Training Facilities Provided by Special Education Schools to Students with Visual Impairment and Teachers to Use Assistive Technology

Dr. Saira Saleem*
Assistant Professor Department of Special Education, University of Karachi
Sheikh Zayed Islamic Research Centre, Special Education, University of Karachi, Karachi- 75270

Prof. Dr. Shahida Sajjad (Co- Author)
Dean Faculty of Social Sciences, Malir University of Sciences & Technology, Karachi
Address: A - 12, Block 4, Gulistan e Jauhar, Karachi - 75290

Dr. Maroof Bin Rauf (Co-Author)
Assistant Professor, Department of Education, University of Karachi, Karachi-75270

Abstract
This descriptive research was carried out to explore the training facilities provided by special education schools to their students with visual impairment and their teachers in the field of assistive technology. A sample of 250 students with visual impairment and their 150 teachers was taken by using purposive sampling method from 31 special schools at secondary level of education (grades 6-10) situated in 15 cities of Pakistan. The data collected through structured questionnaire was analyzed by descriptive statistics and "independent-sample t-tests". The results of present study reveal that most of the special schools were not providing any training for the students with visual impairment and their teachers regarding using assistive technology, software training and training for use of daily living aids, however some special school provide training for Braille to their students and teachers. Training of Walking Stick / White Cane was given to students and teachers as it is easy to do and less expensive. The results of the study highlight the need for capacity building of teachers to improve their pedagogical skills and use of assistive technologies in inclusive settings. Based on the findings, the curriculum for teachers' training may be revised focusing on inclusion of assistive technology as a core subject.
Keywords: Training, Special Education Schools, Students, Teachers, Assistive Technology

1. Introduction

The advancement in science and technology has a great and positive impact on students' learning specially those suffering from any disability. The development of software and hardware can now support students with different disabilities (Duhaney & Duhaney, 2000) including those with visual impairment in their education process (Behrmann & Schaff, 2001; Edyburn, 2002) thus enabling them to live a quality life. With the help of assistive technology, the students with disabilities are now learning to live independently and moving towards inclusion in educational institutes, at job and at large in society (Johnston, Beard, & Carpenter, 2003) therefore, the training to utilize assistive technology is very important for them. Such training is equally important and must for teachers who are involved in education of students with visual impairment. A study by Tara and William (2005) also emphasized on the need of training in the field of assistive technology.

According to Annual Report and Financial Statements (2012) by Sight Savers International, there are 1.4 million persons with visual impairment in Pakistan. In past only few researches were conducted about the use of assistive technology for persons with disabilities in general and for persons with visual impairment in particular (Okolo & Bouck, 2007). The researchers Ijaz and Durrani (2011) also mentioned about the scarcity of research studies in Pakistan related to provision of assistive technology for persons with visual impairment.

This descriptive research was carried out to explore the assistive technology training facilities provided by special education schools to their students with visual impairment and teachers who were teaching these students. The findings of the study will highlight the importance of training for teachers to use assistive technology in the field of special education and to improve their pedagogical skills. Based on the findings, the curriculum for teachers' training may be revised focusing on inclusion of assistive technology as a core subject.

2. Literature Review

Students with disabilities use assistive technology to participate on an equal basis with peers in their various environments (Judge & Simms, 2009; Poel, 2007). Therefore, the teachers need to be able to utilize assistive technology tools to help the students to be successful in the classroom (Edyburn, 2000).

Students with visual impairment face many challenges in their learning process and assistive technology can help them to deal with these challenges and meet their educational needs (Keetam & Alkahtani, 2013).

Inspite of realizing the importance of assistive technology in special education, many researchers found lack of use of assistive technology by students with disabilities and by their teachers also (Bouck, Maeda, & Flanagan, 2012; Quinn, Behrmann, Mastropieri, & Chung, 2009). One major barrier to implement assistive technology is a lack of training of students and teachers (Flanagan, Bouck, & Richardson, 2013; Lee & Vega, 2005; Woodbury, 2015). Many researchers have pointed out a lack of adequate pre-service and in-service training for regular and special educators (Gronseth, 2011; Ludlow, 2001; Michaels & McDermott, 2003; Wahl 2004).

Researchers also came up with models of teachers' training in special education based on theoretical and experimental components (Wojcik, Peterson-Karlan,Watts & Parette, 2004) and web-based modules and hands-on experience in universities (Van Laarhoven et al., 2008).

The National Council for Accreditation of Teacher Education (NCATE) in USA emphasized on use of educational technology in teachers' training programs (NCATE, 2012, as printed in Poel, Wood, & Schmidt, 2013). In Pakistan also, the National Accreditation Council for Teacher Education (NACTE) has recommended assistive technology as a subject in pre-service teachers training program which is meant for general education, but the component of assistive technology need to be a part of curriculum of teachers' training program in special education also. Smith, Kelley, Maushak, Griffin-Shirley, and Lan (2009) in a study developed a highly reliable and valid set of 111 assistive technology competencies for teachers of students with visual impairments.

3. Research Methodology

The present descriptive research used a survey model. Statistical Package for Social Sciences (SPSS) version 21 was used for data analysis. Hypotheses were tested by using descriptive statistics and "independent-sample t-tests" with significance noted at $p < 0.05$. The independent variables included; students with visual impairment and their teachers whereas the dependent variables were; provision of training to students and teachers for the usage of assistive technology by the school, types of training students and teachers taken regarding the usage of assistive technology, provision of software training for students and teachers, type of software trainings for students and teachers, provision of training to students and teachers for daily living aids and the types of training given to students and teachers for daily living aids.

3.1 Population and Sample

The present study aimed to explore the training facilities provided by special education schools for using assistive technology by their students with visual impairment and by their teachers who teaches these students. The population of the present study therefore included all the students with visual impairment studying in special education schools for visual impairments in Pakistan and all the teachers who were teaching these students.

The sample of the study included two types of respondents; students with visual impairment and teachers who were teaching these students. A sample of 250 students with visual impairment was taken by using purposive sampling method from 31 special schools at secondary level of education (grades 6-10) situated in 15 cities of Pakistan. The other group of respondents comprised of a sample of 150 teachers who were also selected from same special schools through purposive sampling method which involve selecting a sample the researcher believes to be representative of a given population (Gay, 2012). Table 1 provides details of geographical distribution of the sample pf special schools.

Table1. Geographical Distribution of Sample

Cities	Schools (N=31)		Teachers (N=150)		Students (N= 250)	
	N	%	N	%	N	%
Karachi	2	6.45	32	21.30	45	18.00
Hyderabad	1	3.22	4	2.60	8	3.20
Larkana	1	3.22	4	2.60	8	3.20
Nawabshah	1	3.22	4	2.60	8	3.20
Swat	1	3.22	3	2.00	5	2.00
Bahawalpur	3	9.67	10	6.66	15	6.00
Gujarat	1	3.22	4	2.60	5	2.00
Rawalpindi/Islamabad	4	12.90	40	26.60	57	22.80
Faisalabad	2	6.45	6	4.00	14	5.60
Lahore	6	19.35	15	10.00	32	12.80
Quetta	1	3.22	3	2.00	4	1.60
Peshawar	2	6.45	7	4.60	15	6.00
Abbottabad	2	6.45	2	1.30	5	2.00
Azad Kashmir	2	6.45	10	6.66	14	5.60
Multan	2	6.45	6	4.00	15	6.00

3.1.1 Demographic Characteristics of Sample

As indicated above in population and sample, there were two groups of respondents; students with visual impairment and their teachers. Table 2 describes the demographic characteristics of students. Out of 250 students, 44 % were male and 56 % were female. Majority of the female students (44.4 %) were from age range of 15-18 years. Among females, majority were total blind (62.6 %) whereas considerable number (37.4 %) were having low vision. Among males, majority were total blind (54.4 %) whereas significant number (45.6 %) were having low vision. Majority of the male students (44.4 %) were 15 to 18 years old and majority of them (28 %) were studying in grade X.

Table 2. Demographic Characteristics of Students with visual impairment (N=250)

Students		N	%
Gender	Male	110	45.30
	Female	140	54.70
Age in years	11-14	69	27.60
	15-18	110	44.40
	19-22	70	56.0
Level of disability			
Low vision	Male	47	45.60
	Female	55	47.40
Total Blind	Male	56	54.40
	Female	52	62.60
Grade	VI	25	10.0
	VII	44	17.60
	VIII	55	22.0
	IX	56	22.40
	X	70	28.0

Table 3 describes the demographic characteristics of teachers. Out of 150 teachers, 45.3% were male and 54.7 % were female. There was no gender discrimination in selection of sample, but it reflects that high proportion of female as compared to male was serving in special schools. Majority of the teachers (55.4 %) were 30 to 39 years old and majority of them (54.7 %) were Graduate.

Table 3. Demographic Characteristics of Teachers (N=150)

Teachers		N	%
Gender	Male	68	45.30
	Female	82	54.70
Age in years	Below 30	45	30.00
	30 to 39	83	55.40
	40 to 49	15	10.00
	Above 50	7	4.70
Qualification	Graduate	82	54.70
	Masters	19	12.70
	M.A in Sp. Edu	49	32.60
	M. Phil	Nil	0.00
	Ph.D.	Nil	0.00

3.2 Instruments of the study

The study was carried out by using two structured questionnaires for both the groups and having same items which were all closed ended. Tshe items of the questionnaire included; demographic information about the respondents and opinion of teachers and students about the provision of training and type of training for the usage of assistive technology given to them by the school, provision of training and types of software training given to them by the school, and provision of training and types of training for the usage of daily living aids given to given to them by the school. The responses were collected through multiple response items. For the content validity, the questionnaire was based on literature review, and further reviewed by experts in the field. To ensure the face validity, a pre-testing of questionnaire was made on four teachers and four students suffering from visual impairment taken from two special schools of visually impaired students in Karachi city. The Reliability Coefficient (Cronbach alpha) was calculated as 0.6

The researcher approached the schools of visual impairment in Karachi city through prior permission of their principals, and distributed questionnaire to the students and teachers. The team of volunteers with the researcher also helped students to fill the form. The data from other cities of Pakistan was collected by mail. It took almost six months to collect data for the present study.

The Statistical Package for Social Sciences (SPSS), and descriptive statistics was used to analyze data. Hypotheses were tested through "independent-sample t-tests" with significance noted at $p < 0.05$.

4. Results

Research Question 1: What provisions do special education schools have for the training of students with visual impairment and teachers in the field of assistive technology?

The provision of training of students with visual impairment and their teachers in the field of assistive technology was reflected through such factors as; the provision of training for the usage of assistive technology, provision of software training, and provision of training for the use of daily living aids provided by special schools. The results are given below in table 4 and were tested through hypotheses number 1-3.

Hypothesis 1: There was no significant difference among the opinion of students with visual impairment and their teachers regarding provision of training for the usage of assistive technology offered by special schools.

Hypothesis 2: There was no significant difference among the opinion of students with visual impairment and their teachers regarding provision of software training offered by special schools.

Hypothesis 3: There was no significant difference among the opinion of students with visual impairment and their teachers regarding provision of training for use of daily living aids offered by special schools.

Table 4. Provision of training in the field of assistive technology offered by special schools (N=400)

Response	Respondents	Yes	No	N	Mean	Standard Deviation	t-value	p	Hypothesis
Training for the usage of assistive technology.	Students	62	188	250	1.75	.433	1.843	.001	Accepted
	Teachers	50	100	150	1.67	.473			
Software training	Students	88	162	250	1.65	.479	-1.489	.002	Accepted
	Teachers	42	108	150	1.72	.451			
Training for use of daily living aids	Students	67	183	250	1.73	.444	-3.193	.000	Accepted
	Teachers	20	130	150	1.87	.341			

Significant α=0.05

Table 4 shows that majority of the students and majority of the teachers were of the opinion that; there was

no provision of training for the usage of assistive technology (Student, Mean, 1.75 & SD, 0.433; Teachers, Mean, 1.67 & SD, 0.473), there was no provision of software training (Students, Mean,.65 & SD, 0.479; teachers, Mean, 1.72 & SD, 0.451) and there was no provision of training for the usage of use of daily living aids by their schools (Students, Mean,1.73 & SD, 0. .444, Teachers, Mean, 1.87 & SD, 0.341).

In table 4, the value of "t" (1.843) is not significant as the "p" value (0.001) <.05 therefore it is concluded that there was no significant difference among the opinion of students with visual impairment and their teacher's regarding provision of training for the usage of assistive technology offered by special schools. The value of "t" (-1.489) is not significant as the "p" value (0.002) <.05 therefore it is concluded that there was no significant difference among the opinion of students with visual impairment and their teacher's regarding provision of software training offered by special schools. The value of "t" (-3.193) is not significant as the "p" value (0.000) <.05 therefore it is concluded that there was no significant difference among the opinion of students with visual impairment and their teacher's regarding provision of training for the usage of daily living aids offered by schools.

Research Question 2: What type of training special education schools were providing to students with visual impairment and their teachers and in the area of assistive technology?

The response of this question was reflected by such measures as; types of training given by school to use assistive technology, types of software training, and types of training for the usage of daily living aids.

The results are given below in tables 5-7 and were tested through hypotheses 4-6 given in table 8 showing consolidated trainings provided by special schools.

Table 5. Types of assistive technology training provided to students and teachers

Types of Training	Respondents	Provision		Total
		Yes	No	
Braille Training	Students	47		47
	Teachers	30		30
	Total	77		77
Computer Courses	Students	15		15
	Total	15		15
Software	Teachers	15		15
	Total	15		15
Mobility & Orientation	Teachers	1		1
	Total	1		1
Early Intervention	Teachers	1		1
	Total	1		1
IT	Teachers	3		3
	Total	3		3
No training	Students		188	188
	Teachers		100	100
	Total		288	288
Total	Students	62	188	250
	Teachers	50	100	150
		112	288	400

Table 5 reflects that most of the special schools were not providing training in regards of assistive technology for their students and teachers however, some students had taken the training in Braille and Computer technology, and few teachers were given Braille training.

Table 6. Types of software training provided to students and teachers

Types of Training	Respondents	Yes	No	Total
Jaws for Windows Screen Reading	Students	43		43
	Teachers	20		20
	Total	63		63
Magic Screen Magnification	Students	4		4
	Teachers	2		2
	Total	6		6
Open book Scanning and Reading Software	Students	19		19
	Teachers	12		12
	Total	31		31
Duxbury Braille Translator	Students	1		1
	Teachers	1		1
	Total	2		2
Dolphin Supernova	Students	1		1
	Total	1		1
Talking typing tutor	Students	4		4
	Teachers	2		2
	Total	6		6
Talks Mobile Software	Students	8		8
	Teachers	5		5
	Total	13		13
Zoom text	Students	8		8
	Total	8		8
No training	Students		162	162
	Teachers		108	108
	Total		270	270
Total	Students	88	162	250
	Teachers	42	108	150
	Total	130	270	400

Table 6 shows that most of the special schools were not providing software training to students and teachers while few students had got the training of Jaws for Windows and Zoom Text for low vision and some of the teachers received training of Jaws for Windows Screen Reading by their schools.

Table 7. Types of daily living aid training provided to students and teachers

Types of Training	Respondents	Yes	No	Total
Measuring Tape	Students	12		12
	Teachers	5		5
	Total	17		17
Needle Thread	Students	12		12
	Total	12		12
Tactile Braille Watch	Students	7		7
	Teachers	2		2
	Total	9		9
Signature Guide	Students	3		3
	Teachers	3		3
	Total	6		6
Walking Stick / White Cane	Students	29		29
	Teachers	8		8
	Total	37		37
Mp3 Player	Students	4		4
	Teachers	2		2
	Total	6		6
No training	Students		183	183
	Teachers		130	130
	Total		313	313
Total	Students	67	183	250
	Teachers	20	130	150
	Total	87	313	400

Table 7 highlights that majority of the special schools were not providing training to their students and teachers for the usage of daily living aids however among the schools that were providing some training for daily living skills, all of them were giving training of Walking Stick / White Cane to their teachers and students and few schools were also providing training to students for Measuring Tape and Needle Thread.

Hypothesis 4: There is no significant difference among the opinion of students with visual impairment and their teachers regarding the types of training for the usage of assistive technology offered by special schools.

Hypothesis 5: There was no significant difference among the opinion of students with visual impairment and their teachers regarding the types of software training offered by special schools.

Hypothesis 6: There was no significant difference among the opinion of students with visual impairment and their teachers regarding types of training for use of daily living aids offered by special schools.

Table 8. Types of training given by special education schools to teachers and students with visual impairment in the area of assistive technology (consolidated table).

Response	Respondents	N	Mean	Standard Deviation	t-value	p	Hypothesis
Types of training regarding assistive technology	Students	250	5.57	2.501	0.873	0.383	rejected
	Teachers	150	5.35	2.493			
Types of software training	Student	250	6.88	3.244	-1.048	0.295	rejected
	Teachers	150	7.22	3.063			
Types of training for the use of daily living aids	Students	250	12.27	3.298	-3.085	0.02	accepted
	Teachers	150	13.21	2.310			

Significant α=0.05

In table 8, for item number 1, the value of "t"(0.873) is not significant as the "p" value (0.383) >05 therefore it is concluded that there was a significant difference among the opinion of students with visual impairment and their teachers regarding the type of training for the usage of assistive technology offered by special schools.

In table 5, for item number 2, the value of "t"(-1.048) is not significant as the "p" value (0.295) >05 therefore it is concluded that there was a significant difference among the opinion of students with visual impairment and their teachers regarding the type of software training offered by special schools.

In table 5, for item number 3, the value of "t"(-3.085) is significant as the "p" value (0.02) <05 therefore it is concluded that there was no significant difference among the opinion of students with visual impairment and their teachers regarding the type of training for the usage of daily living aids offered by special schools.

5. Discussion

Researchers always emphasized on training aspect of insinuations and specific trainings according to special education needs of students (Aird, 2000; Cobb, 2007; Russotti & Shaw, 2004). Bodine (2003) emphasized on use of assistive technology to perform daily living tasks by persons with disabilities. Coulon (2015) in a study found that assistive technology like; software, speech generators, electronic notebooks, and computer-assisted instruction, enhance the academic achievement (e.g. spelling or writing skills) of students and keep them engage in learning. Other studies also concluded a positive impact of assistive technology on achievement of students suffering from various disabilities (Chai, O' Vail, & Ayres, 2014; O'Reilly, Lancioni, Lang, & Rispoli, 2011; Rodriguez, Draper, Strnadová, & Cummings, 2013).

The results of present study reveal that in opinion of students with visual impairment, most of the special schools were not providing training in the field of assistive technology for their students where as some students had taken the training about Braille and Computer technology. Most of the schools had no provision of software training for their students while few students had got the training of Jaws for Windows and Zoom Text for low vision. Majority of the students were not having the training for the usage of daily living aids whereas among the schools that were providing training for daily living skills, all of them were giving training of Walking Stick / White Cane because of easiness to give training and because it has very low cost. Some considerable number of schools were also giving training in Measuring Tape and Needle Thread to their students. The results are in line with other studies (Evans, Williams & Metcalf; 2010; King-Sears & Evmenova, 2007) which mentioned about tape recorders, talking calculators, visual timers as easy to use in educational institutes because of their low cost, and minimal training needed to use them.

The Individuals with Disabilities Education Act , 2004 mandates that "every child must be considered for assistive technology" (Apling & Jones, 2005).The results of present study reveal that in opinion of teachers, most of the special schools were not providing training in regard of assistive technology for their teachers however some of them were giving Braille training to teachers. The results are supported by Koch (2017) who showed concern on lack of training both for pre-service teachers and ongoing professional development of teachers to address the technology needs of their special education students.

Most of the schools had no provision of software training for teachers however some of them received training of Jaws for Windows Screen Reading. Safhi, Zhou, Smith, and Kelley (2009) discussed in detail about the training program on assistive technologies for the teachers. Farnsworth, Charles. and Luckner (2008) also emphasized the use of devices enabling teachers and para-professionals who had no experience with the literary Braille code to generate and emboss Braille documents with a minimum of training. De Freitas et al. (2009) identified lack of planning courses as a barrier in use of assistive technology and emphasized on provision of enough computers for all students, advisers to help teachers, and pedagogical support.

A study by Munemo, Emmanuel; Tom, Tom (2013) emphasized on the responsibility of schools regarding training and education for teachers about the assistive technology because researchers in the area of assistive technology report that new teachers are entering the classroom unprepared to help students with disabilities access their environment through the use of assistive technology (Abner & Lahm, 2002; Bausch, 2006).

6. Conclusion

The results of present study reveal that majority of the students with visual impairment and their teachers were of the opinion that most of the special schools were not providing any training for them regarding using assistive technology, software training and training for use of daily living aids, however some of the students got training for Braille and computer. Similarly, some of the teachers got training for Braille, computer, software, Information Technology, early intervention and mobility-orientation. Training of Walking Stick / White Cane was given to students and teachers as it is easy to do and less expensive. The results of the study highlight the need for capacity building of teachers to improve their pedagogical skills and use of assistive technologies in inclusive settings.

7. Recommendations

Teachers and students with visual impairment must be provided opportunities for training to use assistive technology and special schools should play their diligence role in it. Government should provide trainings or refresher courses about assistive technology for the teachers and students. Monitoring and evaluation is also necessary in this regard. There is a need to establish an institute to cater need of training, selling, repairing and marketing of assistive technology. Future research can be conducted to explore the training provided to pre-service teachers to use assistive technology as a requirement of their professional development. Use of assistive technology for students with other disabilities can also be tapped.

8. References

Abner, G.H., & Lahm, E.A. (1998). Implementation of assistive technology with students who are visually impaired: Teachers' readiness. Journal of Visual impairment & Blindness, 92, 98-105.

Aird, R. (2000). The case for specialist training for learning support assistants employed in schools for children with severe, profound and multiple learning difficulties. Support for Learning, 15(3), 106-110.

Annual Report and Financial Statements. (31 December 2012). Sight Savers International. Retrieved on 2 July 2014 from www.sightsavers.org.

Apling, R.N. & Jones, N.L. (2005). Individuals with Disabilities Education Act (IDEA): Analysis of Changes Made by P.L. 108-446. CRS Report for Congress, USA.

Bausch, M.E. (2006). Assistive technology planner: From IEP construction to classroom implementation. Lexington, KY: National Assistive Technology Research Institute.

Behrmann, M., & Schaff, J. (2001). Assisting educators with assistive technology: Enabling children to achieve independence in living and learning. Children and Families, 42(3), 24-28.

Bodine, C. (2003). What is assistive technology? Exceptional Parent, 33 (6), 32-34.

Bouck, E. C., Maeda, Y., & Flanagan, S. M. (2012). Assistive technology and students with high-incidence disabilities: Understanding the relationship through the NLTS2. Remedial and Special Education, 33, 298-308. doi: 10.1177/0741932511401037

Chai, Z., Vail, C.O., & Ayres, K.M. (2014). Using an iPad application to promote early literacy development in young children with disabilities. The Journal of Special Education, 48, 268-278.

doi: 10.1177/0022466913517554

Cobb, C. (2007). Training paraprofessionals to effectively work with all students. The Reading Teacher, 60(7), 686-689.

Coulon, K. (2015). Exploring the Impact of Assistive Technologies in the Classroom for Students with Disabilities. Master's Theses submitted to department of Education and Human Development, State University of New York. Retrieved from http://digitalcommons.brockport.edu/ehd_theses/613

De Freitas, A., Cassia, C.; Monteiro, G. B.M., Rabello, S., Freire, G., Maria, E. R., & De Carvalho, K.M. (2009). Assistive technology applied to education of students with visual impairment. Pan American, Journal of Public Health, vol. 26(2), p148.

Duhaney, D., & Duhaney, L. (2000). Assistive technology: Meeting the needs of learners with disabilities. International Journal of Instructional Media, 27, 393-401.

Edyburn, D.L. (2002). Models, theories, and frameworks: Contributions to understanding special education technology. Special Education Technology Practice, 4(2), 16-24.

Farnsworth, J., C., R., & Luckner, J. L. (2008). The Impact of Assistive Technology on Curriculum Accommodation for a Braille-reading student. RE: view, 39(4), p171-187.

Flanagan, S., Bouck, E. C., & Richardson, J. (2013). Middle school special education teachers' perceptions and use of assistive technology in literacy instruction. Assistive Technology: The Official Journal of RESNA, 25, 24-30. doi: 10.1080/10400435.2012.682697

Gay, L.R.,G. E. & Airasian, P. (2012). Educational Research: Competencies for Analysis & Application, 10th Edition. New Jersey; Merrill/Prentice Hall.

Gronseth, S. (2011). Factors that impact the use of assistive technologies to support secondary students with mild disabilities (Doctoral dissertation). Retrieved from ProQuest Dissertations & Theses Full Text. (3456464.)

Ijaz, M., & Durrani, Q. (2011). Development of an Open Source Urdu Screen Reader for visually Impaired People: Conference on Human Language Technology for Development, Alexandria, Egypt.

Johnston, L., Beard, L. A., & Carpenter, L. B. (2003). Assistive technology: Access for all students. Upper Saddle River, NJ: Pearson Education.

Judge, S., & Simms, K. A. (2009). Assistive technology training at the pre-service level: A national snapshot of teacher preparation programs. Teacher Education and Special Education: The Journal of the Teacher Education Division of the Council for Exceptional Children, 32, 33-44.

Keetam & Alkahtani. (2013). Teachers' Knowledge and Use of Assistive Technology for Students with Special Educational Needs. Journal of Studies in Education, 3(2). 65-86.

Koch, K. (2017). Stay in the Box! Embedded Assistive Technology Improves Access for Students with Disabilities. Education Science, 7(4), 82; doi:10.3390/educsci7040082

Lee, Y., & Vega, L. A. (2005). Perceived knowledge, attitudes and challenges of assistive technology use in special education. Journal of Special Education Technology, 20, 60-63.

Ludlow, B. L. (2001). Technology and teacher education in special education: Disaster or deliverance? Teacher Education and Special Education, 24, 143-163.

Michaels, C. A., & McDermott, J. (2003). Assistive technology integration in special education teacher preparation: Program coordinators' perceptions of current attainment and importance. Journal of Special Education Technology, 18, 29-41.

Munemo, E., Tom, T. (2013). Access and Support of Assistive Technology for People with Visual Impairments in Open and Distance Learning Institutions (O.D.L) In Zimbabwe. Journal of Emerging Trends in Educational Research & Policy Studies, 4(3), p553.

O'Reilly, M.F., Lancioni, G.E., Lang, R., & Rispoli, M. (2011). Teaching functional use of an iPod-based speech-generating device to individuals with developmental disabilities. Journal of Special Education Technology 26(3), 1-11. Retrieved from http://www.tamcec.org/jset

Okolo, C. M., & Bouck, E. C. (2007). Research about assistive technology: 2000-2006. What have we learned? Journal of Special Education Technology, 22(3), 19-34.

Poel, E. (2007). Improving instruction for students with learning need: Enhancing what students can do. Educational Leadership, 64(5), 64-66.

Poel, Elissa Wolfe, Wood, Jackie, & Schmidt, Naomi. (2013). Including assistive technology in teacher preparation: Exploring one approach. Learning Disabilities, 19, 29-37.

Quinn, B. S., Behrmann, M., Mastropieri, M., & Chung, Y. (2009). Who is using assistive technology in schools? Journal of Special Education Technology, 24, 1-13.

Rodriguez, C. D., Strnadová, I., & Cumming, T. (2013). Using iPads with students with disabilities: lessons learned from students, teachers, and parents. Intervention in School and Clinic, 49(4), 244-250. doi:10.1177/1053451213509488

Russotti, J., & Shaw, R. (2004). In-service training for teaching assistants and others who work with students with visual impairments. Journal of Visual Impairment & Blindness, 95(8), 483-487.

Safhi, M. Y., Zhou, Li., Smith, D. W., & Kelley, P. (2009). Assistive Technology in Teacher-Training Programs: A National and International Perspective. Journal of Visual Impairment & Blindness, vol. 103.

Smith, D.W., Kelley, P., Maushak, N.J., Griffin-Shirley, N., & Lan, W.Y. (2009). Assistive Technology Competencies for Teachers of Students with Visual Impairments. Journal of Visual Impairment & Blindness, 103 (8), p 457.

Tara, J. & William F. M. (2005). Special Education Technology Addressing the Diversity: A Synthesis of the literature. Journal of Special Education Technology, 20 (4), p19.

Van Laarhoven, T., Munk, D. D., Zurita, L. M., Lynch, K., Zurita, B., Smith, T., & Chandler, L. (2008). The effectiveness of video tutorials for teaching preservice educators to use assistive technologies. Journal of

Special Education Technology, 23, 31-45.

Wahl, L. (2004). Surveying special education staff on assistive technology awareness, use and training. Journal of Special Education Technology, 19, 57-59.

Woodbury, R. (2015). The Effects of a Training Session on Teacher Knowledge, Perceptions, and Implementation of Assistive Technology in Secondary Schools. Masters' Thesis submitted to Department Special Education and Rehabilitation, Utah State University

Wojcik, B. W., Peterson-Karlan, G., Watts, E. H., & Parette, P. (2004). Assistive technology outcomes in a teacher education curriculum. Assistive Technology Outcomes and Benefits, 1, 21-32.