THE SCOPE OF ASSISTIVE TECHNOLOGY IN LEARNING PROCESS OF STUDENTS WITH BLINDNESS

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This study was carried out to investigate the scope of assistive technology in learning process of students with blindness. The sample of this study included 56 students with blindness between the ages of 11-22 years from secondary level of education. These students were selected through convenient sampling from five special schools located in four cities of province of Sindh, Pakistan including; Karachi, Hyderabad, Larkana, and Nawabshah. The study was conducted with the help of a structured questionnaire. The hypotheses of the study were tested through percentage and Chi-Square method. The results of the study revealed that, majority of the special education schools/institutes were not providing sufficient assistive technology for students with blindness and the schools did not have sufficient accessibility of assistive technology for students. There was a lack of awareness among students with blindness regarding importance of assistive technology. It is expected that this study will help in creating awareness among students with blindness about the importance of assistive technology in learning process. The study will enable the school administrators to arrange assistive technology in their schools.

Introduction

According to recent estimates by the World Health Organization (WHO), 285 million people worldwide are visually impaired (Pascolini & Mariotti, 2011). Of these, 39 million are blind while 246 million have low vision. Without additional interventions, these numbers are predicted to significantly increase by the year 2020 (WHO, 2003). In Pakistan there are 1.4 million people with visual impairment (Sight Savers International, 2011). In past decades very few researches on assistive technology were conducted to find out the availability of assistive technology for persons with blindness and students with blindness were neglected in these researches (Okolo & Bouck, 2007). Ijaz & Durrani (2011) also pointed out the lack of research conducted in Pakistan to assess the Information Communication Technology needs of persons with blindness.

This is the era of technology which has great influence in the lives of human beings both in developed and under developed countries. Because of technology, the “impossible” can be made “possible”. Assistive technology is technology that increases, improves, or maintains the functional capabilities of students with disabilities (Rose, Hassel bring, Stahl, & Zavala, 2005). Like other persons with disabilities, the individual with blindness also face many difficulties because of their disability but main issues include; independent living, access to information and meaningful experience, although they are entitled to independence and efficiency afforded by technology, including assistive technology (Kelly, & Smith, 2011). According to IDEA (2004), assistive technology is used to improve and maintain the functional capabilities of individuals with disabilities. Assistive technology can not remove the disability but it can reduce the impact of the disability (Moore, 1991). Teachers are using assistive technology enabling students with disabilities to learn, communicate and participate with their peers in classroom teaching.

During last three decades, assistive technology has evolved from specific devices or adaptations, to more general software and hardware solutions which can support students along a continuum of ability (Duhaney & Duhaney, 2000). The high-tech assistive technology that has emerged over the last two decades has made a particularly

dramatic impact on education, and has also captured the imagination of the public (Behrmann & Schaff, 2001; Edyburn, 2002).

Many researchers emphasize on the use of assistive technology in teaching learning process of children with and without disabilities because assistive technology enables teachers to teach those concepts which seemed to be difficult or impossible to teach children with disabilities (Allen, Bowden & James, 2009; Peck & Scarpati, 2006). Although the existing benefits of technology for students with disabilities are already widely recognized (Edyburn, 2003; Hasselbring & Glaser, 2000; Raskind & Higgins 1995; Rose & Meyer, 2002), but frequently it is not applied to solve all their special needs (Johnston, Beard, & Carpenter, 2003). In past decades very few researches on assistive technology were conducted to find out the availability of assistive technology for persons with blindness. This present study was designed to find out the scope of assistive technology in learning process of students with blindness. This study will create awareness among students with blindness about the importance and utilization of assistive technology thus enabling them to learn effectively and live independent life by securing quality jobs and becoming an economically valuable person of society. The findings will also be helpful for the management of special schools/institutes in improving the efficiency of their schools by providing a meaningful education to their students with disabilities through the use of assistive technologies in their teaching learning process. The study designed to accomplish the following objectives:

1. To explore the scope of assistive technology in education of students with blindness.
2. To find out the availability of assistive technology from special education schools/institutes for the students with blindness.
3. To find out the accessibility to assistive technology by special education schools/institutes for the students with blindness.
4. To find out the awareness of students with blindness about the importance of assistive technologies.

Hypotheses of the Study

1. Majority of the special education schools/institutes were not providing sufficient assistive technology for students with blindness.
2. In majority of the special education schools/institutes there was no sufficient accessibility of assistive technology for students with blindness.
3. There was a lack of awareness among students with blindness about the importance of various assistive technologies that can be used in their learning process.

Research Questions

Research question 1: What was the scope of assistive technology in learning process of students with blindness?

Research Question 2: Was there sufficient usability and accessibility of assistive technology for students with blindness in their learning process provided by the school management?

Method

This was an exploratory mixed method research both qualitative and quantitative in nature. The mixed method research has become a popular methodology for social sciences in the recent past (Bryman, 2006; Bryman, 2007). The aim of this research study was to explore the scope of assistive technology in learning process of students with blindness. The data from five schools for students with blindness in Sindh was collected through correspondence methods through email and post.

Participants

The sample of the study included 56 students with blindness between the ages of 11-22 years from secondary level of education selected through convenient sampling from five special schools located in four cities of province of Sindh of Pakistan namely; Karachi, Hyderabad, Larkana, and Nawabshah. The Geographical distribution of sample and the demographic characteristics of sample are given in table 1 and 2 respectively.

Table 1. Geographica Distribution of Sample

S. No	Cities	Schools		Students (N= 56)	
		N	%	N	%
1	Karachi	2	40	32	57.1
2	Hyderabad	1	20	8.0	14.3
3	Larkana	1	20	8.0	14.3
4	Nawabshah	1	20	8.0	14.3

Table 2. Demographic Characteristics of Students (N=56)

S. No.		N	%
1	*Gender*		
	Male	22	39
	Female	34	61
2	*Age in years*		
	11 to 14	15	27
	15 to 18	25	45
	19 to 22	16	28

Description of Instruments

The study was conducted with the help of a structured questionnaire having both open ended and closed ended questions. For face validity this questionnaire was further pre-tested on three students with blindness from two special schools in Karachi city later on they were not included in the sample of the study. The main objective of pretesting was to assess accuracy and clarity of the instrument. After making minor changes in questionnaire, a friendly user questionnaire was developed for the study.

Data Collection and Analysis

The investigator visited the school of blindness in Karachi city, and interviewed the students with blindness in bilingual language i.e. Urdu and English. The responses were filled in the questionnaires on the spot. The data from other three cities of Sindh Province were collected through correspondence methods. The process of data collection took a period of almost two months. The data was analyzed with the help of Statistical Package for Social Sciences (SPSS). Hypotheses testing were made through chi square and Statistical Electronic views. The statistical results were then interpreted and the findings were compiled to give clear picture of the findings of the study.

Findings

Research question 1: What was the scope of assistive technology in learning process of students with blindness?

The scope of assistive technology in learning process of students with blindness was measured through such factors as; the students' opinion regarding definition of assistive technology, their linkage to those institutes which can provide information regarding assistive technology, and arrangement of workshops or seminars for the students about awareness of assistive technology by schools/institutes.

Table 3. Students' Opinion Regarding Definition of Assistive Technology (N = 56)

S. No	Definition	N	%
1	Basic need of children with VI	52	92.85
2	Scientific Instruments	42	75.00
3	Alternative Method of Learning	42	75.00
4	Helpful Technology	19	33.92
5	No life of children with blindness without assistive technology	19	33.92
6	Useful for Educational Purpose	07	12.50
7	Helps to live independently for blind	25	44.64
8	Supportive materials for functional life	49	87.50

Table 3 indicates that when the students were asked about their opinion as what is assistive technology, they gave variety of responses. Majority of the students (92%) said that assistive technology is a basic need of students with blindness, while considerable number of students responded that it is a scientific instrument and an alternative method of learning (75 % each). Other responses included; it is a helpful technology (by 34 %), no life for the students with blindness without assistive technology (by 34 %), it is useful for the educational purposes (by 13 %), it helps to live independently in their life (by 45 %), and it is a supportive material for functional life (by 88 %). The data shown above indicates that the responses given by the students did not reflect a precise definition of assistive technology but reflected the significance and utilization of assistive technology in their life.

Table 4. Students' Linked with those Institutes, which Provide Information Regarding Assistive Technology

S. No	Responses	N	%
1	Yes	15	26.78
2	No	41	73.22
Total		56	100.00

Table 4 illustrates that when the students were asked about their linkage to those institute which can provide information regarding assistive technology to the students, majority of the students (73 %) stated that they didn't have any linkage with the institute while some students (27%) mentioned that "yes" they have been linked with that type of institutes which can provide Assistive technology to them. There for our hypothesis number 3 that there was a lack of awareness among students with blindness about the importance of various assistive technologies that can be used in their learning process is accepted because majority of the students were not having any linkage with the institutes which provide information regarding assistive technology.

Table 5. Arrangements of Seminars/Workshops about the Awareness of Assistive Technology for the Students by Schools/Institutes

S. Nc	Responses	N	%
1	Yes	17	30.35
2	No	39	69.65
Total		56	100.00

Table 5 represents that when the students were asked about the arrangement of seminars/workshops regarding the awareness of assistive technology for the students by the schools/institutes, majority of the students (70 %) stated that their schools/institutes didn't arrange any awareness program for the assistive technology while some students (30 %) mentioned that "yes" their schools/institutes arranged programs for the awareness regarding the use of assistive technology.

In conclusion to research question number 1, it can be said that although majority of the students believed that assistive technology is a basic need of students with blindness but majority did not have any linkage to those institute which can provide information regarding assistive technology. Moreover majority of the schools/institutes did not arrange programs for the awareness regarding the use of assistive technology to the students; therefore we can conclude that the scope of assistive technology was very limited in the learning process of students with blindness.

Research Question 2: Was there sufficient usability and accessibility of assistive technology for students with blindness in their learning process provided by the school management?

The usability and accessibility of assistive technology for students with blindness in their learning process was measured by; the types of assistive technology used by the students, provision of free of cost assistive technology for their home assignments by their school/ institutes, the provision of advanced assistive technology by the school/ institute to students, type of advanced assistive technology provided to students, the students' opinion regarding the availability of assistive technology, the students' opinion regarding the accessibility of assistive technology for them, and the provision of assistive technology in school to fulfill the need of all students with blindness.

Table 6. Type of Assistive Technology Used by the Students Mostly

S. No	Types	N	%
1	Braille Sixer	40	71.42
2	Word Building Educational Kit	06	10.71
3	Braille Alphabet Plate Urdu/English	06	10.71
4	Speaking Dictionary	28	50.00
5	Stylus	56	100.00
6	Braille Slate	56	100.00
7	Perkin Brailler	28	50.00
8	Talking Calculator	27	48.21
9	Abacus	02	3.57
10	Arithmetic's & Algebra Frame	56	100.00
11	Geometry Set	02	3.57
12	Writing And Diagram Slate	01	1.78
13	Magnetic Menstruation Geometrical	00	0.00
14	Braille embosser/printer	02	3.57
15	Braille Display	02	3.57

Table 6 represents the types of assistive technology used by the students. The responses by the students included; that majority of the students used stylus, Braille slate and Arithmetic & algebra frame (100 % each) whereas considerable number of students (71 %) used Braille Sixer for their academic purposes. The other type of assistive technology used were; speaking dictionary, talking calculators, & Perkin Brailler (50 % each), Braille Alphabet Plate Urdu/English (11% each), Word Building Educational Kit, geometry set, Braille embosser, & Braille Display (4 % each), Abacus, writing & diagram slate (4 % each) and while no one using Magnetic Menstruation Geometrical.

Table 7. Provision of Free of Cost Assistive Technology to Students for their Home Assignments by School/Institute

S. No	Responses	N	%
1	Yes	07	12.50
2	No	35	62.50
3	To some extent	14	25.00
Total		56	100.00

Table 7 specifies that when the student were asked regarding the provision of free of cost assistive technology for their home assignments by their school, majority of the students (62 %) stated that there was no support for the provision of assistive technology from the school, at the same time some students (25 %) said that the school

provides assistive technology "to some extent", while very few students (12 %) said "yes" about the provision of assistive technology for the home assignments.

Table 8. Provision of Advanced of Technology by School

S. No	Responses	N	%
1	Yes	10	17.82
2	No	33	58.97
3	To some extent	13	23.21
Total		56	100.00

Table 8 represents the provision of advanced of technology by the schools/ institute to their students. Majority of the students (59%) said that there was no provision of advanced technology by their school; on the other hand very few students (18%) stated that there was a provision of advanced technology, while some students (23%) mentioned that the provision of advanced technology was "to some extent" only.

Table 9. Type of Advanced of Technology Provided by Schools/Institutes (N = 23)

S. No	**Types**	**N**	**%**
1	Daisy player	2	8.7
2	Braille Embosser/Printer	4	17.4
3	Computer with speech Softwares	8	34.8
4	Internet	8	34.8
5	Smart Brailler	0	00

Table 9 shows that 10 students mentioned about the provision of advanced assistive technology and 13 students mentioned about its provision to some extent only. These 23 students were asked about the type of advanced technology provided by their schools/institutes to them. Table 7 indicates that majority of the students mentioned that computer with speech software, and internet facilities (34.8% each) were provided by their schools/institutes, 17.4% students stated that their schools/institutes provided Braille embosser/printer facilities, 8.7% responded for the provision of daisy player and there was no response for the provision of smart Brailler.

Table 10. Students' Opinion Regarding the Availability of Assistive Technology

S. No	Responses	N	%
1	Yes	08	14.3
2	No	35	62.5
3	To some extent	13	23.2
Total		56	100.00

Table 10 represents the students' opinion regarding the availability of assistive technology. More than half of the students (62.5%) mentioned that the assistive technology was not available to them and few students (14.3 %) responded that assistive technology was available to them whereas 23.2 % students had the availability of assistive technology "to some extent" only.

Table 11. Students' Opinion as if Assistive Technology is Accessible to Them

S. No	Responses	N	%
1	Yes	8	14.3
2	No	38	67.85
3	To some extent	10	17.85
Total		56	100.00

Table 11 reveals the students' opinion regarding the accessibility of assistive technology to them. Response from the majority of the students (67.85 %) was "no" whereas response by 14.3 % students was "yes". Few students (17.85%) responded that they had accessibility of assistive technology "to some extent" only. There for our

hypothesis that in majority of the special education schools/institutes there was no sufficient accessibility of assistive technology for students with blindness is accepted.

Table 12. Provision of Assistive Technology in Schools to Fulfill the Needs of Students with Blindness

S. No	Responses	N	%
1	Yes	06	10.71
2	No	40	71.44
3	To some extent	10	17.85
Total		56	100.00

Table 12 represents the provision of assistive technology in schools to fulfill the need of students with blindness. Majority of the students (71.44 %) responded that schools couldn't provide the assistive technology to fulfill their needs while 10.71 % students responded as "yes" and 17.85 % said that schools/institute provided the assistive technology according to fulfill their needs "to some extent only". There for our hypothesis that majority of the special education schools/institutes were not providing sufficient assistive technology for students with blindness is accepted.

Conclusion of research question no 2 indicates that mostly the students with blindness did not have accessibility to and proper availability of assistive technology. Most of the schools were not providing advanced assistive technology to their students. There for our hypothesis no # 2 that majority of the special education schools/institutes was no sufficient accessibility of assistive technology for students with blindness was accepted. The basic (less expensive) assistive technology was used in schools for teaching and also as personal usage including; Braille writing slate, and math slate, stylus, talking watches and clocks, walking sticks and mobiles supporting talking software. The advanced technology like; Perkin Brailler, Braille printer/embosser, computer with speech softwares, internet, electronic canes, and daily living aids were also used in very few schools/institutes. The responses by the students reveals that a hypothesis no # 3, there was a lack of awareness among the students with blindness about the importance of various assistive technologies that can be used in their learning process that was accepted because the students didn't have any linkage with those institutes, which provide information regarding assistive technology and schools didn't arrange any awareness workshops or seminars about assistive technology for the students.

Discussion

Assistive technology plays a vital role in the lives of human beings because of its diversified use like; to access information, participate in different activities, or complete a task independently or with minimal assistance. Mastery of assistive technology contributes to the development of literacy and academic success, social interaction among peers, independence and the potential of future employment (Hatlen, 1996). In an interview with 15 assistive technology users with blindness Shinohara &Wobbrock (2011) noted that their participants had a strong desire to use technology to do things "just like everyone else", as this quote from one participant with blindness illustrates: "You know, if someone's using an iPhone, and I'm using an iPhone, that's normal, right.

Our study reveals that students with blindness did not have a clear perception about the importance & scope of assistive technology in their learning process. Majority of the students mentioned that assistive technology is their basic need and a supportive material for functional life. These finding are supported by De Freitas et.al (2009) in a study which mentioned that information technology enhances reading and writing skills, as well as communication with the world on an equal basis, thereby improving quality of life and facilitating the learning process of students with blindness. A study by Koganuramath & Choukimath (n.d.) reveals that the students with visual impairment in India have been deprived of most of the information sources in print format accessible to the normal students making them, to an unacceptably high degree, dependent on normal people or escorts to read for them.

Access to assistive technology should be a right and not a privilege but majority of the students in our study stated that there was no availability and access to assistive technology for them and there was no support from the school for the provision of assistive technology, and even no provision of advanced technology by their schools. The similar situation was shown by results of a study conducted by Munemo & Tom (2013) in Zimbabwe highlighting that technologies like print media, radio, large print materials, talking books were not available and Braille machines and Braille paper were in short supply. This is the situation in developing countries too and even the advanced countries have similar issues as indicated by Ethridge (2005) in a study conducted in USA by pointing out that, for

individuals with a sensory impairment, particularly low vision or blindness, accessing reading materials that are in a printed format can present specific challenges. This study further elaborates the situation of libraries in USA by saying that there are 10 million individuals with low vision and blindness within the United States but equal access to information to those with low vision continues to be an issue for all libraries. In our study, majority of the students mentioned that they didn't have linkage to those institutes which can provide information regarding assistive technology and their schools/institutes did not arrange the workshops/seminars regarding the awareness of assistive technology.

Conclusion

In Pakistan we encounter the isolation of persons with disabilities, lack of awareness, lack of resources and facilities about the use of technology for persons with disabilities, and attitude problem of society towards the persons with disabilities. But prevailing situation reveals that young generation is more excited towards the use of assistive technology. The research findings reveal that there is encouraging and bright scope of assistive technology because education and training of modern aids is widely accessible (Behrmann, &Schaff, 2001). Mostly the youth with blindness for the purpose of rehabilitation, accomplishment of higher education and getting good jobs is compelled to depend upon the technology (Siddiqui, 2004; Sharma, 2007). Now a day, it is mostly observed that students and teachers with blindness are found very active and enthusiastic to acquire modern technology suited to their training, education, and daily life (Rockoff, 2004). This indicates the encouraging aspect of assistive technology and its natural progress by virtue of its many fold role and impact in life of persons with blindness (De Freitas et al., 2009).

Recommendations

There is a need to create awareness among persons with blindness about the importance of using assistive technology in their day to day life, learning, recreation and other purposes. The schools need to play their role enabling the students with blindness to develop their linkage with those institutes which can provide information regarding assistive technology. The schools should organize workshops and seminars for the students with blindness to create awareness about the use of assistive technology. School/ institutes need to provide free of cost assistive technology that can help students with blindness to manage their home assignments.

There is a need of provision of advanced assistive technology by the school/ institute to students with blindness. Accessible format materials like Braille and Audio should be provided by schools for the students with blindness. To the maximum possible extent the technology/assistive devices may be tried to develop and manufacture locally to avoid the extra cost and irrelevant hindrance like linguistic barrier. To develop the technology locally as per the local requirement, the different components like industrialists, manufacturers, engineers and authorities to facilitate and protect legal requirements may be mobilized by funding agencies both nationally and internationally.

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