

The role of integrating technology in teaching numeric skills to children with visual impairment in Gujranwala, Punjab, Pakistan

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Abstract:

Visually impaired children face mathematics problems at the class level and have hurdles in learning basic numeric skills. This situation calls for action research to identify the effects of integration technology on teaching visually impaired children's basic numeric skills. This study has been conducted by integrating the technologies in teaching basic numeric skills to children with visual impairment through practical action research. The study population included visually impaired students at the Government Institute for Blind Gujranwala, District Gujranwala, Punjab, Pakistan. Action research impacts technology integration in teaching children with visual impairment (CVI) basic numeric skills. The study was taken from practical action research in the institution where the researchers taught visually impaired students in the classroom. Seven visually impaired students were the participants in this research. Researchers implemented ten days of intervention planned to teach them different assistive technologies. Two instruments, a pre-test and a post-test, were used to collect the data. The study shows a qualitative difference among the students in learning basic numeric skills. The students faced many issues in solving basic numeric skills. The results also indicate that a lack of skills in mathematics subjects to use integration technologies is a big challenge for teachers.

Keywords: children, visually impaired, visually impaired children, visually impaired students, basic numeric skills, assistive technology, integration technology.

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1. Introduction

Sight is an essential sensory stimulus of our life. We can see all the things with the help of the eyes, but the deficiency of the vision creates many difficulties in the life of visually impaired children. There are many causes of the visually impaired children like as Cataract, Glaucoma, and Refractive Errors (Sacharowitz, 2016). The person who has not any concept of vision is called totally blind. The low vision person has some residual vision and just light perception. Low vision indicated that if the eyesight is less than 6/18 of visual acuity and visual field is lead to 20 degrees is called visually impaired.

Visually impaired children perceive their knowledge in different areas. They have many mobility and orientation problems. That's why they face many problems to explore the environment. They just use their senses to aware their surroundings. They fully depend on their senses mainly tactile senses and audio senses. They specially use the hearing sense. They fully try to hear the sound of any objects (Sánchez & Sáenz, 2005). Researchers suggest that Children feel anxiety and burden to solve any activities of the mathematics. Because they have poor concept about it. Mathematics is an activity which connect our cognitive learning ability (Hitch & McLean, 1999). Numeric Skills are an ability or activity to solve the logical and reasoning arithmetical problems (Dowker, 2004).

It is observed that visually impaired children are not well adjusted in the society. Because they faced many emotional, educational, social and behaviour problems. They are faced many problems not only in the school level but also in the society (Cohen et al., 2005). Visually impaired children face many difficulties in the school level as compared to other sighted children. It is observed that they are less vigorous in starting their social ties in school level comparing to other disabled children. For that reason, they feel frustrated in the whole life (Celleste, 2006).

1.1. Statement of the problem

Visually impaired students face many problems in their learning process. Especially in the subject of mathematics. They don't know how to solve the basic numeric problems. They don't know about the basic numeric skills. And don't know how to use the assistive technologies to learn the basic numeric skills. So, there is a need to identify the mathematic problems. And identify their best solution under the supervision of teacher. The current study was conducted through the integrating technology in teaching basic numeric skills to children with visually impairment through practical action research. The study was conducted for visually impaired students that belonged to the Government Institute for Blind Gujranwala, District Gujranwala, Punjab, Pakistan.

1.2. Rational

Visually impaired children are faced with many mathematics problems at class level. They don't know how to learn the basic numeric skills. This situation calls for the action research to identify the effects of integration technology on teaching of basic numeric skills for visually impaired children. It was practical based action research. Researchers used different assistive technologies to learn the concept of basic numeric skills. Action research help the students to understand the basic numeric skills at early level.

1.3. The context of the study: classroom setting, participant, researchers

1.3.1. Community and school

The school is located in W Block, People Colony Gujranwala which is urban area. The school has hostel facility for visually impaired children. There are 15 classrooms except the administrative room. School has a big playground for visually impaired children. There is also a computer lab. School is designed according to the needs of the visually impaired students.

1.3.2. Classroom setting

The students are setting in U shaped in the classroom. Classroom is fully ventilated and spacious. Students can be easily accessed for all learning activities. Students were move easily in the classroom.

1.3.3. Participant

The population of the research was the visually impaired students from concerned institute of district Gujranwala. There were fifty-two visually impaired students enrolled in this school. Participants of the research were 7 students ($n=7$) having visual impairment. These seven students have belonged to two class. Their ages were 10 to 14 years. The study was conducted from Government Institute for the Blind Gujranwala. The researchers have worked as teachers for visually impaired students. They are all experienced in teaching of visually impaired students. In this action research study, the teachers worked as researchers themselves.

1.4. Objectives of the study

The study objectives are (a) Teach the numbers skills from 1 to 20 by using the different assistive technologies. (b) Teach the different basic numeric skills like as addition, subtract, multiply and division questions from 1 to 20 numbers by using assistive technologies. (c) Find out the effectiveness of the assistive technologies for visually impaired students in the classroom.

1.5. Research questions

This study is aimed to answer the following of questions (a) What are the basic numeric skills which we can use for the visually impaired students in the math subjects? (b) What's are the effective technologies which use the visually impaired students to learn the concept of basic numeric skills?

1.6. Significance of the study

The practical action research is significant for following reasons. This action research will motivate the visually impaired children to learn the basics numeric skills. It will find out how much visually impaired children are mobile in the math subjects. It will find out the problems of visually impaired students which they face in school during to learn the basic numeric skills. It will highlight the different effective assistive technologies for teachers to learn for practice the basic numeric skills. It will motivate the students to learn the basic numeric skills with use

the technologies. The action research was titled as integrating technology in teaching numeric skills to children with visually impairment through practical action research.

1.7. Ethical consideration

This practical action research is conducted by ethically. We take permission from head of the institute of blind school. Verbally we informed the participants of this school. All activities and data of tests are confidently.

2. Literature review

“Education for All Act 1975” provides all educational facilities to the special children in the public school. We should make the legislation for providing facilities for them and provide them appropriate and free education services according to their disability conditions (Voy, 2009). The low vision person has just light perception. According to “WHO worldwide vision 2020”, give the right of sight for all children. Another basic goals to control the basic five diseases like as glaucoma, cataract, deficiency of vitamin A, trachoma and the reflective errors as usual are made the cause of the visually impaired (Sacharowitz, 2016). Visually impaired children have three different level of vision likes as mild, moderate, and severe condition. All conditions disturbed the eye ball (Robaei et al., 2005).

There are many mathematics domains that's developed cognitive and arithmetic function among the children. It was concluded that mathematics is consisting of various domains some are like as arithmetic's, statistics, geometry, and graphic system. In initial school age teachers try to teach the single number to the students. Arithmetic is a complex process to learn at early stage. Arithmetic is a process to calculate the different numbers in the discipline way. The teacher gives the conceptual framework of knowledge among the students. So that students will be able to understand the basic mathematic concepts easily. Mathematics skills give the knowledge of the conceptual framework. And math finds the relationship between the operational system and their concept. Math is a crucial process in which we understand the concept of various mathematics domain. In math we calculate the knowledge and achievement of the students' performance. In arithmetic we calculate the different numbers and fully try to solve the problems. Arithmetic skills tell the students to solve any single or multi digit tasks basic arithmetic skills procedure.

Basic numeric skills are those skills which help the students to solve their arithmetical problem like as (numbers, addition, division, multiply and subtract questions). All are involving in multiple tasks and each task performed separately (Hitch & McLean, 1999). Students learn the arithmetic skills in discipline way. First, they learn the combinations of the different number in a column way. Then they fully try to learn the addition questions, subtraction questions, multiply questions and in last try to learn the divisional questions. Students try to solve each question in right way. Children learn the principles to calculate the different questions (Anderson, 2010).

Math skills play essential role in our life. These skills include the ability in the students to solve arithmetic skills, basic numeric skills, geometry and graphic skills. With the help of the mathematic visually impaired children can learn the mathematic skills, calculation the various numbers and attain the ability to manage daily life mathematical problems. They can try to

learn and managing, the data of math, basic numeric skills and try to learn different mathematical terms. We calculate the numbers of different things easily and quickly. Basic numeric skills construct the concept of concrete and abstract things to learn the basic numeric skills. children use the cognitive and fine motor skills to learn the basic numeric skills (Penner-Wilger et al., 2007).

The visually impaired students feel anxiety while solving any questions of mathematics. They do not show an appropriate attitude to solve any mathematics problems. In these days' technology is being used as powerful tool to learn any mathematics concepts. Mathematical problems do not affect the specific subjects but it is also effect the other learning subjects (Dowker, 2004).

To use any item or tool of the equipment is called assistive technology (Wong & Cohen, 2011). Technology means to use any part of the equipment or any piece of the item (Hasselbring & Glaser, 2000). Technologies mean the use of variety of any things even these things are including in the form of pencils to computers. Technologies play important role in the curricular and co-curricular activities. Technology helps the students to improve their learning performance in all the subjects. Because it is most powerful tool for solving any concepts. Its creates the critical and positive thinking power among the students and enhance the ability of the visually impaired students (Ringstaff & Kelley, 2002; Rehman et al., 2021).

The assistive technologies play very important role in the life of visually impaired students. Especially it has positive impact in the academic's achievements of special needs children. Teacher uses the various technologies and tools in the special class's room. These strategies enable the students to use the technologies in their academic pursuit, for achievement high educational aims and goals and increase the student's ability in the classroom (Hasselbring & Glaser, 2000).

3. Research Methodology

Two research instruments were used to collect the data assistive mobile phone technology and talking mobile phone calculator technology. Action research is planned to be executed in ten days. We worked first five days with mobile phone technology as research instrument. Next five days we used the talking mobile phone calculator technology as research instrument. We also identify the achievement of the students' performance by observation. For observation focus on questions (a) What is the importance of the basic numeric skills in their life? (b) What is the impact of the technologies to learn the basic math skills? (c) What is the felling of students to solve the question by using different technologies?

3.1. Intervention Plan-A (Level-1)

We fully tried to learn the basic numeric skills of visually impaired students. With the help of mobile phone technology, researchers selected and listen to them different clips of basic numeric skills with the help of YouTube technology. Students learnt the counting from 1 to 10, basic questions of the addition questions from 1 to 10, subtraction questions from 1 to 10, multiply and division questions from 1 to 10. The researchers give it level 1 questions from 1-10. Each variable has been kept different with five clips. The five days activities are as following:

3.1.1 Activities first day

We took pre-test to examine the students' performance before starting the class lecture. We used the selected topics by using mobile phone technologies. These included number song from 1-10 for children (2 minutes), counting songs from 1–10 for children (3 minutes), learn to count from song from 1-10 (5 minutes), and number names (3 minutes). We took post-test to examine the students' performance at the end of the class session.

3.1.2 Activities Second day

We took pre-test to examine the students' performance before starting the class lecture. We used the selected topic by using mobile phone technology. These included basic addition for children grade 1 (2 minutes), children adding activity (3 minutes), what happen when we adding zero in any number? (2 minutes), learn addition song (2 minutes), and adding by one song (3 minutes). We took post-test to examine the students' performance at the end of the class session.

3.1.3. Activities third day

We took pre-test to examine the students' performance before starting the class lecture. We used the selected topic by using mobile phone technology. This included introduction of subtraction (3 minutes), learn subtraction for children (2 minutes), learn what happen on subtracting zero (2 minutes), learning vertical subtraction (2 minutes), and math subtraction kindergarten (8 minutes). We took post-test to examine the students' performance at the end of the class session.

3.1.4. Activities fourth day

We took pre-test to examine the students' performance before starting the class lecture. We used the selected topic by using mobile phone technology. This included introduction of multiplication. (3 minutes), concept of multiplication for kids (5 minutes), learn multiplication table of two (3 minutes), and learn multiplication table of three (3 minutes). We took post-test to examine the students' performance at the end of the class session.

3.1.5. Activities fifth day

We took pre-test to examine the students' performance before starting the class lecture. We used the selected topic by using mobile phone technology. This included learn division for kids (2 minutes), introduction to division for kids. (5 minutes), what is division? (3 minutes), and simple division by grade 1 (3 minutes). We took post-test to examine the students' performance at the end of the class session.

3.2.2. Intervention Plan-B (Level-2)

We also used the talking mobile phone calculator technology. With the help of talking mobile phone calculator students learnt the counting from 11 to 20, addition questions from 11 to 20, subtraction questions from 11 to 20, multiply questions and division questions from 11 to 20. The researchers asked the students to touch the talking mobile phone calculator and identify

the location of numbers in mobile key pad. For this purpose, we download the jaws software in the mobile phone. This software converts the text into speech. We used only talking calculator part in the mobile phone. We give it level 2 questions from 11 to 20. To conduct the action research, we felt that it's not easy task. Voice capacity of the mobile phone was not so fast that affected the learning process of the students. We raised the mobile voice up. The task of use the talking mobile phone calculator was not easy for the students to handle the talking mobile phone. The process of repeating the voice using talking mobile phone technology to create the understanding among students was too challenging. Understanding the speed of students were not equal. So, we repeated the contents again and again.

3.2.1. Activities sixth day

We took pre-test to examine the students' performance before starting the class lecture. We gave the talking mobile phone calculator to the students one by one. And told the students to learn the numbers from 11 to 20 by touching the keypads. So that they will learn the steps how to learn the counting in sequence.

3.2.2. Activity seventh day

We took pre-test to examine the students' performance before starting the class lecture. We gave the talking mobile phone calculator to the students one by one. And told the students to learn the addition questions from 11 to 20 by touching the keypads. So that they will learn the steps how to learn the counting in sequence. We took post-test to examine the students' performance at the end of the class session.

3.2.3. Activity eight day

We took pre-test to examine the students' performance before starting the class lecture. We gave the talking mobile phone calculator to the students one by one. And told the students to learn the subtraction questions from 11 to 20 by touching the keypads. So that they will learn the steps how to learn the counting in sequence. We took post-test to examine the students' performance at the end of the class session.

3.2.4. Activity ninth day

We took pre-test to examine the students' performance before starting the class lecture. We gave the talking mobile phone calculator to the students one by one. And told the students to learn the multiply questions from 11 to 20 by touching the keypads. So that they will learn the steps how to learn the counting in sequence. We took post-test to examine the students' performance at the end of the class session.

3.2.5. Activity tenth day

We took pre-test to examine the students' performance before starting the class lecture. We gave the talking mobile phone calculator to the students one by one. And told the students to learn the division questions from 11 to 20 by touching the keypads. So that they will learn the steps how to learn the counting in sequence. We took post-test to examine the students' performance at the end of the class session.

4. Data analysis and discussion

The data was collected, analysed, tabulated, and reported in the percentage form. Results to compare the students' performance in pre-test and post-test level 1 counting from 1 to 10 by using the assistive mobile phone YouTube technology. The result shown that the result of the post-test is significance different from the pre-test counting, addition questions, subtraction questions, multiply questions and division questions in the level-1 from 1 to 10 numbers.

Table-1: Students performance during level-1

Student	Counting Test			Addition Test			Subtract Test			Multiply Test			Division Test		
	Pre%	Post %	Gain Score	Pre %	Post %	Gain Score	Pre %	Post %	Gain Score	Pre %	Post %	Gain Score	Pre %	Post%	Gain Score
St. 1	40	100	60	23	100	77	10	80	70	0	60	60	0	70	70
St. 2	45	100	55	10	100	90	15	90	75	0	70	70	0	60	60
St. 3	40	100	60	20	100	80	15	80	65	0	65	65	0	62	62
St.4	20	90	70	18	80	62	0	60	60	0	55	55	0	55	55
St.5	13	65	52	0	65	65	0	60	60	0	50	50	0	52	52
St.6	25	95	70	35	79	44	15	75	60	0	65	65	0	70	70
St.7	35	100	65	25	95	70	28	90	62	0	75	75	0	70	70

The results in following table show the comparison of the students' performance in pre-test and post-test level-2 counting from 11 to 20 by using the assistive mobile phone calculator technology. The result show that the result of the post-test is significance different from the pre-test counting, addition questions, subtraction questions, multiply questions and division questions in the level of 2 from 11 to 20 numbers.

Table-2: Students performance during level-2

Student	Counting Test			Addition Test			Subtract Test			Multiply Test			Division Test		
	Pre%	Post %	Gain Score	Pre %	Post %	Gain Score	Pre %	Post %	Gain Score	Pre %	Post %	Gain Score	Pre %	Post%	Gain Score
St. 1	0	100	100	0	100	100	0	90	90	0	85	85	0	80	80
St. 2	0	100	100	0	100	100	0	100	100	0	90	90	0	95	95
St. 3	0	80	80	0	80	80	0	80	80	0	70	70	0	75	75
St.4	0	100	100	0	100	100	0	100	100	0	70	70	0	75	75
St.5	0	100	100	0	90	90	0	89	89	0	80	80	0	85	85
St.6	0	79	79	0	74	74	0	72	72	0	65	65	0	60	60
St.7	0	80	80	0	85	85	0	77	77	0	65	65	0	66	66

5. Conclusion

The research investigates the effects of integrating technology in teaching numeric skills to children with visually impairment through practical action research. Integration. It's reported that the significant effects of the assistive mobile phone technology in the life of visually impaired students. The results of the study show that the use of the assistive mobile phone technology is like YouTube and use of the talking mobile phone calculator technology has positive impact in the performance of the visually impaired students to learn the basic numeric skills. It is found that there is significance difference of pre-test and post-test of level 1 and 2 in all the test questions from the numbers of 1 to 20.

Integrating technology in teaching of basic numeric skills for visually impaired children through practical action research was central of my research. It also enabled me to enhance own my practice. We reflected on my research that majority visually impaired students are not used the assistive technologies to learn the basic mathematic skills. We felt that students were full craze when, we told them that today, we will learn the counting, addition questions, subtract questions, multiply questions and division questions by using the different music clips with fun. They showed very interesting behaviour.

On the base of the results of the study following recommendation were made. There should be provided assistive technology to the visually impaired students especially in the math subjects. Teacher should use assistive mobile phone technologies and talking mobile phone calculator technologies for the visually impaired students. Government should train the teachers of the visually impaired students how to use the effective technology during the teaching of mathematics. Teachers may use the assistive technologies in the classroom to learn the concepts of the basic numeric skills. There should be conduct the different seminars how to use and integrated the technologies for visually impaired students.

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