Global Science Research Journals

ISSN: 2465-7212 Vol. 5 (3), pp. 090-099, August, 2017

http://www.globalscienceresearchjournals.org/

Global Journal of Special Education and Services

Full Length Research Paper

The effectiveness of using optical aids in academic achievement in mathematics for a sample of low vision students

Dr. Shaden KH Elewat

Institute of educational graduate studies, King Abdul-Aziz University, Jeddah, Saudi Arabia

Accepted 25 August, 2017

This study aimed to identify the effectiveness of using optical aids in academic achievement in mathematics for a sample of low vision students. The study sample consisted of (30) of low vision students, they were distributed purposefully, (15 students) were assigned for the experimental group and (15 students) for a control group. For the purpose of this study, academic achievement in mathematics was assessed by pre/post-tests. The optical aids were used in instructing mathematics for the experimental group for three months. The degrees of mathematics school tests were used after completing the training on using optical aids regarding all variables of the experimental and control groups. The findings revealed the presence of statistically significant differences in mathematics school tests in favour of the experimental group.

Key words: Optical Aids, Low Vision Students, Academic Achievement**.**

INTRODUCTION

Assistive technology in general, and visual aids in particular, have become the most widely used means and have an impact on individuals with low vision and visual impairments (Jutai, Strong, & Russell-Minda, 2009) As it is effective in mitigating negative outcomes of this disability, and it helps them to become effective individuals in their community, It also improve the concept of self-esteem and self-confidence, making their reactions positive to society (Ashcroft, 1984). It is also possible to say that the support technology used by students with visual disabilities in academic achievement, especially in the fields of reading and writing. This has contributed to increasing their chances of learning and acquiring the different experiences that contributed to their adjustment and coexistence with the society in which they live (Abu Zeitun, 2008).

Assistive Technology is defined as: tools, and devices used with children and adults with disabilities to compensate for weaknesses in some functions, strengthening and increasing learning, independence, movement, communication, and environmental control (Bradley &Poppen, 2003). Examples on devices, and supporting technological tools used for the visually impaired:

a. Optical weakness aids: Includes convex lenses (positive, magnifying), usually used in reading (Scholl, 1986). The concave lenses (negative, miniature) are used to increase the field of vision (Jenkins, Francis and Hewitt, 1992). In addition to visual aids that may be mounted on a holder, or on glasses (Scholl, 1986).

b. Closed Circuit Television: A television set equipped with a camera under which the printed or written material is placed on the paper of the book to be enlarged then it is photographed and display it magnified on television (Hallahan & Kauffman, 2003).

c. Text-enlarging programs: Examples include Zoom -Text, (Wolffe, 2003).

Optical aids used for the visually impaired can also be divided into two parts

First: visual aids for close-up vision: are tools for enlarging images for the performance of nearby missions, and these tools include convex lenses, including hand-held magnets or list placed on a book, or a small holder, or installed on a glasses' frame. by using them, objects or publications are more visible and easier to see details (Van Dijk & Datrang, 2002).
Second, optical vision aids for remote vision: are used to enlarge the size of images for distant missions, these aids use convex, and concave lenses (Van Dijk and Datrang, 2002). Examples on it such as telescopes, which either enlarge and improve the visibility of distant objects (Keeffe, 1994) and it works to reduce images where an individual can see more than one thing at a time (Jose, 1983).

Currently, Turbert (2017) points out that the most visual aids used by visually impaired students are magnifying glasses, hand held magnifiers, hand-held amplifiers, telescopes, and electronic video amplifiers. Uses of visual aids with students with visual impairment are in academic achievement such as reading, writing and mathematics (Mulloy, Gevarter, Hopkins, Sutherland, & Ramdoss, 2014).

As for academic achievement in mathematics, for students with visual impairment it is very difficult to assess the academic achievement of students with visual disabilities enrolled in academic institutions because there is a clear lack of studies to describe the academic achievement of these groups. The earlier theoretical literature points to a discrepancy between the academic and mental abilities of these students as well as their apparent academic weakness (Beaty, 1994). Early interventions should be initiated through attention to individual differences, the use of teaching and learning methods that promote the participation of visually impaired children in the learning process, and visually impaired children should be trained to improve academic performance (Fernandez, et al., 2001). The most important factors affecting mental development; hence the acquisition of knowledge is the degree of visual impairment experienced by a person. The simple ability to see leads to changes of great importance with regard to the information available to the child. Therefore, the prevailing view is the need to encourage these individuals to use their remaining vision (Alhadidi, 2015). The vision of the visually impaired is also one of the most important sources of information, thus losing it to other senses to obtain knowledge, which may affect their achievement (Eliwat, 2005). The research literature also indicates that academic achievement among students with visual impairments less than that of ordinary people if they are equal in age and mental age, and this is supported by the difficulty of written expression in the visually impaired individual when performing examinations (Shukir, 1999).

Mathematics is also a difficult academic achievement for students with visual impairments. Therefore, simple math concepts for this class from grade 1 to grade 3 are provided with simple modifications, using the tile board, cubes and wood strips. The difficulties and estimates of the required modifications of the mathematics subjects gradually increase after the third grade. The difficulties vary according to the convictions and knowledge of the nature of the visual disability and its impact (Alhadidi, 2008).

Despite this, Kapperman, Heinz, and Strickens (1996) found in their literature review that there is a low level of mathematics for students with visual impairment. This result can be explained by two factors:
First: - that the teachers themselves may not have the appropriate math skills, and as a result teachers can put emphasis on the areas that are more important to them than mathematics.
Second: Teachers may not have been properly trained at the university level to codify mathematical materials using numerical symbols.

Based on the above, it can be said that opinions and practices vary among teachers in the teaching of mathematical subjects. Some of them believe in the principle of not blocking any information required in the mathematics curriculum for the student regardless of the level of knowledge and proficiency expected to reach it. And some of them are thought to be satisfied with giving basic concepts to all sports subjects. Others believe in the importance of seriously teaching mathematical concepts and employing the tools of these concepts, and securing various tools and means (Alhadidi, 2008). It is also necessary to adapt some educational materials in any class that studies mathematics through the use of visual aids, which have two main objectives:
First: Provide visually impaired students with the information contained in the mathematics curriculum, which are in the book in the form of drawings and pictures.
Second: To help the student understand mathematical terms.

It is possible here to use abstracts, or concrete objects to replace images such as the use of geometric shapes,real objects can be also used to teach the student counting such as the use of fingers and toes, and can use household tools such as chairs and cups, and can be used games such as cubes, pieces of wood which serve largely in the teaching of counting (Scholl, 1986).

Problem of the study

The problem of this study stems from many difficulties in teaching mathematics to students with visual impairment. Some even called for teaching mathematics to specific stages of these students, with great adaptations in the curriculum, which led to the weakness of these students in the skills of mathematics. Perhaps the obvious weakness

in the achievement of this category in mathematics is due to the study of these students of the skills of mathematics in classical methods, and the lack of use of visual aids in the field of mathematics, which prevents access to information to students because of poor vision, where previous studies found that the number of visually impaired students who use visual aids are few. There is also a lack of tools and means for academic materials such as mathematics, science, and geography from the point of view of teachers who believe that their requests are often not answered.

Study Questions

Specifically, the problem of study can be limited to the following questions:

The first question

What is the effectiveness of the use of visual aids in academic achievement in mathematics in a sample of students with low vision?

The second question

Are there differences in the arithmetic averages between males and females in the experimental group on the post-test (academic achievement in mathematics) due to gender variable?

The third question

What is the view of some visually impaired students participating in the experimental group in the use of visual aids in learning mathematics?

Objectives of the study

This study aimed to achieve the following:
1. Identifying the effectiveness of using visual aids in academic achievement in mathematics in a sample of visually impaired students.
2. Identification of differences in the arithmetic averages between males and females in the experimental group on the post-test (academic achievement in mathematics).
3. To identify the opinion of some students with visual impairment participating in the experimental group in the use of visual aids in learning mathematics.

The importance of the study

The use of visual aids in mathematics is particularly important for students with visual impairments. But the current reality for use by this category is unsatisfactory. Previous studies have found that the number of people with visual impairments who use support technology is very low. This fact makes it important to study the forms of visual aids that can be used, and in particular the importance of this study is illustrated by the following:

First: The theoretical importance

1. The scarcity of studies that dealt with the use of optical aids in particular in the field of mathematics is a very important field for students who are visually impaired. The researcher did not observe - to the best of her knowledge - any Arab study that dealt with this subject. There is therefore a need for more information that may be important in identifying the effect of the use of visual aids, particularly in mathematics, and other areas of achievement.
2. Provide a database on the use of visual aids in particular in the field of mathematics and other areas of academic achievement for students with low vision in the Arab world, especially in Saudi Arabia, which provides future researchers with a literature earlier in relation to this type of variables.

Second: Practical importance

1. The results of this research can be used in the use of visual aids, especially in the teaching of mathematics for visually impaired students.
2. The results of this research can be used in the design of educational programs in the use of visual aids, especially in the teaching of basic academic skills such as reading, writing, and mathematics for students with low vision.

Definition of study terms

Optical Aids: These are visual impairments, including convex lenses (positive, magnifying), concave lenses (negative, miniature) and used to increase the field of vision. In addition to visual aids that may be affixed to a holder, or to glasses, or telescopes (Abu zeitoun, 2008).
It is defined procedurally as the aids used in the current study, which include the telescope for remote vision, the Dome amplifier and the portable electron magnifier for close-up vision.

Academic achievement: refers to the extent to which students have acquired the concepts and skills in the educational material in mathematics. This was measured for the purposes of this study at the rates of students in the first semester before the use of visual aids and their rates in the second semester after using it.

Students with Visual Impairment: Students with visual impairment are defined by the legal definition of visual impairment as: "a person who has visual acuity between 20/70 feet (6/18 meters), 20/200 feet or 6/60 meters in the

best eye after correction" (Hallahan & Kauffman, 2003). In the current study, they are visually impaired patients from the low vision clinic in the Association of the Absar charity in Jeddah, Saudi Arabia for the month of January 2014, classified as visually impaired according to their medical reports as the sharpness of their eyes Between 6 \ 21-6 \ 60.

Determinants of the Study

The determinants of this study can be determined by the following:

1. The sample of this study was limited to visually impaired students from the low vision clinic at the Association of Absar charity in Jeddah, Saudi Arabia for the month of January 2014.
2. The possibility of generalizing the results of this study is determined by the quality of the demographic, social and psychological characteristics of students with low vision who were studied in Jeddah, Saudi Arabia. Depending on the quality and characteristics of the study tools used.

Limitations of the Study

Human Limitations: Visually Impaired Students from the Vision Impairment Clinic at the Absar Charity Society in Jeddah, Saudi Arabia for the month of January 2014 who are classified as visually impaired according to their medical reports, ranging from 6/21-6 / 60.
Time limits: January 2014.
Spatial limitations: Absar Association in Jeddah, Saudi Arabia.

PREVIOUS STUDIES

Several studies have been conducted on the use of visual aids in visually impaired students in Western countries in the past few years, but few have explored the use of visual aids in the field of achievement directly in mathematics. In the Arab countries, attention to this issue is not at the desired level. A review of the studies conducted in this field, which the researcher reached where the previous studies are rare in this area, which prompted the researcher to use studies related to the impact of the use of visual aids on the areas of life and academic achievement in general.

Lowe (2016) conducted a study aimed at assessing the services provided to individuals with visual impairment, their impact on the quality of life, and aspects evaluated by the vision, visual acuity, and the use of aids, visual instruments, the sample consisted of (122300) volunteers of visually impaired individuals of age range between 40-73 years, the results indicate that 9% of the participants diagnosed with visual impairment receive the services or assistance they need. In the use of visual aids, the results showed that the use of these aids is one of the most important services that affect their lives in a positive manner and at the level of all variables.

Jitai, Strong, & Russell-Minda (2009) conducted a study aimed at analyzing studies on the effectiveness of supporting technology used for the visually impaired. The study sample consisted of (108) studies. The results in terms of aids, electronic and non-electronic optical instruments such as amplifiers are regularly used by students with visual impairments in nearby tasks such as reading, for ease of carrying and low price. The study also indicated the effectiveness of the closed circuit television in the performance of the study tasks.

Lutman et al. (2005) studied the goal of developing a rehabilitation program for the visually impaired to train them to use their eyesight, using the CCTV, in addition to improving their understanding of spatial concepts and learning how to enhance their self-confidence and adapt them to social life. The results showed that participants increased their understanding of spatial concepts, increased their self-confidence and increased their sense of safety in performing daily activities. Participants gained multiple skills and found strategies to help them adapt to everyday activities.

Other studies include the study by Deshpande & Deshpande (2005), which was designed primarily to determine the effect of the use of visual and non-visual impairments on the use of their visual residues. The sample consisted of (49) children who were taught using optical instruments for four months and then followed up two months after the end of the training. It was found that their use of their visual abilities improved after training on visual and non-visual impairment tools, For children with visual impairments, the assessment of visual impairment prior to admission to the School of the Blind includes the provision of appropriate services.

Goodrich et al. (1999) also conducted a study aimed at comparing reading performance among visually impaired students using visual aids and visually impaired students who use CCTV. The study sample consisted of (44) participants in both experimental groups and (46) participants in both control groups, the participants were selected from the visiting volunteers of the Palo Alto Visual Rehabilitation Center in the United States and the program consisted of (25) sessions. The program consisted of (7) sessions of reading training using visual aids compared to (15) sessions of reading training using CCTV As well as (15) training sessions using closed circuit television, followed by 7 sessions using visual aids, also (5) training sessions using visual aids, followed by (7) sessions using some independent applications, followed by (7) training sessions using CCTV, followed by (8) training sessions on some independent applications. There were also (7) training sessions for the closed-circuit television followed by (8) training sessions on some independent applications followed by (5) training sessions for visual aids followed by (7) training sessions

on independent applications. The results indicated that training in visual aids and using closed circuit television improved the reading speed and duration of the students participating in the study. This means that the remaining vision can be used regardless of the type of visual aids used.

Cahill & Linehan (1996) conducted a survey aimed at identifying difficulties in learning mathematics through technology and general experiences using computer technology. The study sample consisted of (42) blind and visually impaired students from different schools, including schools for people with visual disabilities, inclusive schools and colleges. The results indicated that the most difficult difficulties suffered by the blind in mathematics are reading and processing forms and logarithms, writing symbols and reading tables and trigonometry. The average difficulties of the blind include dealing with the main and sub-plans, and the most difficult difficulties for the visually impaired are logarithms, trigonometry, and reading symbols. The intermediate difficulties include reading forms, tables, numbering, master plans, and sub-sections. The less difficult of the blind and the visually impaired are in algebra and numbering. The most computer programs and applications used by the blind and the visually impaired to overcome the problems of mathematics are programs for screen reader and endpoints and electronic Braille applications such as the electronic line in addition to the applications of word program.

The results of the previous studies indicate that most of the previous studies indicated improvement in visual impairments for the use of visual aids, and studies that supported this approach (Lowe, 2016). Among these results, the use of visual aids is the most important service that affects the lives of individuals (Jutai, Strong, & Russell-Minda, 2009). The results indicated that the aids, electronic and non-electronic optical instruments such as amplifiers are used regularly by students Visual impairment is important Like reading, so for easy carrying, and low price. And Lutman et al. (2005), the results showed that participants increased their understanding of spatial concepts, increased their self-confidence and increased their sense of safety in performing daily activities. Participants gained multiple skills and found strategies to help them adapt to everyday activities.

Deshpande & Deshpande (2005), whose findings indicate that the use of visually impaired individuals for their visual abilities improved after training on visual and non-visual impairment (Goodrich, et al., 1999). The results indicated that training in visual aids and using closed circuit television improved the reading speed and duration of students studying in the study. The study of Cahill & Linehan (1996) that the most computer programs and applications used by the blind and visually impaired to overcome the problems of mathematics are the reader programs for the screen and the area and applications of electronic Braille, such as the electronic line in addition to the applications of word program. Finally, it can be said that most of the results of previous studies supported the existence of positive impact and this is the objective of the current study and what distinguishes it from the previous studies is its interest in the effect of the use of visual aids on the academic achievement of the sample subjects in mathematics in particular.

METHOD AND PROCEDURES

Methodology

In this study, Quasi Experimental Design was used using the design of the two unequal control and experimental groups. Two groups of visually impaired students were chosen, one was the experimental group, the other was the control group. The experimental group used the visual aids, while the control group was not subjected to this. Both groups underwent pretest and posttest. The following are the variables of the study:

1. Independent variable: use of visual aids.
2. Dependent variables: scores on the achievement tests in mathematics.

Study Members

The sample of the current study consisted of (30) visually impaired students from the low vision clinic of APSAR charity in Jeddah, Saudi Arabia for the month of January 2014. They were classified as visually impaired according to their medical reports, the distribution of participants in the study purposefully by gender (male, female) and group (control and experimentation) is shown in Table 1.

Table 1: Distribution of study sample by group (control and experimental) and grade

Group	Gender Males	Females	Total
Experimental	8	7	15
Control	6	9	15
Total	15	15	30

All the sample students are enrolled in formal education schools (not special schools for people with visual impairments), and their grades range from the fourth grade to the second secondary.Three visually impaired students were interviewed.

Study Tools

For this study, the researcher used the following:

First: School achievement tests: For the purposes of the current study, the results of academic achievement in mathematics were used in the first two semesters, and the second for the academic year 2013/2014 for all members of the study as a pretest and posttest measurement. Where the marks were obtained from the regular schools where the students participating in the study were studying.

Third: the use of visual aids: The visually impaired students were trained to use the following visual aids:
1. For distance vision: telescope
2. For Close-Up Vision: Portable Electronic Magnifier, Dome Amplifier

Where training was done on the use of these aids in accomplishing the following tasks:
1 - Tracking line
2 - Moving from line to line
3 - Visual selection
4 - Visual excellence
5- Optical transcription
6 - Modifying errors.

Application Procedures

The researcher applied the study procedures as follows:
1. To view the results of the examinations of the visual impairment clinic at the Association of the Absar charity for the month of January 2014 for the purpose of selecting the sample members according to the required specifications.
2. Taking parental approvals on the participation of their children in the current study in addition to collecting some relevant information related to individuals with low vision.
3. The distribution of the members of the study purposefully into two groups:

A. The control group: It included (15) low vision individuals, those individuals who refused to practice visual aids and use them, despite the confirmation of tests on the possibility of benefiting from them.
B. Experimental group: It included15 low vision individuals who agreed to practice using visual aids that were prescribed by the visual impairment specialist.

4. Collecting Mathematical Marks for Individuals of the Experimental and Control Groups for the first Semester of the Academic Year 2013/2014; as a result of measuring of academic achievement in Mathematics.
5. Training of experimental group members on the use of visual aids where each individual was trained on the aids described for him. This training took place in the first week of February 2014.
6. The collection of mathematics marks for the members of the experimental and control groups for the second semester of the academic year 2013/2014; the result of the posttest of the academic achievement of mathematics.
7. Conduct the necessary statistical analysis and then extract the results, discuss them and write recommendations.

Statistical Analysis

To answer the study questions, the adjusted arithmetical averages of the experimental and control groups were extracted on the achievement tests. To determine the significance of the differences statistically, the ANCOVA method was used to compare the performance averages on the post-test of the control and experimental groups using the (SPSS) program.

RESULTS OF THE STUDY

To answer the first question: "What is the effectiveness of using visual aids in academic achievement in mathematics in a sample of students with visual impairments?" The modified arithmetical averages of the experimental and control groups were extracted for performance on the achievement tests in mathematics after taking differences in performance on the pretest into consideration and Table 2 shows this.

Table 2: Modified post means for the performance of the experimental and control groups on academic achievement in mathematics

Group	Modified averages	Standard Deviations
Experimental	86.466	4.517
Control	85.000	4.720

Table 2 shows that the average mean of the experimental group (86.466) and the average mean of the control group (85.000) indicates that there are apparent differences between the performance of the experimental and control groups. In order to determine if these differences were statistically significant at the level of (α = 0.5) Combine Analysis of Variation (ANCOVA) was used for performance on the post-test (academic achievement in mathematics) after taking the differences in performance on the pre/test into account and Table 3 shows that.

Table 3: Results of ANCOVA analysis of the difference between the two groups on the post-test on academic achievement in mathematics

Source of variance	Sum of squares	Df	Sum of squares	The average sum of squares	F	Sig
Pre-test	385.011390	1	385.011390	385.011390	48.868054	0.000
Groups	103.028638	1	103.028638	103.028638	13.077039	0.001
Error	212.721944	27	212.721944	7.878591		
Total	613.866667	29	613.866667			

** Statistically significant at the significance level (α= 0.000)*

It is clear from Table 3 above that the method of treatment (the use of visual aids) had a statistically significant effect on the improvement of the experimental group. The value of F was (48.868054) which is statistically significant at (α = 0.000), this means the use of visual aids has a significant impact on the development of academic achievement in mathematics among members of the experimental group. This is confirmed by the clear differences between the average performance of students in the experimental and control groups, which is in favor of the experimental group, where the mean of the experimental group was (86,466), while the average performance of the control group was (85.000) as shown in Table 2.

To answer the second question, which is: "Are there differences in the arithmetic means between males and females in the experimental group on post-test (academic achievement in mathematics) due to the gender variable? Means and standard deviations on the post-test were extracted and Table 4 shows that.

Table 4 shows that the means in the experimental group for males (85.375000), while the mean of females (87.714286). This indicates that there are apparent differences between males and females in the experimental group. To find out if these differences were significant at the level of (α= 0.05) One Way analysis of variance (ANOVA) was used for post-test (academic achievement in mathematics) and Table 5 shows this.

Table 4: Means for males and females in the experimental group on post-academic achievement in mathematics

Gender	N	Means	Standard deviations
Males	8	85.375000	4.718883
Females	7	87.714286	4.270608

Table 5: Results of ANOVA analysis of performance on post-test (academic achievement in mathematics) by gender variable

Source of variance	Sum of squares	Df	Mean of squares	F	Sig
Between groups	20.429762	1	20.429762	1.001068	0.335
Within groups	265.303571	13	20.407967		
Total	285.733333	14			

** Not statistically significant at significance level (α = 0.05).*

Table 5 above shows that the value of F (1.001068) which is not statistically significant at (α= 0.05) this means that there are no statistically significant differences between males and females in the experimental group on the post-test in mathematics; that means using visual optics is not affected by the gender variable.

To answer the third question: "What is the view of some visually impaired students in the experimental group on using visual aids in learning mathematics?" Three members of the experimental group with the ability to express (secondary and middle school) were contacted and asked about their opinion using visual aids. Their answers were as follows:

The first case: I came to the visual impairment clinic to help me follow my lessons, especially what was written on the blackboard. I was not able to follow the lessons on the blackboard as well as the classes of science, math and grammar. After I got training on the telescope magnifier I did not expect or imagine the great benefit of it, now I can follow my lessons well and I do not need to borrow the books of others to write what is written on the blackboard, along with my ability to correct my duties, correct my mistakes, and participate in school examinations with others.

The second case: I thought at first that the visual aids that I described (the telescope and the portable magnifier), like any glasses or magnifiers, were described to me previously; I try to use them for two days and then put them in the drawer. But after using the magnifiers I loved the school and my marks improved in many materials, I also no longer needed my mother permanently during the study, and I also become able to differentiate between numbers, and similar letters, and also my speed increased in the dissolution of duties and examinations, and these amplifiers helped me in shopping, I can now read shops and product names, prices, and my parents became very happy for me.

The third case: I cannot describe my happiness after using the amplifiers, although my mother and I refused to use them when it was prescribed to me. We were looking for medical treatment, or at least glasses. I was very frustrated because I could not follow my lessons and the mock of my colleagues. After a long persuasion especially because of the lack of replacement I decided to try. I am now able to follow up everything that the teacher writes on the blackboard and solve the duties, as well as to provide exams with my colleagues, and I have been able to follow the lessons of the Koran with the memorization class. Thank God who taught the human unless he knew and pleased me these tools.

DISCUSSION OF RESULTS

Discussion of the results of the first question: With regard to the first question, which is about the effectiveness of the use of visual aids in the academic achievement of mathematics in a sample of students with visual impairment? In the analysis of the results, there were statistically significant differences at the level of (= 0.05) in academic achievement in mathematics among students in the experimental group who were trained on using visual aids (telescope and portable magnifier), among students in the control group did not receive training on those aids, in favor of the experimental group,this means that the use of the telescope and mobile amplifier in the academic achievement in mathematics of students with low vision applied in this study has contributed significantly to the improvement of academic achievement in mathematics in the experimental group of students with visual impairment. This result can be explained by comprehensive training on the telescope and the portable magnifier in mathematics, which helped them see what was explained on the blackboard and written in the curriculum clearly, which may have been raised the motivation of students with low vision and made them accept to learn mathematics.Thus, the use of the telescope and the portable magnifier may have contributed to the morale of the students and encouraged them to initiate and work independently. The use of the telescope and portable amplifier can be traced back to the method used in individual training, which focused on attracting attention, clarifying verbal instruction and repetition, ensuring the students' use of visual aids, and providing them with appropriate feedback, which may increase their ability to academic achievement in mathematics.

The findings of the present study are consistent with the results of Lowe (2016). Among these results, the use of visual aids is the most effective service that affects the lives of individuals with visual impairments and all variables,also with the results of the study of (Jitai, Strung, Strong, & Russell-Minda, 2009). The results indicated that aids, electronic and non-electronic optical instruments such as amplifiers are used regularly by visually impaired students in nearby tasks such as reading, for ease of carrying and low price.

The findings of the present study also agreed with the results of the (Whitman et al., 2005) study, which showed that participants with impaired vision gained a greater understanding of spatial concepts and their self-confidence increased. The results of the present study also concurred with the results of (Deshpande & Deshpande, 2005), which indicated that their use of their visual abilities improved after training on visual and non-visual impairment tools. The results of the present study also agreed with the results of the (Goodrich et al. ,1999) study, which pointed out that using the closed TV channel

improved reading speed and duration in the study participants.The results of the present study also agreed with the results of the (Cahill & Linehan study, 1996), which showed that the most computer programs and applications used by the blind and visually impaired to overcome the problems of mathematics are screen reader programs, and the applications and Braille applications, such as the electronic line in addition to the applications of the word programs. The results of the current study differed with the results of the (Cahill & Linehan study, 1996). The results indicated that the most computer programs and applications used by the blind and visually impaired to overcome the problems of mathematics are screen reader programs, and the applications and Braille applications, such as the electronic line in addition to the applications of the word program.

In summary, the use of visual aids can be considered effective in all areas of life of students with visual impairment, especially in academic achievement in mathematics, which can be considered as an important method in the development of academic achievement for visually impaired students.

Discussion of the results of the second question: With regard to the second question, regarding the differences in the arithmetic averages between males and females in the experimental group of visually impaired students on the post-test (academic achievement in mathematics) due to gender variable? The results of the present study showed that there are no differences between males and females in the use of training on the use of visual aids, and the opportunity is available to both genders to benefit from these services. This result can be interpreted by the positive effect of the use of visual aids on academic achievement regardless of gender. The reference here is that the researcher - as far as her knowledge - did not find any study dealt with this variable with the use of visual aids.

Discussion of the results of the third question: With regard to the third question, regarding the opinion of some visually impaired students participating in the experimental group in the use of visual aids in learning mathematics? Three members of the experimental group (secondary and middle school) were contacted and asked about their opinion using visual aids. The three subjects referred to the effectiveness of visual aids in improving academic achievement and improving some other functions in their daily lives. This is consistent with most previous studies, which indicated the effectiveness of using visual aids in most areas of life in individuals with visual impairment, including academic achievement in mathematics.

RECOMMENDATIONS

The researcher's recommendations can be presented in this study as follows:

1. Encouraging future studies, including training visually impaired teachers on visual rehabilitation, employing visual aids in training their students, and learning about the impact of this training on the achievement of their students in other academic fields.
2. Encourage further studies in the field of training visually impaired students on the use of visual aids in particular and support technology in general to address new variables not addressed in the current study.
3. Make the training of visually impaired students in the use of visual aids, particularly those used in this study, a part of the educational programs of these students, so that the necessary procedures are taken to ensure this.
4. Design training programs for students with visual impairments in the use of visual aids, support technology at an early stage of the basic stage, and teach it through the curriculum.

REFERENCES

Abu Zeitoun, J. (2008) The extent of using technology by visually impaired people in reading and writing in Jordan. Educational and Psychological Sciences, University of Bahrain, 9 (1), 179-201.

Alhadidi, M. (2015) Introduction to visual impairment, Dar Al FikrFor Printing, Publishing & Distribution: Amman, Jordan.

Alhadidi, M. (2008) Final Report on Special Education Programs for Blind and Visually Impaired Students (unpublished report), Ministry of Education, Amman, Jordan.

Ashcroft, S. C. (1984). Research on Multimedia Access to Microcomputers For Visually Impaired Youth. Education of the Visually Handicapped, 15 (4), 108-126.

Beaty, l. a. (1994).Psychological factors and academic success of visually impaired college students.Review, 26(3), 131-140.

Bradley, N. &Poppen, W .(2003). Assistive Technology, Computers and Internet May Decrease Sense of Isolation For Homebound Elderly and Disabled Persons. Technology and Disability, (15) ,19-25.

Cahill, H. &Linehan, C.(1996). Blind and partially sighted access to mathematics and computer technology in Ireland, Journal Of Visual Impairment And Blindness, 90(2), 105-118.

Deshpande, R. &Deshpande, M. (2005) A clinical study to evaluate and manage pediatric cases of low vision from school for blind . Vision 2005programme, 1, Westminster, London, United kingdom,4-7 .

Elewat, Sh. (2005) the impact of the training program on improving the effectiveness of functional vision, academic achievement and social skills for the visually impaired,Unpublished PhD Dissertation, University of Jordan, Amman.

Fernandez, E. Ameezcua, J. ,Dichardo, M & Lopez, M. (2001). The Self –Concepts Of Spanish Children Of Adolescents With Low Vision Of Their Sighted Peers, Journal Of Visual Impairment And Blindness, 90(5), 364-367.

Goodrich, G. L. , Jennine, K. , Curtis, K. Theresa, B. B., Patricia, W. , Berenice, d. Haazan, J. & Peters, L. J.(1999).Reading: Reading Devices And The Low Vision Patient: Quantifying The Benefits of CCTV Versus Optical Aids . In Cynthia, S., Arditi, H. A. , Rosenthal, B. , Seidman, K. R. , Vision Rehabilitation Assessment , Intervention

And Outcomes , International Conference On Low Vision,(pp 333-337), Swets&Zenitlinger Publishers.
Hallahan, D. P.& Kauffman, J. M. (2003). Exceptional Learners : Introduction to Special Education , Boston , Allyn And Bacon, USA.
Jose, R. (1983). Understanding Low Vision, New York :American Foundation For The Blind, USA.
Jenkins, Francis and Hewitt (1992) Fundamentals of Optics, translated by: Eid Al-Fattah Al-Shazly, Saeed Al-Bassiouni, Third Edition, Cairo, International Publishing House.
Jutai J. W., Strong, G., & Russell-Minda, E. (2009). Effectiveness Of Assistive Technologies For Low Vision Rehabilitation: A Systematic Review. Journal Of Visual Impairment & Blindness.210-222.
Keeffe, J. (1994). Assessment of Visual Impairment in Developing Countries, Book 2: Implications of Visual Impairment and Job Vision Assessment, translated by Samir Debabneh, and Helena Pana, Melbourne, Global Visual Impairment Project.
Leyser Y, Heinze A &Kapperman, G. (1996).Stress and adaptation in families of children with visual disabilities.Family in Society, 77(4):240–49.
Lowe, S. E. (2016). Study Low vision services can improve quality of life. From site: http://www.aoa.org/news/clinical-eye-care/low-vision-study-quality-of-life?sso=y
Lutteman, B. , Bilge, A. &Carlsson, B. , (2005).deeper and border rehabilitation for persons with visual impairment. Vision 2005programme, 1, Westminster, London, United kingdom,4-7 .
Mulloy, A. M., Gevarter, C. , Hopkins, M., Sutherland, K. S. and Ramdoss, S. T..(2014). Assistive Technology for Students with Visual Impairments and Blindness.
Scholl, G. T. (1986). Foundations of Blind and Visually Handicapped Children and Youth: Theory And Practice . New York , American Foundations of Blind, Inc.
Shukir, Z. (1999) Psychology of Special Groups and Disabled Persons, The Egyptian Renaissance Library: Cairo.
Turbert, D.(2017). Low Vision Rehabilitation and Low Vision Aids. From site: https://www.aao.org/eye-health/diseases/low-vision-aids-rehabilitation.
Van Dijk, K. &Datrang, S. (2002).training course on low vision for educators and rehabilitation Professionals, Nepal: May22-26 May.
Wolffe, K. (2003). Wired To Work : An Analysis of Access Technology Training for People with Visual Impairment . Journal of Visual Impairment and Blindness, 97 (10),633-646.