason, it is possible to use technology to overcome many learning disabilities. These technological devices such as graphic organizers, screen readers, braille displays, word prediction, etc. are able to meet the students' unique needs. With their use, students can become the competent, exceptional individuals that they already have the potential to be. However, inclusive education is besieged by some challenges that impede the learning outcomes of students with disabilities. For instance, majority of inclusive schools lack basic infrastructures and amenities such as electricity, clean water and toilets, appropriate furniture, playgrounds or adequate lighting and ventilation in classrooms, lack of trained teachers and the teachers available are overworked and underpaid. Nevertheless, inclusive education presents an opportunity for students with disabilities to learn with other children with the use of technological devices and available trained teachers.

Integrating technology into instruction in an inclusive classroom for diverse learners is a welcome step to overcome the challenges they encounter. Promoting technology tools like apps, software and platforms for students with disabilities is necessary in order to provide for the appropriate conditions of teaching and learning in an inclusive classroom. Students with special needs must have access to technology-based equipment such as computers, printer, tablet, etc being a part of the general school programme and to ensure that the technological devices used are suitable and appropriate for their needs, it is very important to assess regularly the level of training and support provided for students and teachers. The main role of technology in the inclusive classroom can be considered as meeting a variety of individual learners' needs via an apt technical infrastructure such as hardware, software and networks. For some students, a technological solution such as Artificial Intelligence, virtual and augmented reality and Internet of things will be the only way to ensure that they can make their needs, opinions, and views known. Technology support such as braille displays for visually impaired, handheld touch screen computers for reading disabilities, etc. in inclusive education is important because it covers issues that apply to a spectrum of potential learning needs. These technologies enable students to learn in a way that accommodates their individual learning styles and increase academic performance.

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In an inclusive classroom, technology used by students with disabilities should not be restricted to a specific subject area, rather, these technologies should be an integral part of all subjects and the use of these tools should be built into the curriculum. There is need for the curriculum used for teaching in an inclusive classroom to be modified appropriately to create awareness for both teachers and students of the frequent changes made with regards to meeting their special needs.

Concept of Writing

Writing is a thinking process which demands intellectual effort and it involves generating ideas, planning, goal setting, monitoring, evaluating what is going to be written as well as what has been written and using language for expressing exact meanings (Hammad, 2013). This means that writing consists of some stages that should be done by the writer in conveying the message of writing. Writing is one of the literacy skills that is significant and worthy of instructional emphasis. According to Graham & Perin (2007), writing skill is a powerful predictor of academic success, along with reading comprehension. The emergence of writing begins when the student begins to transform thought into a connected series of words and these words into a sequence of visual text. However, students with disabilities are at a high risk of experiencing writing difficulties (Graham & Harris, 2003) by making more mechanical errors, including spelling, pronunciation and capitalization, make more subject/predicate agreement (syntax) errors, and do not exhibit an increase in fluency with age (maturity).

Students with disabilities can write effectively with the use of technology. It can facilitate the development of new teacher-writer and peer-writer relationships, permit students to work with peers at remote locations and allow them to gauge the quality of their writing and level of skill against peers elsewhere (National Commission on Writing, 2006). In order to select the appropriate technology tools to support writing needs, teachers need to consider the individual students' abilities and needs, the goals of the curriculum based on standards of performance, the growing body of effective instructional practice (for example: defining a purpose for writing, providing authentic opportunities for self-expression drafting and peer reviews) and ways to access or monitor student progress. In other words, students' prior knowledge, level of technological literacy, personal interests, and those things that make them special and unique individuals should be considered while selecting technological tools for writing. However, the use of an appropriate technological tool in writing depends on the students' environment, comprehensive writing curriculum, the consultation of a technology specialist when deciding on appropriate tools and the training of teachers and team members to help students use these tools and integrate it effectively into the curriculum. Professional development is crucial. Also, when using a new

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technology tool, it is important that the student's initial writing tasks be calibrated to balance the difficulty in learning to use the technology itself. When technology is used to support an individual's writing needs, the measure of the success or failure of the technological tool should be considered based on an individual student's use. This is to determine whether the student is more likely to continue writing with the technological tool or without it.

The Use of Technology in an Inclusive Classroom

In inclusive education, the technology supporting and helping students with disabilities increasingly implies computer-related applications or computer-assisted instruction. This refers to software and applications that have been designed to provide instruction and practice opportunities on a wide range of devices. Examples are computer, laptop, iPad, mobile technology. The subset of technology tools known as Assistive Technology (AT) can be an effective element of the writing curriculum for students with disabilities. Assistive technology (AT), as well known, is the keystone of a fruitful, modern educational process including students with disabilities.

Information and communication technologies have expanded the AT field to new dimensions, opening new doors, broadening horizons and enabling autonomy for many individuals with special needs.AT refers to the devices and services that are used to increase, maintain or improve the capabilities of a student with a disability (Dell, Newton & Petroff, 2012). It can help and support the involvement of such students in the learning process by overcoming some of the effects of their impairment. Over the last few years, the computer (which includes sophisticated hardware and software applications has turned into valuable resources for teaching students with learning difficulties. AT ranges from low- to high- tech; using high-tech AT devices in educational activities allows students with disabilities to be indispensable in the group of their peers, to participate in the learning process and to gain self-confidence, social and communication skills. The AT applied in inclusive education enable students with disabilities to exploit their cognitive potential, to interact with others, and to control certain aspects of their environment. For example, using the right AT devices, children who cannot hold a pencil, can write and draw. Similarly, children unable to speak can use the computer as a communication tool.

AT plays important role in inclusion. Students with disabilities have the right to choose the technologies they need, so that they can live more independently. Choosing an AT device must always take place in a negotiation process, a constructive dialogue between one or more professionals (or peer counsellor/s) and the end-user (Besio, 2002a). These negotiations include the AT devices necessary for a particular impairment, training of the users, and adequate maintenance. Sometimes, 'peer counselling' in this field is carried out by students with disabilities who have achieved good knowledge and

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experience in using AT and who can serve as a model. However, motivation is very important to support an effective use of AT; for this reason, the goals of the potential user should be carefully defined, so that the device application can become meaningful and motivating to the person.

Technologies used in Teaching Writing in an Inclusive Classroom

In writing, many students struggle with the actual motoric skills required in handwriting, including grasping the writing utensil like a pencil or pen, and creating the correct formations of and spacing for letters and words. As a result, there has been a sustained interest in a variety of technologies to support writers with disabilities. Technology providing such compensatory function to students with writing disabilities is referred to as assistive technology. Assistive technologies can be grouped as general and specific technology tools.

1. General Technological Tools. These are tools that can serve a particular and important purpose in writing for students with disabilities, especially those with mild disabilities. These students can use standard text production tools such as word processing, multimedia software, and graphic organizers.

a. Word Processing (WP). This software was originally designed for students with physical disabilities who experienced difficulty typing. Most WP programmes are keyboarding (use of separate adapted keyboards such as Intellikeys, or on-screen keyboards operating via scanning mouse), and spell checkers (which assist writers in detecting and correcting spelling errors. WP increases transcription accuracy and may also increase word fluency and compositional quality of writing for students with learning and academic difficulties (Peterson-Karlan, 2011). Word processing with text-to-speech is also effective for students with disabilities because it reduces the need for handwriting and improves students' spelling accuracy and writing skills (Silio & Barbetts, 2010).

b. Multimedia Software. This software makes it possible for students with diverse physical disabilities to write. An example is clicker 5 (a computer-based writing support and multimedia tool). At the top of the screen is a word processor called "Clicker Writer", at the bottom of the screen is the "Clicker Grid". The clicker grid has a number of individual cells containing letters, words or phrases that the user can click on. This can be used with an adapted mouse (such as, trackball or optical mouse) or via single-switch scanning. These selected words or phrases are then automatically sent into Clicker Writer, allowing users to write sentences without actually writing or using individual keyboard strokes. This tool facilitates the generation of visual symbols to represent multi-element communications.

c. Graphic Organisers. Using a web-based graphic organizer with procedural prompts help students generate and organize ideas through building visual relationships among concepts rather than having to use language-based

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mediation. An example includes visual thesauruses that help students get important vocabulary and information concepts through building ideas in physical space. Being taught a strategy to plan and organize writing can improve the compositions of students with learning disabilities (MacArthur, 2009).

2. Specific Technological Tools. These specific AT tools are those that are typically not used by most students but are simply designed for students with more specific needs. They are divided into three categories namely- tools for physical and sensory access, tools for creating text, and tools for reviewing text.

a. Tools for physical and sensory access. These are tools for those individual with significant motor/sensory impairments that make it difficult to engage in writing and related school activities without a computer and specialized hardware or software. They range from a larger keyboard that allows a person with movement disabilities to type, to a computer- generated device called synthesized speech or Text-To-Speech (TTS), to read back what was written for an individual who cannot see the screen.

b. Tools for creating text. These are needed by students who have significant spelling problems, or by students with illegible handwriting who need to take notes in class, or by students who are unable to learn to type effectively. Examples are the Word Prediction (a small electronic keyboard) and Speech Recognition software/capabilities. The Word Prediction programs (examples: Co:Writer 4000 or Word Q) provide a list of choices of words to choose from, offers substantial potential benefits to students with poor spelling abilities or students with impaired ability to quickly and accurately enter keystrokes (MacAuthur, 2000); it also enhances typing speed of students with disabilities (Tumlin & Heller, 2004). Voice output, that is, synthesized text-to-speech pronunciation of the offered words can be added to word prediction/word cueing to offer further support (Zhang, 2000). Speech Recognition technology uses a microphone and computer programs to input spoken language of the "writer", and then directly generate transcribed text. Examples are Dragon Dictate Naturally Speaking and SpeakQ. Speech recognition systems typically require the user to "train" the software by speaking pre-determined words or text passages. This input is then analyzed by the program to compare voice patterns with the known words and word sequences, with the user fine-tuning the speech recognition accuracy as necessary. These AT tools offer students support for producing text that matches and compensates the

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areas in which they have greatest difficulty and allows them to write at a level commensurate with their capacity.

c. Tools for reviewing text. This could help students with learning disabilities who have difficulty reading texts they have created, even if poor handwriting has been avoided. An example is Text-To-Speech (TTS) engines. This is used for reviewing and for reading back the text on the screen. Some students might also benefit from having the words highlighted as they are read back to help visually track them as they are "spoken". With TTS, students can hear the text read back by an independent and non-evaluative reader, and thereby detect errors they made while writing. Also, the use of Kurweil 3000 software improves students' perception of their work and their ability to write expressively (Chiang & Jacobs, 2009). With this support, students have the potential of becoming independent in making a first revision of their work.

Other technological devices such as audio recorders, portable note takers, mp3 players, calculators and Pentop computers such as Live Scribe Smar tpen which can be used by teachers who can incorporate these tools within their teaching to support an inclusive learning environment. Berninger & Amtmann, (2003) listed some assistive technologies to include: word processing, spell checkers, word prediction, speech recognition and text-to-speech screen review. Batorowicz, Missiuna & Pollock (2012) supports that AT can improve the writing skills of students with learning disabilities.

Challenges of using Technology for Teaching Writing in an Inclusive Classroom

Although the benefits of using technology, especially assistive technology, for teaching writing in inclusive classroom cannot be overemphasized, there are possibilities that these students with disabilities cannot write proficiently. Okolo & Diedrich (2014) opined that lack of common vision, limited training, access to support services, insufficient funding and lack of teachers' time are commonly cited problems to the implementation of assistive technology. Supporting Burne, Knafelc, Melonis& Heyn (2011) noted that there is still an enormous gap between the potential of assistive technology and how much it actually helps in the classroom. Students with learning and physical disabilities can become active and participate in classroom activities when these technological tools are used appropriately in the teaching and learning process. Batorowicz, Missiuna& Pollock (2012), concluded that for students with disabilities to benefit from technology, educators must have an understanding of assistive technology and how to embed it in instruction.

The successful implementation of assistive technology in the classroom is directly related to the knowledge, skills and dispositions of qualified trained teachers who can make use of these tools in teaching. Often, many teachers

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feel that they lack the knowledge and support to fully integrate assistive technology into the curriculum (Okolo & Diedrich, 2014). Teachers' use and understanding of assistive technology may increase when provided with effective instruction during pre-service education or professional development opportunities (Flanagan, Bouck & Richarson, 2013). Also, funding should be allotted for the training of teachers to effectively facilitate assistive technology use (Burne et al, 2011) to help students with disabilities to access and use these technologies in the classroom.

Conclusion

Technology offers a great potential to support learning for students, including those who have special educational needs. The application of technology enhances independence, integration, and equal opportunities for such students and in this way facilitates their inclusion in the school and society. When students with disabilities apply these technologies, they overcome the difficulties they encounter while writing. Using technologies such as spell check and grammar features, students can write with confidence knowing that they can easily make changes. In this way, trained teachers should endeavor to use these technologies to assist disabled students to write effective and efficiently in the classroom. However, technological tools for writing must be up-graded, requiring new skills and knowledge to be mastered frequently by both students and teachers. The assistive technologies available today and those, which are about to emerge, have the potential to transform the inclusive educational system.

Recommendations

1. Policy-makers should provide a legal framework for successful development of inclusive education at national and regional levels and provide the means of access to information which are required to meet special educational needs, including ICTs and assistive technologies.
2. Government should make available funds for the provision of appropriate technological tools for both the training of teachers and students with disabilities to access and use in the classroom that will promote active participation and interaction among them.
3. School administrators should organize the training of teachers and staff in order to instruct them in modern pedagogical methods and ways to use new hardware and software applications required to enhance the effectiveness of inclusive education.
4. The curriculum used for instruction in an inclusive classroom should be modified appropriately in order to raise awareness of teachers, parents, and peers regarding a change in culture and their

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attitude toward students with special needs to be educated within the communities.

5. It is very important to review and renew teachers' training programmes continually to ensure that they meet the changing expectations and take advantage of the opportunities offered for teaching and learning by more powerful technologies. Careful monitoring and evaluationare therefore needed. In this regard, policy- and decision-makers must focus their attention on ensuring that teachers receive the knowledge and skills adequate for teacher's changing roles and working conditions that assist teachers in performing their roles.

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