ISSN: 2278-4012, Volume:6, Issue:1, January 2017

ASSISTIVE TECHNOLOGY IN TEACHING ENGLISH AS A FOREIGN LANGUAGE

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Abstract:

In view of the differences in the learning styles and strategies of learners of English as a Foreign Language (EFL), this paper discusses the usefulness of different Information and Communication Technology (ICT) applications that can work well as Assistive Technology (AT) for the students with special needs. The objective of this paper is to bring about an awareness of some of the technological support systems that can be used in teaching English to students with various physical, cognitive and sensory challenges. The paper defines assistive technology and describes the usefulness of LT125ThinkingMind, Assistive Technology Rapid Integration & Construction Set (AsTeRICS), Brain-Computer Interfaces (BCIs), Blogs, BreakThru and Smart Tutor system as AT interfaces for the students of EFL with special needs and challenges. It further explains the use of autonomous agents and iPads as AT gadgets, and the way teachers of EFL can integrate AT in their teaching for the students with special needs.

Key Words*: Information and Communication Technology, Assistive Technology, EFL Learners,Special Needs and Learners with disabilities, Rapid Integration & Construction Set, Brain-Computer Interfaces, Blogs, BreakThru and Smart Tutor system.*

Introduction

Facilitating learning in the classroom has been a major goal for both English as a foreign language (EFL) teachers and researchers worldwide. The complexity involved in the learning of English as a Foreign Language proves to be more intricate in the cases of EFL learners with special needs, which needs to be addressed with different viable strategies. The term special education needs is defined as “a restriction in the capacity of the person to participate in and benefit from education on account of an enduring physical, sensory, mental health or learning disability or any other condition which results in a person learning differently from a person without that condition” (Government of Ireland, 2004, section 1). Special education is offered to persons with special educational needs (Data protection Commissioner, 2004). The past decade has seen a number of Information and Communication Technology (ICT) applications available to students with special needs. Among the strategies that have been adopted and have been proved to be ideal in supporting special needs EFL students is implementing Assistive Technology (AT), which is also referred to as adaptive technology, in EFL classes. AT is defined

as a range of supports that help the students and individuals with a number of cognitive, physical, sensory, learning and communicative disabilities among many other challenges that could affect and limit their learning and participation opportunities (Guder, 2012: 14). According to Hersh and Johnson (2010:2), AT is a "generic or umbrella term which covers technologies, products, services and systems used by disabled or elderly people to increase their independence and participation in society and/or enable them to carry out activities that would be difficult, dangerous, or impossible otherwise". Assistive technology consists of systems, which help a person with disability to be able to navigate around the area that challenges them. They do not provide a cure for the disability that the person suffers from, but help the user to finish the task without the necessity for help from outside. When well matched, they provide learning opportunities to people having disability in learning like normal people would do (Beigel, 2000).

The increase in the demand for using technology in teaching has led researchers, curriculum developers and other education stakeholders to look for various support features that ICT offers. The diversity in terms of the challenges that the learners with special needs face frequently makes it difficult for using hypermedia in their education and their general life. Developing software and applications that are suitable to such learners is a great challenge for application developers as well. Evaluating materials that are available can help in influencing the design and delivery as such in the future. Since the main goal of using adaptive technology is the creation of suitable learning environment for the students with specific challenges, the technology needs to be adapted to nullify the basic feeling of the disability as a hindrance for learning.

Using LT125ThinkingMind in Classrooms

'LT125ThinkingMind' is application software designed and developed to support educators in providing individualized teaching. Although it was designed basically to teach basic mathematics concepts like directionality, position, classification and order, its usefulness is felt in EFL classes for developing the communicative capabilities through various language learning activities that can be developed in the interfaces of the application. As reported by Morfidi, Papachristos, & Mikropoulos (2010), educators can make use of interfaces to create individualized visual instructional materials that facilitate learning for the learner with different needs. Training students for the production of oral speech becomes easier with the use of visual stimuli as it promotes and facilitates communication by improving discussion on the language content as well as memory of the language content as it creates strong mental images in the students' cognitive base. It is argued that employing digital visual support in EFL classes through the embedded interfaces can help "facilitate and improve the optical communication through visual content and create language learning opportunities for variously challenged EFL learners" (ibid: 267).

The application provides an interface for teachers to choose from various concepts of language that are positioned in different colors, sizes and in different places of the interface to provide an opportunity to the learners to know about them. Teaching and learning of the language concepts

ISSN: 2278-4012, Volume:6, Issue:1, January 2017

happen in game like activities with the teacher keep changing the position of the picture of a concept while learners keep watching the positioning of the concept and understanding the concept in the form of language format. The activity is usually carried out in two steps starting with the teachers designing the activity in their interfaces before going to that of the student where he is expected to act in the routinized model he is made familiar to. When learners act in the expected format, they obtain a positive feedback and in the event of failure to act in the expected format, the application is reset so as to give them another chance to understand and respond to it. The application comes with a manual of contents for teachers to design the activities, which gives pre-structured activities to be learnt and keep increasing the difficulty levels as students progress.

It is worth mentioning that applications such as LT125ThinkingMind always need some modification for improving their nature of adaptability in terms of their hardware and software so that they will be able to cater for the various needs that learners have and enhance the overall process of language learning. The LT125ThinkingMind application is found to have its own issues to be dealt with for some users, and its disadvantages and advantages need to be articulated better in order to make it possible for the learners who use it to become aware of their usefulness, and for developers to work on how to make it better. According to Morfidi, Mikropoulos & Bellou (2012: 426) the list of the advantages of the application includes "repetitive and structure rules, provision of feedback, promotion of computer use and an eye-catching use of colors in representing the instructional concepts and objects". Moreover, the application proves to be user friendly, easy to use and more student engaging; hence motivates learners and promotes learning. However, when looked at the disadvantages, educators need to think about learners' familiarity level with the use of computers, high-level technical accuracy demands of the application to execute, feelings of boredom with repeated use, and lack of 3D environment. In spite of the fact that current scholarly endeavor is focusing on the ways of using the application to its utmost potential, research is needed to further explore its usefulness and development for the sake of EFL classes.

Assistive Technology Rapid Integration and Construction Set

Assistive tools have been developed for usage in 'out of the box' situations. In addition, not everyone can access them as they are expensive and are limited in terms of their adaptability. The objective of Assistive Technology Rapid Integration and Construction Set (AsTeRICS) project is to help change the situation described above. AsTeRICS gives an affordable and flexible construction set that helps in building assistive functionalities that make the adaptation easier by customizing the functionalities. The system allows integration of new functions without the necessity to make major modifications in it. AsTeRICS provides access to people suffering from severe motor disabilities to standard desktops in addition to mobile services and embedded devices, which did not provide customized user interface in the past. The application has adaptable and flexible AT functionalities that people with special needs can use when they are

not near desktops. The system helps them in interacting with fast changing and diverse embedded devices that are found in the environment. The study of Ossmann et al., (2012) reveals that most of the users of the webcam-mouse model find it comfortable and easy to use, while a few users found it difficult to control fine movements and move their heads. In general, majority of the users were able to do their assigned tasks and easily learn to use the system although there were a number of flaws that became known through the use of the device (ibid).

As many regularly useful devices can be integrated into the functionalities of AsTeRICS, the integration of EFL language instruction console can make teaching and learning easier for the teachers as well as their students. Among the main strengths of AsTeRICS is the ability of customizing it considering the various needs of the users. The results of the various user tests look promising as majority of the users is supported by it (ibid). Nevertheless, there is a need to perfect it further so as to incorporate various user needs.

Using Blogs as Assistive Technological Interface

The development of computer resources is much expensive. For example, the variability of challenges faced by children having cerebral palsy is a factor that challenges the development of computer resources and their development needs to deal with some economic consequences as well. Hardware and software development is expensive, which makes it hard to help children suffering from cerebral palsy. On the contrary, blogs provide an easy and affordable way for the users with cerebral palsy. In addition to helping in creating an autonomous way of communication, blogs also aide in covering deficiency of computer-resources as there are inexpensive blogs that can be used by people suffering from cerebral palsy. The blog can act as a tool that supports collaboration in education and work as a system that allows integration of various uses in the process of simulating writing and reading. Through blogs, teachers can post images, videos and messages among many other things. This way, users are involved in a virtual learning environment ensuring their social inclusion.

Research done by Ferreira, Ferreira, & Silveira (2012) reports that during the use of computers there was improvement in the academic performance of some participants even though motor deficiency, especially in their upper limbs, seemed to limit their handwriting development. During their face-to-face ethnographic study, Ferreira *et al* found that some participants are in need of systems that allow resizing of fonts without the need to resort to the excess usage of magnifying glass for reading small letters. As they do not have resources to help in resizing fonts, they made errors due to the wrong position of elements on the screen. For this reason, the use of blogs can help encourage writing, as students do not need to be fast when typing. By the use of cognitive process abilities in composing the subject to be posted in the blog, the blog users are able to see their language improve.

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Brain-Computer Interfaces

Several access technologies can be used in facilitating learning for students suffering from extreme cases of motor disabilities that are defined as "the disabilities that affect a person's ability to learn or perform motor tasks such as moving and manipulating objects, walking, running, skipping, tying shoes, crawling, sitting, handwriting and others" (Kouroupetroglou, 2013: 152). These technologies include proximity sensors, mechanical switches, voice recognition, adapted joysticks, eye trackers, head trackers, electrooculography (EOG), electroencephalography (EEG) and electromyography (EMG) (Tai, Blain, & Chau, 2008). Looking at some degenerative neuromotor diseases like Amyotrophic Lateral Sclerosis (ALS), patients entering into a Locked-In State (LIS) have only residual voluntary control like blinking and moving their eyes. At the tail end of the disease, they may lose all their motor control in state (Kubler & Birbaumer, 2008).

For students with such conditions, Brain-Computer Interfaces (BCIs) are the best technological solution that can bring back their ability to communicate. BCI needs signals from the brain so as to be able to translate the volitional intents of the users to commands hence giving a non–muscular channel that consequently helps completely paralyzed learners to communicate. BCIs technology that is based on electrophysiological signals can be divided based on the degree that it records invasiveness. This ranges from mediums that are non-invasive like the scalp EEG method of recording, through the medium-invasive ECoG recording, to the highly invasive also known as intra-cortical recording. There are risks that are associated with the long-term use of such recordings, which work towards strongly limiting their usage. BCI that is based on scalp and is recorded by EEG remains the most widely used approach because it uses the devices that are easy to use and are affordable.

People having extreme cases of motor disabilities can effectively use BCI. Many participants who are tested clinically on their use of the interface endorse the use of BCI as a method of learning. The BCI experiments were done in normal environments that were similar to the domestic ones, which make it possible to use in normal situations. Pires, Nunes, & Castelo-Branco (2012a) report that the ALS group had BCI performances that are a little below the level attained by able people. Based on one case, the report presents the BCI as an alternative to the normal interface. The report also presents the case of the efficient use of BCI when compared to the head tracker by a subject having Duchenne Muscular Dystrophy (DMD), which is the best-known form of muscular dystrophy.

BCI proves to be promising when it comes to the evaluation of learning by various groups of people. However, the use of BCI is practically limited due to the low rates of transfer of signals. Further, it requires division of it into various sections and lacks automation control that switches on and off by the user. These are some of the examples of the limitations of BCI that need to be addressed by current researchers to improve the efficacy of the interface. Overall, positive results

are obtained when BCI is used to assess people having motor impairments. BCI opens a channel for the people who are unable to facilitate the operation of even a single interface and enable them to communicate with others through computers, robots and other domestic devices. BCI helps people with motor disabilities to find ways of expressing themselves effectively in the process of improving their ability to learn (Pires, Nunes, & Castelo-Branco, 2012b).

Using 'BreakThru' in Virtual Environment

Developed by researchers at Georgia institute of Technology and University of Georgia, BreakThru is a model that helps in motivating learners with special needs and in involving them in the process of learning. It is an inclusive and innovative learning method combining elements from social networking in addition to virtual communities targeting adults and adolescents having an interest in pursuing STEM (Science, Technology, Engineering & Mathematics) careers. The system brings together virtual training, e-mentoring, video analysis, personalized virtual learning communities and social networking. Its virtual media model can be seen as an inclusive and innovative method that helps in accessing how people learn. Universal design concepts in the model are key as they show the approach of including design features that are accessible and at the same time reducing the need to retrofit it to accommodate individual needs. Its differentiating feature can be seen to be its usage of virtual islands in the implementation of e-mentoring activities.

Participants of BreakThru take part in a universal design virtual world that makes use of avatars to access e-monitoring, academic support, social networking, and research and transition assistance. BreakThru students and mentors can access virtual learning environments facilitated through a number of social networking tools. Through the use of traditional assistive technologies people having barriers and difficulties in learning have been greatly helped though there is a rise in awareness showing that AT is not the final solution when it comes to education and work spheres (Gregg & Banerjee, 2009). Due to rapid proliferation of technologies, the lines between mainstream and assistive technologies have become blurred. Technologies such as Virtual worlds open a window for social interaction, distance learning, group work, role-playing and learner engagement (Jarmon, Traphagan, Mayrath, & Trivedi, 2009).

One important downside of the virtual platforms that needs to be addressed by developers is the issue of universal design principles and the scope of accessibility. A closer look at these principles and the scope of their accessibility when using BreakThru, notifies that access to the design principles and time are factors that could limit the effective use of such learning interfaces. Considering this, the level of accessibility in virtual world has resource availability and time being the main limiting factor (Todd, Pater, & Baker, 2012). Nonetheless, universal design principles are continually integrated into newly developed virtual environment, which makes it easy for the learners to interact with such platforms.

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Building virtual learning environments, to help people having problems with learning, requires good design principles in place. Virtual learning environments need to be developed further for differentiating academic choices, mentoring preferences and learning opportunities (Burgstahler & UoW, 2009). To the majority of special needs adults and adolescents with literacy barriers, especially disabilities related to reading skills, virtual media options developed by the use of universal design alternatives are of profound importance in enabling students to access education and work environment. Thus, great attention is needed when designing the e-mentoring solution of BreakThru and the different ways to incorporate the various universal design principles in its social media and e-monitoring tools.

According to cognitivists, the framework of BreakThru has three important roles: tutor, tutee and tool (Vimala, 2011). In the view of Vimala (ibid), computers are used mainly in the role of tools, and less frequently in the other roles. In Ecuador, Assistive Technologies Laboratory developers are expected to come up with a model that aims to deploy around 25 of such tools at three special needs' education centers. The team's idea of the model is to incorporate the experiences of special needs instructors, knowledge of the staff of the school as well as the experiences and knowledge of teachers and students from the mainstream educational sector (Bykbaev, Velez, & Guerra, 2011). The university students from the mainstream student folk get an opportunity to help special needs students as they interact with the tools that are developed in the process. They also consistently making changes as necessary and are suggesting on how well the intervention can be implemented to ensure the learning process works faster. The students, like their teachers, get to understand the specific uses of each tool as they interact with special needs teacher during the process.

'Smart Tutor System'

Vullamparthi, Khargharia, Bindhumadhava, & Babu (2011) suggest that the experience of using software applications has profound impact on students with Autistic Spectrum Disorder (ASD). The students suffering from ASD normally do well in predictable, stable environments, which computers can best provide. Using human educators brings about a number of inconsistencies, which in turn imposes a particular method of learning. Children suffering from ASD differ from each other as they have their own auditory/visual preferences and learning styles. This calls for developing flexible learning software that can make use of a number of approaches and techniques. As a solution to the oddities in ATs of this kind, the Centre for Development of Advanced Computing developed Smart Tutor System. This system contains two important sessions called e-learning sessions and assessment sessions. When it is started, the system performs an assessment task so as to determine the interests, concentration and mood of the student. The system then goes onto the e-Learning session where it works on two levels: sub-conscious and conscious levels. When on the conscious level, the system interacts with the students actively capturing information on how they are responding so it can change the sessions as needed. When on the subconscious level, on the other hand, the system updates the students'

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profile in the process of creating its domain of expertise. Thus, the system provides an interface that is easily adjustable with the capabilities of evaluating the students' learning process.

Autonomous Agents and iPads as AT

A study by Chaminade, et al. (2012) shows that autonomous agents most likely attract normal and autistic children equally well, although normal children tend to relate better with them. It is found that the region of the brain that is normally stimulated when interacting with human faces reacts in a similar way when interacted with a robot. A study by Dickstein-Fischer et al. (2011) finds that as robotics are emotionally stable and their actions are predictable, they are more helpful in engaging the children suffering from ASD. Davydenko (2012) brings forth the example of a robot called 'Keepon' that operates in automatic mode as well as in manual modes. The robot is designed for engaging the children in game-like interactions for learning purposes. When the robot is in automatic mode, a student can identify an object of a predetermined color, locate the place and position of the object, observe the movement of the object and interact with the robot. In the manual mode, the robot can be controlled and used by a human operator for engaging the students in interactions.

As for the use of iPads, a report by the government of Queensland shows the way an iPad supports special needs students in being engaged in autonomous learning that is considered essential for them in order to get assimilated into mainstream education. While explaining the uses of iPad for educational purposes, the report brings forth a number of functionalities of the device. As an example, the report mentions the function of making the learning tasks more achievable by breaking bigger and complex tasks into smaller and easily manageable chunks. Moreover, iPads are light in weight, user friendly and offer a number of applications that can be used for educational purposes. For example, students can record a video or take a photo and mix it with another software like Creative Book Builder by using the edit options. Therefore, with iPads students can have a one-stop shop for all their educational needs. The report also provides the cases of wheelchair bound students who were unable to attend classes, but were able to access the classes via videos recorded by their peers. With recorded videos, students can experience the real-time classroom environment repeatedly at their convenient time and place (Queensland-government, 2012).

Conclusion

The challenges of the individuals with special needs normally span a range of emotional, physical and learning disabilities. AT can help in bringing about a better language education for learners with special needs. Each student can be trained differently depending on the peculiarity of his case. These benefits help special needs cases to have a better chance in learning and development, as they improve communication skills and gain self-esteem among other things.

AT greatly benefits special needs EFL students in learning language. In addition to the use of technology, there is a need for human attention and guidance from the professionals in order to ensure that they learn adequately (Fereday, 2012). Through AT, students with special needs are motivated in the ways that, unlike a human teacher, it gives them neutral feedback; marking their work instantly, praising them if they succeed and encouraging them when they do not, without having mixed emotions. Hence AT helps students progress immensely without leaving a space where they can be hurt. However, when there is sophistication and advanced technology there is a need to have practitioners who are able to make use of such technologies to obtain the best out of them and help the students with special needs in learning without difficulty (Dyes, 2010).

Having discussed the various AT models that can be integrated into EFL teaching, especially for the sake of differently challenged EFL learners, it is suggested that further research should focus on the range of impact of the use of the discussed interfaces on the learning outcomes of the learners in focus. On one hand, the focus of the developers of the technological applications is sought on improving the rate of the efficacy of such learning interfaces. On the other hand, it is suggested that educators explore the possibilities of using the applications in such a way that they carry the differently challenged learners towards equating them with the mainstream learners.

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