

## **ROLE OF ASSISTIVE DEVICES IN THE REHABILITATION OF PHYSICALLY HANDICAPPED CHILDREN IN SOUTHERN PUNJAB**

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### **ABSTRACT**

*This study was conducted to explore the Role of Assistive Devices in The Rehabilitation of Physically Handicapped Children in Southern Punjab. This research was descriptive in its nature. In this study the total sample consisted 170 Senior and Junior Teachers of special education, Instructor Physical Education (IPE) and Physical Education Teachers (PET) working with physically handicapped children. It was concluded that the assistive devices proved helpful to minimize the level of disability of children with physical impairment. The results reflect that according to the parents of children with physical disabilities, the usage of assistive devices played a positive role for the rehabilitation of the children with physical impairment. Services of the professionals such as, Physiotherapist, Psychologist, Instructor Physical Education (IPE) or Physical Education Teacher (PET) should provide in the all institutions of physically disabled children.*

**Keywords:** Assistive Devices, Rehabilitation, Physically Handicapped Children, Southern Punjab.

### **INTRODUCTION**

Assistive technology (AT) is meant for professional and children with disabilities. As a term, it covers assistive, adaptive, rehabilitative technologies and related services. It improves the teaching and learning experience of students with disabilities through implementation of software which is helpful in rehabilitation of these people. Teachers use assistive devices for pedagogical process of students with disabilities. In special education literature, these devices are grouped in various forms by educationists (Chukwuemek, 2019).

Assistive technology (AT) is services for education. They are given to the children with impairment. They help to develop technology expertise as well as to enhance student outcomes. For academic success of the students with disabilities, assistive technology services are incorporated. These services provide practical solutions to promote successful academic outcome of the physically impaired students (Akpan, Beard, & McGahey 2014).

These specialists identify the needs of physically impaired students. They perform evaluation. They determine the educational goals in consultation with teachers and the school administration. The school administrations educate the physically impaired students and take care of them identifying assistive technology needs for students with disabilities. These teachers and school personnel are responsible for the care and education of the students. However, all the professionals, performing their services as assistive technology specialists, inform about

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various procedures to pin point the needs of assistive technology for the disabled students (Davis, Barnard-Brak & Arredondo, 2013).

It is a fact that without its uniform educational level, no nation can rise above. For this reason, The Punjab Education Policy 2019, focuses on employability of skills, using creative best practices, such as communication, language skills and educational technology. The use of assistive technology resources for students with physical disabilities to carry out activities is also a relief to their difficulties. The implementation of assistive technology in special education curriculum would boost the growth of special education in the Punjab, Pakistan (Saienko et al., 2019).

While previous researches provide valuable details on the role of assistive technology for physically handicapped children, but they do not adequately discuss concerns relevant to Pakistani background, since Pakistan has many linguistic, economic, social, geographical and administrative disparities from other countries. Consequently, in the light of the above, this research explores the appropriate role of assistive technology for rehabilitation of children with physically impaired in special education schools in the Punjab, Pakistan (Saienko et al., 2019).

Researchers have proved that assistive technology can have powerful impact on the academics and rehabilitation of children with special needs. The intent of this study is to assess the role of assistive technology in the rehabilitation of children with physical disabilities in the Punjab. The significance of this study will be to assess the knowledge parents and teachers of physically handicapped children about the role and benefits of assistive technology. This study may provide information regarding effective use of latest available assistive technologies in Pakistan. Results from this study may indicate to schools more effective ways of getting benefits from use of technologies that can be used in order to make physically handicapped children a less independent person. This research will particularly be useful for the parents, students, teachers, and administrators, which are the four major stakeholders in education.

#### **Objectives of the Study**

To examine the role of assistive technologies in the rehabilitation of children with physical disabilities.

#### **REVIEW OF LITERATURE**

As per definition of U. S. Assistive Technology Act of 1998, the assistive technology devices are described as a piece of equipment, any item, a product system which is commercially acquired, modified, customized and used to enhance, maintain and improve the capability of any function of a person with disabilities (Scherer, 2005).

There are a lot of assistive technology devices and types such as; raised-line papers, magnifiers, switches and communication devices among others. As per individualized education plan of a student with disability the implementation of an assistive device, equipment for that individual is totally based on the recommendations of the school's team consisting of teachers, parents, different therapists and students. These recommendations also follow the state policies as well (Parette, Blum., & Boeckmann, 2009).

All these suggested equipment's must be justified in order to promote the independence of a student with physical disabilities and also to facilitate his learning in the school background. Some of these approved equipment's are used in school while some others are retained at home by the students with special needs (Cook & Adams, 2011).

The students with physical disabilities use selected assistive technology to promote learning and their functional skills in their school. Some of this selected equipment are for postural support system, which maintains the student's posture during the class. Similarly, iPad applications provide facilitations in problem solving, measures during mathematical solutions. Some of these programs are used during primary grades which facilitate some skills and subjects such as reading and writing, science & music. The same are used for the preparation of a student's work environment. Some skill related applications are also in use in many schools (Parette, Blum., & Boeckmann, 2009).

Students with disabilities are provided with a variety of technologies intended from simple to complex. They are also provided with hard to soft technologies for their future success at their work places. AT strategies are provided to enhance communicational skills and for some

other tasks such as; filing, sorting and assembly. The same are provided to the students having reading difficulties. Assistive technology devices provide solutions which assist them in reading such as visual acuity and scanning. They also provide assistance in recognition of letter and word (Cook & Adams, 2011).

Moreover, a large number of students with special needs are having difficulties in the writing skills, punctuation and to express their ideas and capitalization as well. Similarly, some new computer software features are integrated which help the teachers make accommodation in promoting writing skills of the students with special needs. The computer skills are taught to ease writing skills in schools included personal computer, spelling checker software for the word prediction and alternative writing as well (Bruce, Di-Cesare, 2013).

Ortega-Tudela & Gomez-Ariza (2006) described that the children with Down syndrome can learn mathematical counting skills more efficiently by the use of educational software. Mostly students with physical disabilities as well as visual and cognitive deficits face difficulties in mathematics.

In an experiment, ten students were provided multimedia education software and eight students were given traditional paper pencil approach in order to assess the learning of basic counting skills. As a result, the student's familiar with the multimedia software, their performance was notably higher as compared to those having paper-pencil approach (Bruce, Di-Cesare, 2013).

#### ***Assistive devices for the rehabilitation of PHC***

Physical disability is a deficit in a person's physical functioning and also in mobility. In the daily living of physical disable person, he should be provided proper infrastructure facilities and proper transportation services because they face many daily living difficulties and during travelling in private buses. Physical disable person largely depends on their families emotionally and economically. These are also used to improve and extend the performance of the students with disabilities (Wielandt et al., 2006).

#### ***Rehabilitation for Physically Handicapped Children***

Rehabilitation of physical handicapped is to maximizing the physical and mental fitness through different aspects such as mentally, Para medically, vocational training and through offering job opportunities and also provide them proper social environment. It is the moral duty of government to focus on disabilities, give them proper environment like transportation and other facilities as they required. Normally these physical disabilities are laden on society. Government should come forward and take steps to make them useable person in society and intervene them according to their level of disability (Van den Heuvel, Lexis & Witte, 2017).

#### ***Traditional Institutional Rehabilitation***

The developed countries are working on transitional rehabilitation which means to provide different services like vocational rehabilitation, special school with therapy shelter workshops and day care centers. Now it is the duty of disable person's family, their friends and society to encourage them to access the facilities of society.

#### ***Community Based Rehabilitation***

Community based rehabilitation means the supportive role of community and NGOs which are playing active role. This community-based NGOs have been working for several years like WHO, UNICEF & ILO and other international organization are working for different disabilities. Rich people can face any types of disability due to their economic status but poor people cannot afford the disabilities and its treatment which is costly so, it is now government duty to pick these persons and give them shelter and contribute in their settlement (Wielandt et al., 2006).

A rehabilitation institute should be established in such areas where it needs most so a great number of people may get benefit. Another important aspect is that it should make possible to manage special children in normal school by providing certain facilities. If we manage to get a systematic training for the teacher, they can be able to deliver maximum output and, in this way, special children can also get fundamental education. The WHO has marked over different projects in order to provide care to people they have put different methods in this regard. It suggests that teachers should be given special training to manage the handicapped

and a less abnormal student, a day should be provided (Bongo,Dziruni & Muzenda-Mudavanhu, 2018).

Community based rehabilitation has also put some theories in this regard.

- a. It is much cheaper to establish these kinds of centers because in this way people can take advantage at their door steps.
- b. It also helps people to understand the basic problem of the environment and it also keeps them safe from displacing them in their original territories.
- c. It is also useful in competing transport issues, allows easy supervision and follow up and continuous help for the family.
- d. It avoids psychological scaring and dependence upon someone. These short-term institutions are more valuable and it takes for less cost both economically and psychologically.
- e. Its results are also tremendous as compared to others of this kind.

Rehabilitation process helps in providing a number of jobs at a certain point. In this way, the people of local area get maximum benefits and help to solve massive problems for example unemployment. The people get a basic training and help special people in their studies and daily tasks most of the time special people help themselves (Wielandt et al., 2006).

Rehabilitation institutes are very keen in research, development and other functions and their main concern is to facilitate the special people. A well-established rehabilitation authority is very beneficial both for the government and for the community. The Government can get maximum output by these institutions and can facilitate the handicapped in a better way. It is reported by community-based rehabilitation authority and by United Nations Experts groups, (2002) that the project of rehabilitation along with basic health care units and disability centers cost much than the useful budget (Tamakloe & Agbenyega, 2017).

However, IDEA uses the term “devices”, we should know that stand alone devices are also part of assistive technologies, with hardware and software for disable people. Other than the surgical implanted assistive devices almost every other tool that can aid any disable to improve his way of life by removing any disability, is assistive technology as defined by IDEA (2004).

Assistive devices terminology is very vast that provides rehabilitation professionals to feel free regarding making decisions for individuals who are needy. It provides solution for how to use other guide tools & how much to these are helpful for fulfilling IEP of these. For example, digital notepad is helpful in processing and writing words for those students who are slow in responses of writing but it can be helpful for students. IEP planers should keep in mind while designing or selecting assistive device that it must be economically approachable for most of the needy people and it can be easily modified able according to the patient needs (For example computer keyboard can be modified for visually impairment child for adding tactile locator dots etc.) (Tamakloe & Agbenyega, 2017).

These assistive devices are technology and cost wise divided into two major categories. Firstly, low tech (low cost) easy to handle devices. For example, adapted cup with enlarged handles for those individuals who have difficulty in handling regular cups. Secondly high tech (high cost/expensive) devices that need training to use independently, spoken written word alone computers. According to their functions assistive devices have variety of ranges that meets to the different disabilities’ requirements (Bruce, Di-Cesare, 2013).

#### ***Augmentative Communication***

These are based on software that is helpful in receptive and expressive language.

- *Computer access and instructions:* These are computer with their modified parts (like tactile locator dots keyboards for blind child). It enables a child with multiple disabilities to use computer in his /her classroom more beneficially.
- *Environmental Control:* Electronic and non-electronic devices that enhance the abilities of disabled student all areas of curriculum.

***Mobility Aids:*** Such as wheel chairs, sticks and walking stands.

***Recreation:*** These devices increase participation of disable children in different extracurricular activities that are also important for the mental growth and confidence building.

**Seating and positioning:** Seat belts and modification seats in the classroom are necessary to enhance child participation in the class.

Source: Bruce & Di-Cesare, 2013

## **RESEARCH METHODOLOGY**

### ***Research Design***

This research was descriptive in its nature. It would explore the role of assistive technology devices in rehabilitation of physically handicapped children.

### ***Population of Study***

The population is the total number of elements from which subjects are selected (Faiz et al., 2021; Kanwal et al., 2022; Lakhan et al., 2020; Ali et al., 2021; Sajjad et al., 2022; Siddique et al., 2021). The population of the study included Senior and Junior Teachers of special education, Instructor Physical Education (IPE) and Physical Education Teachers (PET) and Psychologists working with physically handicapped children in special education schools and centers of Southern Punjab.

### ***Sample of Study***

The sample were the number of subjects chosen from the population (Jabeen et al., 2022; Ali et al., 2021; Siddique et al., 2021; Mah Jabeen et al., 2021; Munir et al., 2021; Saeed et al., 2021; Siddique et al., 2020). In this study the total sample consisted 170 Senior and Junior Teachers of special education, Instructor Physical Education (IPE) and Physical Education Teachers (PET) working with physically handicapped children. Convenient sampling techniques were used. The sample was selected from following instruction.

### **Descriptive information about the subjects of the study**

**Table 1**

#### **Gender**

<i>Gender</i>	<i>Frequency</i>	<i>Percent</i>
Male	42	24.7
Female	128	75.3
Total	170	100.0

**Table 2**

#### **Profession Qualification**

<i>Profession qualification</i>	<i>Frequency</i>	<i>Percent</i>
B.Ed special education.	05	2.9
M.Ed special education	56	32.2
M.A special education	84	49.4
M.Phil special education	25	14.7
Total	170	100.0

**Table 3**

#### **Teacher Experience**

<i>Experience</i>	<i>Frequency</i>	<i>Percent</i>
0-5	62	36.5
6-10	50	29.4
11-15	48	28.2
16-20	07	41.8
More then 20	03	1.8
Total	170	100.0

**Table 4**  
**Classification of Teacher Designation**

<i>Designation</i>	<i>Frequency</i>	<i>Percent</i>
SSET	64	37.6
JSET	50	29.5
Other	56	32.9
Total	170	100.0

**Data Collection**

The questionnaire tool was created on Google form. The tool was sent by mail and through social media.

**Data Analysis**

After the collection of data, the data was entered into the computer, Statistical Package for Social Sciences (SPSS) was used to analyses the collected data and tool was drawn the responses and categories received from the respondents in the form of data. Descriptive and inferential statistical tools were used to analyze the data. Analyzed results were interpreted and findings were made on the basis of analysis. Then on the basis of findings, conclusions were drawn and recommendations were devised.

**Table 5**

*Frequency Distribution Table*

<i>Statement</i>	<i>Never</i>	<i>Rarely</i>	<i>Sometime</i>	<i>Frequently</i>	<i>Always</i>	<i>Mean</i>	<i>SD</i>
Assistive devices prove helpful to minimize the level of disability of children with physical impairment.	1(0.6)	3(1.8)	56(32.9)	97(57.1)	13(7.6)	3.7	0.66
Parents have the opinion that the usage of assistive devices play a positive role for the rehabilitation of the children with physical impairment.	1(0.6)	1(0.6)	41(24.1)	95(55.9)	32(18.8)	3.91	0.71
Health of the children with physical disabilities has improved with the utilization of assistive devices.	2(1.2)	3(1.8)	41(24.1)	96(56.5)	28(16.5)	3.85	0.75
Assistive devices have improved the social participation of the children with physical disabilities.	1(0.6)	48(28.2)	94(55.3)	27(15.9)	0(0)	3.85	0.69
The use of assistive device has increased the social circle of the children with physical impairment.	1(0.6)	1(0.6)	43(25.3)	93(54.7)	32(18.8)	3.91	0.71
Assistive devices help in performance of personal activities	1(0.6)	3(1.8)	31(18.2)	102(60)	33(19.4)	3.96	0.71

of the children with physical disabilities.							
Assistive devices help the student with physical impairment how to complete the task and it help to bypass an area of disability.	2(1.2)	4(2.4)	38(22.4)	82(48.2)	44(25.9)	3.95	0.83
Assistive technology is road to get the aims of life for physically impaired children.	1(0.6)	36(21.2)	93(54.7)	40(23.5)	0(0)	4.01	0.69
Assistive devices motivate the intrinsic abilities of the children with physical disabilities	3(1.8)	56(32.9)	66(38.8)	45(26.5)	0(0)	3.89	0.81

**Independent Sample t-test**

*Comparison of opinion of male and female teacher's role of assistive devices in the rehabilitation of children with physically handicapped children of southern Punjab.*

**Table 6**

	Gender	N	M	S.D	df	t	Sig.
Total	Male	42	134.7857	15.35202	169	1.849	.066
	Female	128	129.9535	14.49669	66.467	1.796	.077

\*P >.05 Level of Significance

Table 4.37 indicates, that the mean and standard deviation for the male is (M=134.7857, S.D. = 15.35202) and the mean and standard deviation for the female is (M=129.9535, S.D. = 14.49669). Results show that the t-value is 1.849 and the significance value is .066 which is greater than the .05. It is concluded that there is no significant difference between the opinions of the respondents on the basis of their gender. Male and female teachers have similar opinions about the role of assistive devices for the rehabilitation of children with physical disabilities.

**Results of ANOVA Test.**

**Professional Qualification**

*Comparison of opinion of respondents on the basis of their Professional Qualification regarding the role of assistive devices in the rehabilitation of children with physically handicapped children of southern Punjab.*

**Table 7**

Qualification	SS	df	Mean Square	F	Sig.
Between Groups	536.661	3	178.887	.813	.489
Within Groups	36765971	167	220.156		
Total	37302.632	170			

\*P >.05 Level of Significance

The results of table 4.38 describe that there is no statistically significant difference in the opinions of teachers on the basis of their Professional Qualification between group as determined by One-Way ANOVA (F(3,167)=.813, P=.489) and the significance value is .089 which is greater than the .05. All the teachers with different professional qualification have similar opinions about the role of assistive devices for the rehabilitation of children with physical disabilities.

**Teachers Experience**

*Comparison of opinion of respondents on the basis of their teaching experiences regarding the role of assistive devices in the rehabilitation of children with physically handicapped children of southern Punjab.*

**Table 8**

<i>Experience</i>	<i>SS</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
Between Groups	748.326	4	187.082		
Within Groups	36554.305	166	220.207	.850	.496
Total	37302.632	170			

\*P >.05 Level of Significance

The results of table 4.39 describe that there is no statistically significant difference in the opinions of teachers on the basis of their teaching experience between group as determined by One-Way ANOVA (F(4,166)=.850, P=.496) and the significance value is .496 which is greater than the .05. All the teachers with different teaching experience have similar opinions about the role of assistive devices for the rehabilitation of children with physical disabilities.

**Designation**

*Comparison of opinion of respondents on the basis of their designation regarding the role of assistive devices in the rehabilitation of children with physically handicapped children of southern Punjab.*

**Table 9**

<i>Designation.</i>	<i>SS</i>	<i>df</i>	<i>Mean Square</i>	<i>F</i>	<i>Sig.</i>
Between Groups	1495.678	2	747.839		
Within Groups	35806.954	168	213.137	3.509	.032
. Total	37302.632	170			

The results of table 4.40 describe that there is no statistically significant difference in the opinions of teachers on the basis of their designation between group as determined by One-Way ANOVA (F(2,168)=3.509, P=.032) and the significance value is .032 which is greater than the .05. All the teachers with different designation have similar opinions about the role of assistive devices for the rehabilitation of children with physical disabilities.

**FINDINGS**

Majority of the respondents 89 (57.1%) were responded frequently to the statement assistive devices prove helpful to minimize the level of disability of children with physical impairment with mean and standard deviation is 3.70 and .661 respectively , 95 (55.9%) were responded frequently to the statement parents have the opinion that the usage of assistive devices plays a positive role for the rehabilitation of the children with physical impairment with mean and standard deviation is 3.91 and .710 respectively, 96 (56.5%) were responded frequently to the statement health of the children with physical disabilities has improved with the utilization of assistive devices with mean and standard deviation is 3.85 and .749 respectively.

Majority of the respondents 94 (55.3%) were responded frequently to the statement assistive devices have improved the social participation of the children with physical disabilities with mean and standard deviation is 3.86 and .689 respectively, 93 (54.7%) were responded frequently to the statement the use of assistive device has increased the social circle of the children with physical impairment with mean and standard deviation is 3.91 and .713 respectively, 102 (60%) were responded frequently to the statement assistive devices help in performance of personal activities of the children with physical disabilities with mean and standard deviation is 3.96 and .706 respectively.

Majority of the respondents 82 (48.2%) were responded frequently to the statement assistive devices help the student with physical impairment how to complete the task and it help to bypass an area of disability with mean and standard deviation is 3.95 and .825 respectively,



93 (54.7%) were responded almost always to the statement assistive technology is road to get the aims of life for physically impaired children with mean and standard deviation 4.01 and .686 respectively, 66 (38.8%) were responded frequently to the statement assistive devices motivate the intrinsic abilities of the children with physical disabilities with mean and standard deviation is 3.89 and .812 respectively.

### **CONCLUSION**

It was concluded that the assistive devices proved helpful to minimize the level of disability of children with physical impairment. The results reflect that according to the parents of children with physical disabilities, the usage of assistive devices played a positive role for the rehabilitation of the children with physical impairment. The findings also disclose that the health of the children with physical disabilities has improved with the utilization of assistive devices. The assistive devices have improved the social participation of the children with physical disabilities. The teachers noticed that the use of assistive device has increased the social circle of the children. They were of the opinion that assistive devices helped in the performance of personal activities of the children with physical disabilities. They observed that the assistive devices helped the student with physical impairment in learning how to complete their task and it also helps bypass an area of disability. The assistive technology is the road to get the aims of life for physically impaired children & has motivated the intrinsic abilities of the children with physical disabilities.

### **DISCUSSION**

The main objective of the study is to know about the role of assistive devices in the rehabilitation of physically handicapped children in southern Punjab. The role of assistive devices has an immense impact on the academics and proves to be very helpful in rehabilitating children with physical disabilities. Students manifest better peer relationships; they can move freely from one place to another which results in improved academics and better rehabilitation. Assistive devices have a very strong relation with the rehabilitation of children with physical disabilities. Student's academic level increase and they exhibit positive attitude towards their studies and school, resultantly they succeed in rehabilitating themselves in their societies. Similar kind of results indicated by Beard, Carpenter, & Johnston (2011) in their study that assistive devices positively and directly affect the education of children and help in them in their rehabilitation.

The results of the study indicate that parent's role is very significant in encouraging students to use assistive devices and to seek knowledge. Assistive devices enable the physically disabled children to improve their mobility and use means of transportation independently. Similar results have been expressed by Parette, Blum, & Boeckmann, (2009) that assistive can make children with physical disabilities to move independently in their communities.

The findings of the study show that consistent role of assistive devices enables the children with physical disabilities to improve their gross motor skills. As result students participate in extracurricular activities and achieve better grades academically. But those students who do not use assistive devices show poor performance in their education and result in poor rehabilitation. Cook & Adams, (2014) described similar results in their study that the role of assistive devices helps the special children in minimizing their dependence on others and prove very fruitful for the students in enhancing their educational performance and rehabilitation as well.

All those children who use assistive devices can perform their daily routine affairs and can help their family by assisting in house hold activities independently. That's how children with physical disabilities can develop strong and friendly relation with the society and improve their socialization. When students use assistive devices regularly and with responsibility, they become more independent and mobilize which result in establishing strong relation with the family and with the society.

## **RECOMMENDATIONS**

1. Services of the professionals such as, Physiotherapist, Psychologist, Instructor Physical Education (IPE) or Physical Education Teacher (PET) should provide in the all institutions of physically disabled children.
2. Sports activities must be carried out in the all institutions of physically disabled children.
3. The children with physical disabilities should motivate to use assistive devices on regular basis.
4. Children with physical disabilities should be given awareness about the importance of using assistive devices in order to rehabilitate themselves.
5. Children with physical disabilities should be advised to use assistive devices throughout the entire life of the child and must not stop using assistive devices as they grow old.
6. Parents of the children with physical disabilities and community should be given awareness about the importance of the using assistive devices in order to rehabilitate the children with disabilities.

## **REFERENCES**

- Ahmed, A. (2018). Perceptions of using assistive technology for students with disabilities in the classroom. *International Journal of Special Education*, 33(1), 129-139.
- Assistive Technology Act of 1998 (NOTE: Nov. 13, 1998 - [S. 2432])
- Akpan, J., Beard, L., &McGahey, J. (2014, March). Assistive technology enhances academic outcomes of all students. In *Society for Information Technology & Teacher Education International Conference* (pp. 1796-1801). Association for the Advancement of Computing in Education (AACE).
- Ali, M. S., Siddique, M., Siddique, A., Abbas, M., & Ali, S. (2021b, 06/23). Teachers' Citizenship Behavior as a Predictor of Teaching Performance: Evidence from Pakistani Context. *Humanities & Social Sciences Reviews*, 9(3), 1135-1141. <https://doi.org/10.18510/hssr.2021.93112>
- Ampratwum, J., Offei, Y. N., &Ntoaduro, A. (2016). Barriers to the Use of Computer Assistive Technology among Students with Visual Impairment in Ghana: The Case of Akropong School for the Blind. *Journal of Education and Practice*, 7(29), 58-61.
- Beard, L. A., Johnston, L. B., & Carpenter, L. A. B. (2011). *Assistive technology: Access for all students*. Pearson Higher Ed.
- Bongo, P. P., Dziruni, G., &Muzenda-Mudavanhu, C. (2018). The effectiveness of community-based rehabilitation as a strategy for improving quality of life and disaster resilience for children with disability in rural Zimbabwe. *Jambá: Journal of Disaster Risk Studies*, 10(1), 1-10.
- Borg, J., Larsson, S., &Östergren, P. O. (2011). The right to assistive technology: For whom, for what, and by whom? *Disability & Society*, 26(2), 151-167.
- Bruce, D., Di Cesare, D. M., Kaczorowski, T., Hashey, A., Boyd, E. H., Mixon, T., & Sullivan, M. (2013). Multimodal composing in special education: A review of the literature. *Journal of Special Education Technology*, 28(2), 25-42.
- Chukwuemeka, E. J., &Samaila, D. (2020). Teachers' Perception and Factors Limiting the Use of High-Tech Assistive Technology in Special Education Schools in Northwest Nigeria. *Contemporary Educational Technology*, 11(1), 99-109.
- Cook, A. M., Adams, K., Volden, J., Harbottle, N., &Harbottle, C. (2011). Using Lego robots to estimate cognitive ability in children who have severe physical disabilities. *Disability and Rehabilitation: Assistive Technology*, 6(4), 338-346.
- Dalton, E. M., & Roush, S. E. (2010). Assistive and educational technology standards and teacher competencies in relation to evidence-based practice: Identification and classification of the literature. *Journal of Special Education Technology*, 25(2), 13-30.

- Davis, T. N., Barnard-Brak, L., & Arredondo, P. L. (2013). Assistive technology: Decision-making practices in public schools. *Rural Special Education Quarterly*, 32(4), 15-23.
- De Witte, L., Steel, E., Gupta, S., Ramos, V. D., & Roentgen, U. (2018). Assistive technology provision: towards an international framework for assuring availability and accessibility of affordable high-quality assistive technology. *Disability and Rehabilitation: Assistive Technology*, 13(5), 467-472.
- Durlach, P. J., & Lesgold, A. M. (Eds.). (2012). *Adaptive technologies for training and education*. Cambridge University Press.
- Dyal, A., Carpenter, L. B., & V Wright, J. (2009). Assistive technology: What every school leader should know. *Education*, 129(3).
- Faiz, Z., Iqbal, T., Azeem, A., Siddique, M., & Warraich, W. Y. (2021). A Comparative Study between Online and Traditional Counseling for Students with Attention Deficit Hyperactivity Disorder (ADHD): School Psychologists Perspective in the Obsequies of Pandemic COVID-19. *LINGUISTICA ANTVERPIENSIA*, 2021(3), 5763-5777.
- Faucett, H. A., Ringland, K. E., Cullen, A. L., & Hayes, G. R. (2017). (In) visibility in disability and assistive technology. *ACM Transactions on Accessible Computing (TACCESS)*, 10(4), 1-17.
- Federici, S., & Scherer, M. (Eds.). (2012). *Assistive technology assessment handbook*. CRC press.
- Jabeen, S., Siddique, M., Mughal, K. A., Khalid, H., & Shoukat, W. (2022). School Environment: A Predictor of Students' Performance at Secondary Level in Pakistan. *Journal of Positive School Psychology*, 6(10), 2528-2552.
- 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*, 32(1), 33-44.
- Kanwal, W., Qamar, A. M., Nadeem, H. A., Khan, S. A., & Siddique, M. (2022). Effect of Conceptual Understanding of Mathematical Principles on Academic Achievement of Secondary Level Chemistry Students. *Multicultural Education*, 8(3), 242-254. <https://doi.org/10.5281/zenodo.6370449>
- Lakhan, G. R., Ullah, M., Channa, A., ur Rehman, Z., Siddique, M., & Gul, S. (2020). The Effect of Academic Resilience and Attitude on Managerial Performance. *Elementary Education online*, 19(3), 3326-3340. <https://doi.org/10.17051/ilkonline.2020.03.735498>
- Lee, Y., & Vega, L. A. (2005). Perceived knowledge, attitudes, and challenges of at use in special education. *Journal of Special Education Technology*, 20(2), 60.
- Mah Jabeen, S., Aftab, M. J., Naqvi, R., Awan, T. H., & Siddique, M. (2021). Prevalence of Students with Learning Difficulties in Basic Arithmetic Operations in the Subject of Mathematics at Elementary Level. *Multicultural Education*, 7(5), 444-453. <https://doi.org/10.5281/zenodo.5110685>
- Mason-Williams, L., Bettini, E., Peyton, D., Harvey, A., Rosenberg, M., & Sindelar, P. T. (2020). Rethinking shortages in special education: Making good on the promise of an equal opportunity for students with disabilities. *Teacher Education and Special Education*, 43(1), 45-62.
- Mavrou, K. (2011). Assistive technology as an emerging policy and practice: Processes, challenges and future directions. *Technology and Disability*, 23(1), 41-52.
- Munir, M., Ali, M. S., Iqbal, A., Farid, M. F., & Siddique, M. (2021). RELATIONSHIP BETWEEN LEARNING ENVIRONMENT AND PERFORMANCE OF STUDENTS AT UNIVERSITY LEVEL. *Humanities & Social Sciences Reviews*, 9(3), 877-884. <https://doi.org/10.18510/hssr.2021.9385>
- Ortega-Tudela, J. M., & Gómez-Ariza, C. J. (2006). Computer-assisted teaching and mathematical learning in Down syndrome children. *Journal of computer assisted learning*, 22(4), 298-307.
- Parette, H. P., Blum, C., & Boeckmann, N. M. (2009). Evaluating assistive technology in

- early childhood education: The use of a concurrent time series probe approach. *Early Childhood Education Journal*, 37(1), 5-12.
- Powell, L. E., Glang, A., & Ettl, D. (2013). Systematic assessment and instruction of assistive technology for cognition (ATC) following brain injury: An introduction. *Perspectives on Neurophysiology and Neurogenic Speech and Language Disorders*, 23(2), 59-68.
- Quaglia, G., Franco, W., & Oderio, R. (2011). Wheelchair. q, a motorized wheelchair with stair climbing ability. *Mechanism and Machine Theory*, 46(11), 1601-1609.
- Raskind, M. H., & Shaw, T. (1999, March). Assistive technology for individuals with learning disabilities. In *Center On Disabilities, Technology and Persons with Disabilities Conference 1999*.
- Retter, S., Anderson, C., & Kieran, L. (2013). iPad use for accelerating reading gains in secondary students with learning disabilities. *Journal of Educational Multimedia and Hypermedia*, 22(4), 443-463.
- Saeed, A., Warraich, W. Y., Azeem, A., Siddique, M., & Faiz, Z. (2021). Use of Social Media Apps for Cyberstalking during Pandemic COVID-19 Lockdown: A Cross-Sectional Survey at University Students of Lahore. *Multicultural Education*, 7(11), 334-343. <https://doi.org/10.5281/zenodo.5705998>
- Safdar, S., Khan, S. A., Azam, N., Mahmood, H., & Pervaiz, F. (2019). Need assessment of assistive technology in children with multiple disabilities. *PAFMJ*, 69(SUPPL 2), S229-34.
- Saienko, N., Olizko, Y., & Arshad, M. (2019). Development of tasks with art elements for teaching engineers in English for specific purposes classroom. *International Journal of Emerging Technologies in Learning (iJET)*, 14(23), 4-16.
- Sajjad, Q., Siddique, M., & Tufail, I. (2022). Teacher-Student Interaction towards Chemistry at Secondary Level. *Global Educational Studies Review*, VII(II), 167-174. [https://doi.org/10.31703/gesr.2022\(VII-II\).16](https://doi.org/10.31703/gesr.2022(VII-II).16)
- Scherer, M. J. (2005). Assessing the benefits of using assistive technologies and other supports for thinking, remembering and learning. *Disability and Rehabilitation*, 27(13), 731-739.
- Sherry, M., Ravneberg, B., & Söderström, S. (2017). *Disability, society and assistive technology*. Routledge.
- Siddique, A., Taseer, N. A., & Siddique, M. (2020). Teachers' Emotional Intelligence and Teaching Effectiveness: A Correlational Study. *Ilkogretim Online*, 19(3), 2411-2417. <https://doi.org/10.17051/ilkonline.2020.03.735399>
- Siddique, M. (2020). *Students' Attitude towards Learning of Chemistry at Secondary School Level in Lahore District* [Unpublished M.Phil thesis, Minhaj University, Lahore, Pakistan].
- Siddique, M., Ali, M. S., Nasir, N., Awan, T. H., & Siddique, A. (2021). Resilience and Self-Efficacy: A Correlational Study of 10th Grade Chemistry Students in Pakistan. *Multicultural Education*, 7(9), 210-222. <https://doi.org/10.5281/zenodo.4912254>
- Siddique, M., Tatlah, I. A., Ali, M. S., Awan, T. H., & Nadeem, H. A. (2021). Effect of Total Quality Management on Students' Performance in Chemistry at Secondary Level in Pakistan. *Multicultural Education*, 7(11), 592-602. <https://doi.org/10.5281/zenodo.5828015>
- Saleem, S., & Sajjad, S. (2016). The Scope of Assistive Technology in Learning Process of Students with Blindness. *International Journal of Special Education*, 31(1), 46-54.
- Smith, E. M., Gowran, R. J., Mannan, H., Donnelly, B., Alvarez, L., Bell, D., ... & Wu, S. (2018). Enabling appropriate personnel skill-mix for progressive realization of equitable access to assistive technology. *Disability and Rehabilitation: Assistive Technology*, 13(5), 445-453.
- Satterfield, B. (2016). History of Assistive Technology Outcomes in Education. *Assistive Technology Outcomes & Benefits (ATOB)*, 10(1).

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- Tamakloe, D., & Agbenyega, J. S. (2017). Exploring preschool teachers' and support staff's use and experiences of assistive technology with children with disabilities. *Australasian Journal of Early Childhood*, 42(2), 29-36.
- Van den Heuvel, R. J., Lexis, M. A., & de Witte, L. P. (2017). Robot ZORA in rehabilitation and special education for children with severe physical disabilities: a pilot study. *International journal of rehabilitation research. Internationale Zeitschrift für Rehabilitationsforschung. Revue internationale de recherches de readaptation*, 40(4), 353.
- Wielandt, T., McKenna, K., Tooth, L., & Strong, J. (2006). Factors that predict the post-discharge use of recommended assistive technology (AT). *Disability and Rehabilitation: assistive technology*, 1(1-2), 29-40.