UMT Education Review (UER)

Volume 4 Issue 1, Spring 2021
ISSN(P): 2616-9738 ISSN(E): 2616-9746
Journal DOI: https://doi.org/10.32350/uer
Issue DOI: https://doi.org/10.32350/uer.41
Homepage: https://journals.umt.edu.pk/index.php/uer

Article: **Using Technology to Enhance the Performance of Intellectually Disabled Students: Mobile Game-based Urdu Learning**

Author(s): Nida Gul[1], Hina Noor[2], Farkhunda Rasheed Chaudhary[3]

Affiliations
[1]Government special education center Millat town, Faisalabad, Pakistan
[2]Department of Special Education, AIOU, Islamabad, Pakistan
[3]Department of EPPSL, AIOU, Islamabad, Pakistan

Pub. Online: Spring 2021

Article DOI: https://doi.org/10.32350/uer.41.03

Article History:
Received: 26-2-2021
Revised: 26-04-2021
Accepted: 29-06-2021

To cite this article: Gul, N., Noor, H., & Chaudhary, F. R. (2021). Using technology to enhance the performance of intellectually disabled students: Mobile game-based Urdu learning. *UMT Education Review*, *4*(1), 42–57.
Crossref

Journal QR

Article QR

Nida Gul

Indexing

A publication of the
Department of Education, School of Social Sciences and Humanities,
University of Management and Technology, Lahore, Pakistan

Using Technology to Enhance the Performance of Intellectually Disabled Students: Mobile Game-based Urdu Learning

Nida Gul[1*], Hina Noor[2] and Farkhunda Rasheed Chaudhary[3]

[1]Government Special Education Center Millat Town, Faisalabad, Pakistan
[2]Department of Special Education, AIOU, Islamabad, Pakistan
[3]Department of EPPSL, AIOU, Islamabad, Pakistan

Abstract

The notion of using technology for learning is not new. However, the high level of digital exclusion of individuals with intellectual disabilities is well-documented. The purpose of this paper was to investigate the effect of two different pedagogies for students with intellectual disability (ID). The main objective was the comparison of assistive technology and the traditional teaching method for improving Urdu vocabulary. Using a quasi-experimental design, 8 ID students of 10 to 15 years of age were selected and divided into control and experimental groups. Their performance was measured before and after a six-week intervention program. The results showed that mobile-based technology improved the experimental group's performance as compared to the control group. The technology had a positive impact on the learning of Urdu vocabulary by students with ID. The findings suggest that learning the Urdu language through game-based software/programs/utilities can improve students' learning in the classroom. Teachers can use mobile phone as a learning tool to enhance their learning goals.

***Keywords**:* assistive technology, intellectual disability (ID), mobile-based learning

Introduction

Students with intellectual disabilities (ID) experience certain limitations in their mental functioning which undermine their adaptive capability including their social, perceptual, and adaptive skills (Schalock & Luckanson, 2004). They face difficulties in learning new skills, especially new languages. Urdu is the national language of Pakistan. It is hard to teach to students with intellectual disabilities because of their limited intellectual functioning. Moreover, Urdu has a complex and confusing alphabetic system. It omits diacritics and certain vowels in its writing system. These limitations cause learning difficulties in the classroom. They have a detrimental impact on the ability of children to learn in a traditional educational setting. Children with intellectual disabilities face significant disparities and

*Corresponding Author: nidaaslam79@gmail.com

challenges in the academia. To prepare effective strategies or interventions, educators must understand the effect of impairment on academic success. Instead of resolving poor performance issues, teachers often look for explanations to justify poor performance in learning and fail to respond via the provision of required support and services (Edyburn, 2006; Durgungoz & Durgungoz, 2021).

Technology plays an essential role in the education of students with disabilities all over the world. Technologies can be low (pencil grip, magnifier, highlighter), middle (talking calculator, MP3 player, organizers), and high (word processor, mobile, computer). Increasingly, instructional technology is focusing on promoting student progress in the subject area. Several mathematical applications can improve a child's computational skills (addition, subtraction, division multiplication).

Literature Review

In a study by Soares et al. (2018), a mathematical app was used to help students both with and without a disability to improve their mathematical skills. The results showed improvement in the group struggling with computational mathematics. Many studies suggest that it is indispensable that technology is not seen as an end to itself but only as a cognitive device (Weston & Bain, 2010). Technology used as an aid or support may significantly improve student engagement and achievement (Thompson et al., 2016). Predictably, a significant number of individuals with intellectual disabilities may need supporting technologies to enhance their independence and functional skills that can improve their quality of life (Bootet al., 2017).Also, instructional technology focuses on promoting student advancement in the subject area. Unfortunately, no consideration was given to the use of assistive technology for improving the skills of students with intellectual disabilities (Biancarosa & Griffiths, 2012). Individuals with intellectual disabilities face a high level of digital exclusion (Terraset al., 2018). Assistive technology (AT) helps to bridge the gap between students with learning disabilities (Atanga et al.,2020).

Low academic achievement can be used as the rationale for using assistive technology for better learning outcomes (Edyburn, 2007). Disabled people use assistive devices to perform tasks that would either be difficult or unmanageable for them. AT is any tool, equipment, or software that supports people to overcome challenges to learn, interact, and work better. It can be used in schools for reading, writing, mobility, math, communication, studying, recreation and leisure (Cook et al., 2020).

On the other hand, its use seems promising for intellectually disabled students (Kversøyet al., 2020). However, it is not clear what percentage of individuals with

intellectual disabilities currently have access to good assistive products globally because there is more misdiagnosis or under diagnosis (Bootet al., 2017). Developing countries have very little academic awareness about AT. Little scientific proof is available in developing countries which supports the development of approaches targeting the distribution of AT (Borget al.,2011a).

A survey was conducted to explore the barriers to using AT in Pakistan by the researchers of the National University of Medical Sciences (NUMS, 2019). It was reported that children with disabilities face barriers to AT and their lack of awareness is the primary barrier (Safdaret al., 2019). The 'Convention on the Rights of Persons with Disabilities (CRPD)'acknowledges the vital role of assistive technology (AT) and information and communication technologies (ICTs) in facilitating and empowering individuals with disabilities, ensuring to have full enjoyment of fundamental freedoms and human rights. However, access to AT in underdeveloped countries is minimal and compounded by a shortage of related resources (Borget al.,2011b), as explained by Awais and Ameen (2015). CRPD emphasizes the use of AT for children with disabilities. The positive impact of AT in improving access to education and increasing achievement in the lives of the disabled individuals has been documented in various studies (Borg et al.,2011b). It is the right of disabled students to access AT and the government has the responsibility to provide it (Cagiltay et al., 2019). In 2011, Pakistan also ratified CRPD that clarifies the equal rights of individuals with disabilities. AT can help the students with disabilities in the completion of their tasks and learning new skills. For this purpose, learning devices like laptops, tablets, mobile phones and computers help to fulfill the demands of today's classroom.

Mobile learning becomes ubiquitous when teachers have sufficient funds provided by the government to buy tablets or computers (Amarin & Ghishan, 2013). Teachers can easily use these devices in the classroom or outside the class for teaching new skills. Digital innovations have resulted in a new generation of instructional devices that offer easy exposure and a range of innovative uses. As defined by Godwin (2012), the key advantage of mobile technology is the possibility of learning anytime, anywhere. Mobile technology has been considered beneficial by a wide variety of studies. It can be understood as a device used with an educational method for improving the awareness of word comprehension, spelling and vocabulary skills, as well as math reality and fluency among students with and without disabilities (Yasiret al., 2019). Neumann and Neumann (2014) also recommended the use of touch screen tablets to increase the literacy of early learners. However, a report warns us that the excessive use of digital devices such as smart phones and tablets at 4 years of age is related to the later appearance of

deregulation symptoms and to lower academic achievement at the ages of 6 and 8 years (Cerniglia et al., 2020).

Previous research has documented the efficacy of mobile devices and their applications for the teaching and learning process. Most educational applications are mini-programs that can be downloaded on mobile devices. Many are free of cost and available online, but some require payment. Using interactive tablet apps to teach individuals with intellectual disabilities is a successful way to develop their everyday living skills (Yeniet al., 2019). In outdoor learning and classrooms, mobile devices such as personal digital assistants and laptops have become educational learning tools with a great potential. Mobile devices and applications are being adopted for intervention, such as the video modeling interference app to teach social skills with mobile-based learning. Emerging data indicates that the application has a significant potential to assist the learning procedure (Shuler, 2012; Kim & Smith, 2017). It is a mini-program that can be downloaded on mobile devices.

Students can learn through games which can be used to promote learning of a specific subject, a new language, math skills, and other types of learning. Games are widely used to provide training and education to support online safety, independent living, and social skills (Papadakis, 2018; Terras et al., 2018). Educational games are developed to promote game-based learning aimed to stimulate learners and to obtain different educational outcomes. Cohen et al. (2011) suggested three types of educational games including creating apps, gaming apps, and eBook apps. Godwin (2012) also recommended a triple bound range of a comprehensive classification of apps based on students' locus of control over the apps' tasks and their intellectual assessment level; these are instructive, constrictive, and manipulative.

Digital Games Based Learning (DGBL) may significantly influence the learning concerns of individuals with disabilities and other similar sensory impairments (Brown et al., 2013). Students with intellectual disabilities can learn different adaptive, self-help, social skills, and daily life skills more effectively when these skills are demonstrated through video modeling techniques on smart phones. However, the findings of previous studies suggest that grass is not so green after all; children aged 0-5 use a variety of apps, some of which are not aimed at this age range. The design features of such apps can lead to the support or inhibition of play and creativity (Marsh et al., 2018, 2019). It means that apps must be age specific for intellectually disabled children. Furthermore, how teachers can best utilize these

digital tools in early childhood classrooms to support emergent literacy requires further investigation (Neuman, 2018).

Moreover, there is a lack of research that can furnish conclusive evidence that mobile technology is currently being used in the actual classroom environment of children with disabilities in Pakistan. The use of assistive devices and materials for people with intellectual disabilities is a neglected area of study and experience. Little research has been conducted on mobile-based learning and its educational impact on students with intellectual disabilities. Therefore, we can conclude by saying that there is an urgent need to undertake initiatives to address the academic challenges faced by the underprivileged segments of the community.

Method

Research Model

The research was quantitative and a quasi-experimental design was used. Eight participants with intellectual disabilities were selected based on their diagnosis made explicit in terms of low vocabulary usage, as evident by their assessment reports. The researchers assessed their previous academic work. Students facing difficulty in Urdu word recognition were selected from two intact classes (experimental group-N=4 and control group-N=4) from a public school of Faisalabad, Pakistan. The independent variable of the research was mobile application and the dependent variable was academic score.

Table 1

Quasi-experimental Research Design

Groups	Pretest	Treatment	Posttest
Experimental group	O1	X	O2
Control group	O1		O2

X= Learning with mobile app
O1=Experimental and control group pretest
O2=Experimental and control group posttest

Hypotheses

In the current study, two null hypotheses were tested against their alternative hypotheses. These hypotheses are as follows:

H_{01}: There is no significant difference in the pretest and posttest scores of the control group after administering traditional teaching for the recognition of Urdu words.

H_{02}: There is a significant difference in the pretest and posttest scores of the experimental group after using a mobile application for their cognition of Urdu words.

Study Participants

The study was conducted in a public Special Education Institution, Faisalabad where the participants were enrolled in Grade 1. The age group of the participants was 11-16 years and 13.5 years was their mean age. The participants were diagnosed with a mild to moderate level of intellectual disability. The school psychologist diagnosed the IQ level of the students. Those participants who were continuously facing difficulty in Urdu word recognition were selected for this study by the researchers. Eight participants of the selected institute were facing problems in Urdu word recognition. All of them were selected for the current study. The participants were divided into two groups, that is, experimental and control groups (experimental group-N=4 and control group-N=4). Both groups had the same academic level in Urdu word recognition (2 to 3 letters).

Materials

An android mobile phone was used for the experimental group. The study aimed to assess the effectiveness of a mobile app in learning Urdu. The researchers uploaded the *Taleem abad* mobile application. It has an *instructive (educational)* design. This design has aspects of the drill-and-practice style, which provides the app with a predetermined 'mission' reaction from the learners or users, homogeneously. Such apps demand little computational effort from the learners.

The *Taleemabad* mobile app is specially designed for kids with special learning needs and covers the national curriculum. It is a bilingual app offered by Orenda studio in both English and Urdu with audiovisuals and animation. Urdu word recognition is also a part of this app on three levels. This app is certified by the Ministry of Federal Education, Pakistan for nursery to class five. It covers main subjects such as Urdu, English, Math, and Science. It has the following salient features:

1. Bilingual (Urdu and English)
2. Appealing for children
3. Easy to use and easy to see
4. Proceeds from a simple to a complex task

5. Guide character
6. Provides reinforcement on correction
7. Offers verbal prompts/cues

Beginner's level was chosen because of the participant's low IQ. Guide character (Batman) helps step by step in choosing letters and pronounces phonics needed to make a word with due encouragement, such as a good job and excellent. After practice, students are able to make words without any prompts or cues.

The researchers used the traditional classroom tools such as the Urdu textbook (Grade 1), flash cards, notebook and pencil, blackboard, and wall charts for practice for the students of control group.

Procedure

The study was conducted in three steps. In the first step, an initial assessment was carried out to determine the benchmarks of both groups. The initial assessment scores served as the baseline data regarding the students' current performance level with reference to the target skill.

The content of the study was the same for both groups. The list of five selected words of Urdu was developed (shown in Table 2 below). The researchers wanted to ensure the ability level of both groups. The responses of the participants against the words on the list were noted down.

Table 2

Urdu Words Targeted for the Experimental Group and the Control Group

No	Word
1	شاخ
2	نان
3	تین
4	باغ
5	ڈاک

In the second step, both groups were taught for about 45 minutes daily for six days a week. They were taught separately and it was a 6-week plan. The treatment group learned the selected words using the *Teleemabad* mobile App following the model of an *instructive (educational)* design. The control group was taught Urdu through the traditional teaching method using text books, blackboards, and flashcards. The variables of learning content, teacher (researcher), and teaching duration were controlled for the study.

In the final step of the study, a posttest was conducted to evaluate the difference in both groups' scores. Summative evaluation was also performed separately for each group through multiple choice questions and noted on a test paper. All the data of the pretest-posttest were collected. Afterwards, *t*-test was applied using SPSS.

The researchers chose a list of five selected Urdu words from the *Taleemabad* mobile app to determine the academic scores of pre and posttests. Cronbach's alpha value depicting internal consistency was 0.8, indicating a good coefficient. Mobile app comprised the independent variable used for the experimental group. The possible responses after the treatment of the independent variable were measured to find out the difference. The results of the pretest-posttest of both groups were analyzed and evaluated using a *t*-test.

Results

The scores of pretests and posttests of the treatment and control groups were measured. Standard deviation and mean scores were computed. The scores were compared statistically and evaluated using the independent sample *t*-test.

Table 3

Comparison of Control Group in Pretest and Posttest

Group	N	Test	Mean	SD	Mean Diff.	t	p
Control	4	Pretest	12.500	2.88	-1.250	-1.000	0.391
		Posttest	13.7500	2.500			

df=3

Table 3 shows the performance of the control group in pretest and posttest. It shows that the mean score (M=12.500, SD=2.88) of control group in pretest was less than the posttest score (M=13.750, SD=2.500). However, the mean difference (-1.25) for the control group in both tests was not significant due to the calculated value of t=-1.00 and $p>0.05$. Therefore, H_{01} was accepted and it can be inferred that the control group did not perform well in the posttest.

Table 4 shows the performance of the experimental group in pretest and posttest. It shows that the mean score (M=12.500, SD=2.88) of experimental group in pretest was less than the posttest score (M=18.750, SD=2.500). It yielded the mean difference (-6.250) for the experimental group in both tests. The calculated value of t=-5.00 was also significant as $p<0.05$. Therefore, H_{02} was rejected and it can be inferred that the experimental group performed well in the posttest.

Table 4

Comparison of Experimental Group in Pretest and Posttest

Group	N	Test	Mean	SD	Mean Diff.	t	p
Experimental	4	Pretest	12.500	2.88	-6.250	-5.000	0.015
		Posttest	18.7500	2.55			

df=3

Table 5

Comparison of Control and Experimental Groups in Pretest

Group	N	Mean	SD	Mean Diff.	T	p
Experimental	4	12.500	2.88	0.000	0.000	1.000
Control	4	12.500	2.88			

df=6

Table 5 shows the comparison of both groups in pretest scores. It reflects that the experimental group's scores (M=12.500, SD=2.88) and control group's scores (M=12.500, SD=2.88) were the same before treatment. The calculated value of t=0.000 was not significant as p>0.05. It can be inferred that both groups were equal in terms of scores obtained before treatment.

Table 6 shows the comparison of both groups in posttest scores. It reflects that the experimental group's scores (M=18.750, SD=2.55) were higher than the control group's scores (M=13.750, SD=2.55) after treatment. The calculated value of t=2.028 was significant as p<0.05. It can be inferred that there was a significant difference in posttest scores of both groups after treatment.

Table 6

Comparison of Control and Experimental Groups in Posttest

Group	N	Mean	SD	Mean Diff.	T	p
Experimental	4	18.750	2.55	5.000	2.028	0.030
Control	4	13.750	2.55			

df=6

Discussion

The findings of the current study showed the effectiveness of technology for bringing improvement in the recognition of Urdu words. Learning through technology has a positive impact on the recognition of Urdu words by students with intellectual disabilities. The experimental and control groups showed almost identical scores in the pretest. Students in the control group did not improve their scores as compared to the students included in the experimental group. Students in the experimental group improved their Urdu by using the *Taleemabad* mobile app. The detailed analysis of each group showed that the scores of the experimental group were improved by using technology and there was a significant change in their scores after the experiment.

The current study aimed to investigate the effectiveness of AT in improving the ability to recognize Urdu words in students with intellectual disabilities. Urdu writing system is complex for students because of the similar shapes of letters and the use of dots. Researchers have tried to solve this issue with the help of technology.

The current study aimed to examine the effects of mobile-based learning on students' academic performance and found the results favorable to enhance the learning of Urdu language in the classroom by students with intellectual disabilities. Such students showed a great interest in mobile-based learning during the experiment and their learning outcomes were enhanced. The findings showed that technology can improve the learning level of these students. Mobile-based teaching has been adopted to teach individuals with intellectual disabilities, globally. Many studies have proved that mobile-based teaching is more productive for better understanding than the use of traditional teaching strategies.

Several studies have shown the benefits of AT for students with disabilities. AT helps to improve the spelling and reading skills in students with learning difficulties (Baker, 2017; Higgins & Raskind, 1999). Mobile technologies have a great potential to enhance student learning by improving subject learning and creativity, high-level skill development, and other problem-solving skills (Warschauer, 2007; Sung et al., 2016). In the current study, AT in the form of mobile devices was used for teaching students with intellectual disabilities in the classroom to improve their Urdu word recognition. It showed that mobile-based learning improves the recognition of Urdu words among such students. So, the alternate hypothesis of this research that there is a substantial difference in the scores of the treatment group after using the *Taleemabad* mobile app in learning Urdu word recognition is supported.

Conclusion

In sum, the results provided positive evidence (in line with the previous researches) proving that the use of mobile-based technology for improving Urdu word recognition for students with intellectual disabilities is beneficial. This conclusion is based on the score of the experimental group after using mobile-based technology which was statistically significant.

Recommendations

For the future, there is a need to improve the provisions available for better facilitation of students with intellectual disabilities through AT to meet the international standards regarding the education of such students. It is vital to encourage the teachers to find new approaches to improve these students' academic performance. AT should be accessible, affordable, adaptable, and acceptable for these students and their families. The government and stakeholders need to maintain their commitment towards realizing the provisions of CRPD.

Acknowledgment

We want to express our sincere gratitude to our students who were a part of this study. Without their support, it was impossible for us to complete this research.

References

Algahtani, F. (2017). Teaching Students with Intellectual Disabilities: Constructivism or Behaviorism? *Educational Research and Reviews*, *12*(21), 1031−1035. https://doi.org/10.5897/ERR2017.3366

Amanulla, M. B. (2016). *Teaching of Urdu: Problems and Prospects*. Department of Arabic, Persian and Urdu, University of Madras, Chennai.

Amarin, N. Z., & Ghishan, R. I. (2013). Learning with technology from a constructivist point of view. *International Journal of Business, Humanities and Technology*, *3*(1), 52−57.

Atanga, C., Jones, B. A., Krueger, L. E., & Lu, S. (2020). Teachers of students with learning disabilities: assistive technology knowledge, perceptions, interests, and barriers. *Journal of Special Education Technology*, *35*(4), 236–248. https://doi.org/10.1177/0162643419864858

Awais, S., & Ameen, K. (2015). Information accessibility for students with disabilities: An exploratory study of Pakistan. *Malaysian Journal of Library & Information Science*, *20*(2), 103−115.

Baker, E. (2017). Apps, iPads, and literacy: Examining the feasibility of speech recognition in a first-grade classroom. *Reading Research Quarterly, 52*(3), 291–310. https://doi.org/10.1002/rrq.170

Biancarosa, G., & Griffiths, G. (2012). Technology Tools to Support Reading in the Digital Age. *The Future of Children, 22*(2), 139−160. http://www.jstor.org/stable/23317415

Boot, F. H., Dinsmore, J., Khasnabis, C., & MacLachlan, M. (2017). Intellectual disability and assistive technology: opening the GATE wider. *Frontiers in Public Health*, *5*, 10−14. https://doi.org/10.3389/fpubh.2017.00010

Borg, J., Lindström, A., Larsson, S. & Östergren, P-O. (2011a). The right to assistive technology: for whom, for what, and by whom? *Disability & Society, 26*(2), 151−167. https://doi.org/10.1080/09687599.2011.543862

Borg, J., Lindström, A., & Larsson, S. (2011b). Assistive technology in developing countries a review from the perspective of the convention on the rights of persons with disabilities. *Prosthetics and Orthotics International*, *35*(1), 20−29. https://doi.org/10.1177/0309364610389351

Brown, D., Standen, P., Saridaki, M., Shopland, N., Roinioti, E., Evett, L., Grantham,S., & Smith, P. (2013). Engaging students with intellectual disabilities through games based learning and related technologies. In *International Conference on Universal Access in Human-Computer Interaction* (pp. 573-582). Springer, Berlin, Heidelberg.

Cagiltay, K., Cakir, H., Karasu, N., Islim, O. F., & Cicek, F. (2019). Use of educational technology in special education: Perceptions of teachers. *Participatory Educational Research*, *6*(2), 189−205. https://doi.org/10.17275/per.19.21.6.2

Cerniglia, L., Cimino, S., & Ammaniti, M. (2021). What are the effects of screen time on emotion regulation and academic achievements? A three-wave longitudinal study on children from 4 to 8 years of age. *Journal of Early Childhood Research*, *19*(2), 145−160. https://doi.org/10.1177/1476718X20969846

Cohen, M., Hadley, M., & Frank, M. (2011). Young children, apps & iPad. *US Department of Education Ready to Learn Program*, *200*, 5−10.

Cook, M., Polgar, J., & Encarnação, P. (2020). *Assistive technologies, Principle sand practice* (5th ed.). Elsevier.

Durgungoz, F., & Durgungoz, A. (2021). Exploring the use of touch screen devices for children with special educational needs and disabilities: Digital vs. traditional. *European Journal of Special Education Research, 7*(1), 92−109.https://doi.org/10.46827/ejse.v7i1.3612

Edyburn, D. L. (2007). Technology-enhanced reading performance: Defining a research agenda. *Reading Research Quarterly*, *42*(1), 146−152. https://doi.org/10.1598/RRQ.42.1.7

Godwin, K. (2012). *Use of Tablet Technology in the Classroom. NSW Curriculum and Learning Innovation.* Institute of Earlyy Childhood Macquarie University. https://www.cirta.org/images/doc_archive/cirta_nouvelles/iPad_Evaluation_Sydney_Region.pdf

Higgins, E. L. & Raskind, M. H. (1999). Speaking to read: The effects of continuous vs. discrete speech recognition systems on the reading and spelling of children with learning disabilities. *Journal of Special Education Technology*, *15*(1), 19−30. https://doi.org/10.1177/016264340001500102

Kim, Y. & Smith, D. (2017). Pedagogical and technological augmentation of mobile learning for young children interactive learning environments. *Interactive Learning Environments*, *25*(1), 4−16.

Marsh, J., Plowman, L., Yamada-Rice, D., Bishop, J., Lahmar, J., & Scott, F. (2018). Play and creativity in young children's use of apps. *British Journal of Educational Technology, 49*(5), 879–882.

Marsh, J., Wood, E., Chesworth, L., Nisha, B., Nutbrown, B., & Olney, B. (2019). Makerspaces in early childhood education: Principles of pedagogy and practice. *Mind, Culture, and Activity*, *26*(3), 221−233. https://doi.org/10.1080/10749039.2019.1655651

Neumann, M.M., Neumann, D.L. (2014). Touch screen tablets and emergent literacy. *Early Childhood Education, 42,* 231–239. https://doi.org/10.1007/s10643-013-0608-3

National University of Medical Sciences. (2019). https://numspak.edu.pk/

Papadakis, S. (2018). The use of computer games in classroom environment. *International Journal of Teaching and Case Studies*, *9*(1), 1−25. https://doi.org/10.1504/IJTCS.2018.090191

Safdar, S., Khan, S. A., Azam, N., Mahmood, H., & Pervaiz, F. (2019). Need assessment of assistive technology in children with multiple disabilities. *Pakistan Armed Forces Medical Journal*, *69*(Suppl 2), 229−234.

Schalock, R. L., & Luckasson, R. (2004). American association on mental retardation's definition, classification, and system of supports and its relation to international trends and issues in the field of intellectual disabilities. *Journal of Policy and Practice in Intellectual Disabilities*, *1*(3-4), 136−146. https://doi.org/10.1111/j.1741-1130.2004.04028.x

Shuler, C. (2012). iLearn II: An Addendum an Analysis of the Games Category of Apple's App Store. *New York*. http://www.joanganzcooneycenter.org/upload_kits/ilearnii.pdf.

Soares, N., Evans, T., & Patel, D. R. (2018). Specific learning disability in mathematics: A comprehensive review. *Translational Pediatrics, 7*(1),48−62. https://doi.org/10.21037/tp.2017.08.03

Sung, Y. T., Chang, K. E., & Liu, T. C. (2016). The effects of integrating mobile devices with teaching and learning on students' learning performance: A meta-analysis and research synthesis. *Computers & Education*, *94*, 252−275.

Thompson, J. R., Shogren, K. A., & Wehmeyer, M. L. (2016). Supports and support needs in strengths-based models of intellectual disability. In *Handbook of research-based practices for educating students with intellectual disability* (pp. 39-57). Routledge.

Terras, M. M., Boyle, E. A., Ramsay, J., & Jarrett, D. (2018). The opportunities and Challenges of serious games for people with an intellectual disability. *British Journal of Educational Technology*, *49*(4), 690−700.

Warschauer, M. (2007). A teacher's place in the digital divide. *Yearbook of the National Society for the Study of Education*, *106*(2), 147−166. https://doi.org/10.1111/j.1744-7984.2007.00118.x

Weston, M. E., & Bain, A. (2010). The end of techno-critique: The naked truth about 1: 1 laptop initiatives and educational change. *Journal of Technology, Learning, and Assessment*, *9*(6), 1−26.

Yasir, T., Abid, A., & Shahzada, A. (2019, February). Development of Smart phone based Cultural Social Stories for Intellectually Disabled Children of Pakistan. In *2019 2nd International Conference on Advancements in Computational Sciences (ICACS)* (pp. 1-8). IEEE.

Yeni, S., Cagiltay, K., & Karasu, N. (2019). Usability investigation of an educational mobile application for individuals with intellectual disabilities. *Universal Access in the Information Society*, *19*(4), 1−14.

APPENDIX A

SCREENSHOTS