

ICT based learning tools and its impact on students with visual Impairment

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Abstract— The students with visual impairments want unique educational needs and a parent of these students expects interventions of information and communication technology (ICT) tools to meet the learning expectations of these students. It is observed that the field of education of visually impaired students was the first to develop a range of special education program options. In recent years, ICT is playing a vital role in the development of educational curriculum and also in teaching learning process due to advancements in the area of IT and hardware. It supports the students to improve their knowledge and learning skills and enables them to most effectively compete with their peers in school and ultimately in society and hence the ICT based assistive tools are most widely used to support inclusive learning. This paper provides an outcome of the comprehensive study on role of technology towards the learning process of visual impaired children as a assistive tool.

Keywords : ICT, Assistive Technology, Visual Impairment,

I. INTRODUCTION

All The world health organization (WHO) describes the disability as “the outcome or result of a complex relationship between an individual’s health conditions and personal factors and of the external factors that represent the circumstances in which the individual lives”. Students with disabilities have the right to expect the same academic quality as their schoolmates and hence they have the right to access educational tools, including ICT based ones. In many countries, information and communication technology has a lucid impact on the development of educational curriculum, and it helps the students to augment their knowledge skills as well as to improve their learning skills

II. VISUAL IMPAIRMENT

Visual impairment is defined as the limitation of actions and functions of the visual system. The National Eye Institute defines low vision as a visual impairment not correctable by standard glasses or surgery that interferes with the ability to perform activities of daily living. The World Health Organization (2004) has identified that childhood blindness remains a significant problem, with an approximated 1.4 million blind children below age 15 [1]. It is observed that the people with visual impairments are facing more difficulty in learning than people with blindness. Also the number of partial vision peoples are estimated three times greater than

blindness. Sik-Lányi [2] identified the level vision impairment and classified that person with the vision of 0.3 to 0.1 as partial impairment and 0.7 to 0.3 as medium impairment. They have to be helped in developing their skills; they have to be supported in their learning. A large number of ICT tools are available to help visually impaired students to assist in their learning process and also to support the daily routine of their life.

III. IMPACT OF VISUAL IMPAIRMENT

Intelligence of an individual is not connected with the visual impairment and it is reported that the visually impaired people have the same range of intelligence and abilities of normal people. However, it is observed that the significant number of visually impaired people needs additional support in reading and writing and concept development. This is because visually impaired pupils may not have access to the incidental learning through vision.

IV. ASSISTIVE TECHNOLOGY

World Health Organization defined the assistive technology as any product or technology supported services which enable the disabled to lead a normal life. In recent years, technology plays a crucial role in the development of teaching learning process due to ease in usage of computers and its supporting accessories. Hence researchers are being motivated towards developing tools for automation of an existing classical system.

Individual’s ability should be identified before recommending an assistive technology to disabled person. The following measurements such as target size, visual range, visual tracking and visual scanning are used to assess the visual capability of a person [3].

V. VISUAL IMPAIRMENT AND LEARNING DIFFICULTIES

Students with partial or low vision impairment need support for reading, writing and decoding of visual information. Braille is a good alternative, however only few braille learning resources are available in braille. It is reported that 10% of the students learn in braille. Hence assistive tool such as magnifier, adjustment of screen contract, speech or voice recognition can be used by the visual impairment students to overcome the above difficulties.

An e-learning tool is the best tool in case of inclusive learning to enhance the learning level of the students in different areas. Also a number of play and development toys and games are available for visually impaired to support leaning. In addition,

students with visual impairments can use assistive technology for note taking, studying for tests, research and a variety of other academic uses. Use of assistive technology can increase their access to the general curriculum and improve their performance. It also supports student centered and self-directed learning. Also visually impaired students have a number of commercially available tools both specific and generalized. But the availability and usability becomes an issue.

VI. OBJECTIVE

The objective of this paper is to study the various ICT based teaching and learning methods used for people with visual impairment and to analyse the adaptive learning by using eye tracking

VII. RESULTS AND DISCUSSION

Akakandelwa and Joseph [4] studied the provision of learning and teaching materials for students with visual impairment in basic and high schools of Zambia. They used various methods like questionnaire, interviews and a review of the literature for their work. They reported that most schools in Zambia did not provide suitable teaching and learning materials to visually impaired students. Also they observed that the budget allocations by the government are comparatively very small. Hence the students with visual impairment are poor in the science and mathematics subjects due to lack of teaching and learning materials. They also recommended a good infrastructure, effective distribution of teaching learning material and proper training to the teachers and students.

A study was carried out to analyse the impact of ICT in education sector of Pakistan and was based on data accumulated from 429 respondents from 5 colleges and universities. The study report shows that the availability and usage of ICT improves the knowledge and learning skills of students. This indicates that existence of ICT is improving the educational efficiency as well as obliging for making policies regarding education sector. It recommends that the availability and usage of ICT is very essential to improve the educational efficiency of students and also helps the student in individual development through projects and assignments. The report concludes that ICT brings a positive impact on education sector of Pakistan [5].

Few researchers have studied the problems of disabled students in higher education. They identified availability of e-learning resources and its accessibility in case of availability as major problems. They also stated that the learning systems are not inclusive during the instructional design and recommended inclusive tools for e-learning to support disabled students [6]. Malik et al [7] studied the impact of e-learning in different perspectives. They identified the reason for non-usability of e-learning systems as attitude towards e-learning, computer anxiety, computer efficacy, interaction with other students.

Hakobyan, Lilit, et al.[8] studied the scope of ICT-based mobile assistive technologies to facilitate the independence, safety, and improved quality of life of the visually impaired.

The research was based on hand held devices accessible via touch and audio senses. They concludes that smart phone based application can make the visually impaired people's life safe and help them to live a normal social life. Pawluk et al [9] identified the issues relevant for the design and use of haptic technology for assistive devices for blind or visually impaired. Some major areas of importance are Braille reading, tactile graphics, orientation and mobility. They identified the differences in brain organization and performance capabilities between individuals who are "early blind" and "late blind" by conducting behavioural experiments. They also suggests that the importance of training and assessing these groups individually.

Anjali et al [10] developed and presented an automated reading or talking tutor for a programming language like Java. It can help a student with visual impairment to learn and acquire good expertise on the programming language. They concluded that system would bridge the gap of visual impaired learners and IT industry.

Eye tracking based interface tool for training was used by Rosch [11] to understand the cognitive load from student responses. They also predicted that the cost of the system prevents the integration of training system with the eye tracking system. Usability plays a significant role towards the success of e-learning applications as well. If an e-learning system is not usable enough, it obstructs student's learning; the learners would spend more time learning, how to use the software rather than learning the contents [12].

Andrea et al[13] predicted the human decision making process and assess it by tracking eye movements. The movements can be assessed by the gaze size, fixation etc. They also concluded that an eye tracking system can be used for automatic assessment of an ICT based system.

VIII. CONCLUSION

The usage of ICT-based assistive tools according to various studies clearly reveals that it helps the visually impaired students to a greater extent and these tools are categorized as adaptive tools to facilitate ease of learning among these students. It is also evident from the literature review that, the use of ICT tools proved to be more effective in many countries. However, government support is important to implement ICT in developing and under developed countries.

REFERENCES

1. World Health Organization, WHO (2004) "Magnitude and causes of visual impairment" Fact Sheet N°282, <http://www.who.int/mediacentre/factsheets/fs282/en/print.html>
2. Multimedia Program for Training of Vision of Children with Visual Impairment and Amblyopia, Cecilia Sik-Lányi, Veszprém, Hungary, Zsuzsanna Lányi, Journal of Information Technology Education Volume 2, 2003
3. Sigafos, J. & O'Reilly, M.F. (2004). Providing the Means for Communicative Ends: Introduction to the Special Issue on

- Augmentative Alternative Communication. Disability & Rehabilitation, 26 (21-22), 1229-1230.
4. Akakandelwa, Akakandelwa, and Joseph Munsanje. "Provision of learning and teaching materials for pupils with visual impairment: Results from a National Survey in Zambia." British Journal of Visual Impairment 30.1 (2012): 42-49.
 5. M. Wasif Nisar, Ehsan Ullah Munir and Shafqat Ali shad, Usage and Impact of ICT in Education Sector; A Study of Pakistan, Australian Journal of Basic and Applied Sciences, 5(12): 578-583, 2011
 6. Julius T. Nganji, Designing Disability-Aware E-Learning Systems: Disabled Students' Recommendations , International Journal of Advanced Science and Technology Vol. 48, November, 2012 , 61
 7. Malik, Mahwish W., and Ghazala Mubeen. "Student satisfaction towards e-learning: influential role of key factors." Comsats International Business Research Conference (CBRC), 2nd. 2009.
 8. Hakobyan, Lilit, et al. "Mobile assistive technologies for the visually impaired," Survey of ophthalmology 58.6 (2013): 513-528.
 9. Pawluk, D. T., Richard J. Adams, and Ryo Kitada. "Designing Haptic Assistive Technology for Individuals Who Are Blind or Visually Impaired." IEEE transactions on haptics 8.3 (2014): 258-278.
 10. Anjali D. Kapadni, Bhagyashri S. Ravina S. Kotwal, Shraddha P, "A Learning Tool for Visually Impaired People ." International Journal of Computer Applications (0975 - 8887) International Conference on Recent Trends in engineering & Technology - 2013(ICRTET'2013)
 11. Rosch, Jonathan L., and Jennifer J. Vogel-Walcutt. "A review of eye-tracking applications as tools for training." Cognition, technology & work 15.3 (2013): 313-327.
 12. Wong B, Nguyen TT, Chang E, and Jayaratna N (2003) Usability metrics for e-learning. workshop on human computer interface for semantic web and web applications, 3-7 November, 2003, Catania, Sicily, Italy, Springer-Verlag, Berlin Heidelberg New York, Germany, LNCS No: 2889, pp 235-252
 13. Andrea Guazzini, EikoYoneki, GiorgioGronchi, Cognitive dissonance and social influence effects on preference judgments:

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