Effectiveness of Training Program to Increase the Functional Vision of Partially Sighted Students Considering Assistive Technology through the SETT Framework in Saudi Arabia

By

Abdulrahman Ahmed Al-Bulayhi *

*Department of Special Education, University of Hail, Hail City, Saudi Arabia

Abdulrahman Bin Ali Bin Abdullah Alduaylij **

**Department of Jurisprudence and its Principles- College of Sharia and Law, University of Hail, Hail City, Saudi Arabia

Yasir A. Alsamiri ***

***Department of Education - Islamic University of Madinah, Madinah City, Saudi Arabia

Omar Abdullah Alsamani ****

****Department of Special Education, University of Hail, Hail City, Saudi Arabia

Abdulrahim Ajyan Alsenani *****

*****Faculty of Sharīʿah - Islamic University of Madinah, Madinah City

Mansour Mosleh Aljohani******

******Department of Curricula and Methods, Hail University. Hail City, Saudi Arabia

Abstract:

The study aimed to determine the effectiveness of a training program to Increase the Functional Vision of Partially Sighted Students Considering Assistive Technology through the SETT Framework in Saudi Arabia and the continuity of the program's impact on increasing the functional vision of partially sighted Students after its implementation. The study was applied to a sample of 20 students with low vision selected using the purposive, hypothetical, or intentional method. They have functional vision impairment at the Al-Noor Institute for the Blind (boys) in Buraydah, Saudi Arabia. They were divided into two groups, one experimental and the other control, each consisting of ten students with a chronological age range of 6–8, an average age of 6.65, and a standard deviation of 0.813. The research instrument was a Functional Vision Scale (prepared by the researcher). A Training Program to Increase the Functional Vision of Partially Sighted Students Considering Assistive Technology through the SETT Framework (prepared by the researcher) The study reached the following results: The findings of this study have the potential to significantly influence policy and practice in special education and assistive technology, with statistically significant differences at the significance level ($\alpha \leq 0.05$) in the mean ranks on the functional vision scale between the experimental and control groups in the post-measurement for students with low vision in the primary stage. There are statistically significant differences at the significance level ($\alpha \leq 0.05$) in the mean ranks on the functional vision scale between the experimental group members pre- and post-measurement. There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) in the mean ranks on the functional vision scale between the experimental group members in the post-measurement and the follow-up measurement. These findings underscore the potential of the training program to shape policy and practice in special education and assistive technology, instilling hope and optimism for the future of these fields.

Keywords: Increase the Functional Vision, Partially Sighted Students, Assistive Technologies, and SETT Framework.

Introduction:

In recent years, Saudi Arabia and the Arab countries in general, have seen impressive advancements in the educational and rehabilitative programs and services offered to the Blind. The idea is to consider people with visual memories that may be used and profited from during the learning process (Saudi Vision 2030, 2018). Teachers of visually impaired students may encounter a variety of challenges when instructing these students on vision activation programs, such as the visually impaired refusing to rely on visual cues in learning and preferring to read Braille out of fear of failing, as well as the tremendous effort they must make to use the vision (Al-Zboon, 2020). Therefore, it has become the responsibility of the teacher to know the programs and activities related to activating vision and training the visual abilities of children, whether for far or near vision (Heldal, Helgesen, Ali, Patel, Geitung& Pettersen, 2021). The teacher's job also lies in finding situations and materials that help the child to use his remaining vision, as well as enhancing their confidence in their ability to carry out visual activities and helping them to perform visual tasks that focus on various activities such as developing Attention, visual awareness, visual Memory, and activities to train on visual discrimination, activities for training in visual closure, for distinguishing between shape and background, and activities for training in visual-motor coordination (Abduljaber, Alworikat& Darawsheh, 2022). With this in mind, this study aims to Increase the functional vision of visually impaired students through training programs, particularly in childhood, that aim to make the best use of what remains of their vision.

People who are blind employ unique strategies when performing instrumental activities of daily living (iADLs), often relying on multiple sensory modalities and assistive technologies. While prior research has extensively explored adaptive strategies for outdoor activities like way finding and navigation, less emphasis has been placed on the information needs and problem-solving strategies for managing domestic activities. (Turkstra;Bhatia; Van Os.& Beyeler ,2025).

Review of literature:

Tools known as assistive gadgets (such as magnifiers, telescopes, and talking book readers) help people with disabilities preserve or increase their functional abilities, therefore promoting their involvement in society (Ok, Rao, Pennington& Ulloa, 2022).

Such tools make it easier for those who have lost their eyesight to resume daily tasks like reading, learning, and traveling. As a result, they can raise a user's subjective quality of life and sense of self-worth (Board, 2021). Despite these proven advantages, traditional assistive devices are disturbingly underutilized and abandoned. According to some surveys, the proportion of abandonment varies from 30% to 50% for all devices combined and up to 75% for specific devices (Jacobsen, 2012).

Although there are many reasons why conventional assistive devices are no longer used, a few of them include expense, a dearth of technical assistance, and the shame associated with their usage (Phillips& Proulx, 2018). Also, it will be critical to enhance the identification and treatment of mental health issues in this group by creating more efficient treatments and increasing access to services.

Importance and Effectiveness of Using Assistive Technology for Students with Visually Impaired:

The goal of assistive technology is to Increase the functionality of persons who are blind or visually impaired in terms of autonomy, independence, quality of life, and social inclusion. It is an interdisciplinary field of knowledge that includes products, resources, techniques, strategies, practices, and services, and it is a field that you, as educators, researchers, and policymakers, are an integral part of. Teachers can create strategies for evaluating student performance using simple procedures. For instance, visually impaired students find reading challenging. However, AT enables them to digest information more quickly by obtaining it in audio format, or teachers might use Braille in their teaching methods. To examine what they have learned and mastered, such as concepts, blind persons can verbally convey what they have learned to their teachers or in controlled contexts.

Creating an educational environment by using Assistive Technology for the Visually Impaired:

An effective educational connection can be said to depend on the teacher's proficiency in managing assistive technology tools (Kisanga& Kisanga, 2022) because the right resources and trainers help teachers become comfortable with how the technology works (Admiraal, Vermeulen& Bulterman-Bos 2020).

Special education instructors should have AT devices for practical training, enhancing their expertise in technology. (Senjam, 2020).

Teacher education provides instructors with various skills in integrating technology into teaching practice to encourage the creation of a classroom atmosphere conducive to learning. Because of this, AT will continue to impact on the educational process and aid all students in developing a wide range of abilities, regardless of their circumstances or degree of aptitude (Alsolami, 2022).

(ECC) developed for students with visual impairments, addressing incidental skills and specific experiences beyond fundamental subjects (Ravenscroft, Davis, Bilgin& Wazni, 2019). With nine (9) Skill sets that address (a) Compensatory (or Access) Skills, (b) Social Interaction, (c) Recreational and leisure skills, (d) Orientation and Mobility (O&M), (e) Independent living skills, (f) Assistive Technology (g) Career Education skills, (h) Sensory Skills, and (i) Self-Determination Skills, the ECC is a Curriculum that focuses on functional Outcomes for Students with Visual Impairments (Phutane, Wright, Castro, Shi, Stern, Lawson& Azenkot, 2022).

Studies show that developing depth perception and more complex visual skills Increases distance vision (Zhao, Kupferstein, Rojnirun, Findlater & Azenkot (2020). Nissim, Ido, Sanduka, Shmerling& Ariel (2022). It focuses on the assessment and teaching methods required for educators who seek to aid multiple visually impaired children in achieving their highest levels of visual ability.

To address this gap, our study presents insights from 16 semi-structured interviews with individuals who are either legally or completely blind, highlighting both the current use and potential future applications of technologies for home-based iADLs. Our findings reveal several underexplored challenges, including the difficulty of locating misplaced objects, a structured problem-solving approach where digital tools are a last resort, and limited awareness of assistive training programs. Participants also faced persistent usability barriers as software updates disrupted accessibility features. Participants utilize a variety of low-tech and high-tech solutions, with tactile labeling systems and digital assistance apps being particularly prevalent. However, existing assistive technologies often fail to integrate seamlessly with users' preferred strategies, leading to frustration and underutilization. Addressing these barriers is crucial for enhancing the adoption of assistive technologies and ultimately improving the quality of life for people who are blind(Turkstra;Bhatia; Van Os.& Beyeler ,2025).

Previous research has demonstrated that AT can help these children communicate their goals and requirements (Nguyen, Tilbrook, Sandelance& Wright, 2021). Moreover, different curricular areas might benefit from using AT devices and services in the classroom (Stasolla, Perilli, Di Leone, Damiani, Albano, Stella & Damato, 2015). This demonstrates the urgent need to increase auxiliary aids and technology so that students may overcome obstacles and reduce achievement disparities.

Conceptual and Theoretical :

The conceptual framework guiding this research is the Training Programme to Increase the Functional Vision of Partially Sighted Students in KSA, highlighting the necessity for information on the tasks, the environment, the students, and the equipment needed to integrate AT into classrooms successfully.

The SETT framework model:

which Zabala was first established (1995). SETT stands for "students, the environment, tasks, and tools" (Zabala, 2020). focuses on the requirement for knowledge about the students, setting, activities, and resources to incorporate AT into the classroom effectively.

Visual impairment:

Those with limited vision and those who are blind are two groups with different requirements and features regarding visual impairment (Bennett, Bex, Bauer & Merabet, 2019).

Low vision :

Even after optical correction, people still have compromised vision and can use their eyesight to do activities (Oess, 2021). Students with limited vision often retain residual vision in the educational field, allowing them to read printed materials using instructional materials and specialized equipment (Al-Zboon, 2020).

Blindness is the total loss of sight and conditions in which people rely primarily on sight-replacement abilities [WHO] (2021). In education, a blind student does not use sight in the learning process (Klingenberg, 2007). It is a common misunderstanding among general educators that "legally blind" refers to total blindness in pupils with visual impairments. That is untrue. Even with treatment, a vision impairment that negatively impacts a child's academic performance is called "visual impairment - including blindness" under the IDEA. The phrase refers to blindness and partial sight (Stuart-Cassel, Nuñez& Chung, 2022).

Functional vision :

Functional vision can frequently reveal insightful data about others. For instance, if a person exhibits signs of diminished visual functioning, such as lower acuity, one may anticipate prospective difficulties with specific visual tasks, such as reading, and potential solutions to the problem (such as magnification or large print). (Kran, Mayer, Bartuccio& Maino, 2012).

Functional vision assessment:

The capacity to effectively use one's remaining vision is known as functional vision. A person can benefit from having functional vision in daily activities (Corn& Erin, 2010).

Importance of functional vision training:

It aids in figuring out the person's current level of visual functioning, determining the level of education and visual stimulation required to enable the person to make the best use of their remaining vision, allows the person to make the most of their limited vision, helps in planning a mobility training program for individuals, making decisions regarding the use of visual stimulation materials, deciding the type of primary reading medium, and This enables one to select the kind of equipment a person needs (Senjam, 2019).

Vision Training Guidelines:

selecting the ideal tools for vision training. Use everyday items, well-known objects, and fascinating objects (food and toys); use the proper size, distance, contrast, color, positioning, light on and around the object, etc. Observations should be made while practicing vision: What tools are used to train eyesight, and how simple or challenging was it for the individual to conduct the vision training? People offer feedback on the assignment, the subject's behavior during visual training, specimen distance, and the time needed to perform each task (Snyder, 2020).

Functional vision training:

This can be developed by engaging in the below activities.

Visual Awareness: It concerns the child's capacity to recognize the visual field's items. Ex: The youngster is moved by familiar items placed in front of their eyes.

Visual Attention refers to a child's capacity for perceiving what is in front of them. For example, You Could Use a rattle ball to capture the child's Attention.

Visual fixation: the kid's capacity to maintain eye contact with the moving target.

Ex: Asking a youngster to focus on a moving item before their eyes.

Visual Focus: The kid's capacity to perceive a well-known item from diverse distances. Ex: Ask for the names of familiar things and keep them between 1 and 6 meters away.

Visual Fusion: The kid's capacity to identify the thing as such.

Ex: Ask the youngster to observe a ball rolling on the floor with their eyes.

Visual Tracking :refers to the child's eye-tracking skills around moving objects. For example, Ask the child to collect bubbles in soapy water.

Visual Scanning : refers to the child's capacity to sift through several visual inputs in search of a particular stimulus. For example, Ask the child to use a magnet to choose an iron nail.

Visual discrimination is the young child's capacity to distinguish between different items depending on their color, form, or size. For example**,** Ask the kid to distinguish between the forms.

Visual Character Discrimination: This section refers to the child's capacity to separate a particular object or picture from its surroundings.

Ex: The youngster gets a picture and is instructed to circle each flower.

Visual Memory : **relates to a** child's capacity for Memory and the ability to combine old experiences with brand-new ones.

Ex: The youngster is asked to name a famous person in the picture.

Visual Closure: When a component of an object is visible or available, this describes the child's capacity to see the entire object or picture.

For example, display an image of any missing parts or items.

Visual Spatial Relationships: The child's capacity to recognize spatial notions like directions, distances, etc., is relevant here. For example, Have the youngster demonstrate the instructions.

Visual Mobility: This refers to the kid's movement-based understanding of concepts like right and left. Ex: To the left or right, request the youngster to move.

Eye-Hand Coordination: Eye-hand coordination refers to the capacity to accomplish a job while coordinating our hands and eyes.

Ex: Request that the youngster only colors within the lines on the image.

***Eye-foot coordination* :refers to a** child's capacity to perform a job while coordinating their feet and eyes.

Ex: Request that the youngster tread on the floor-drawn circles.

Constancy of Shape: This speaks to a child's capacity to recognize the same item from several angles.

For example, a youngster should be presented with an image of an object in various locations (Dhana Lakshmi, 2016).

The Research Problem :

The programs offered to visually impaired children still do not pay the necessary Attention to the visual remains of these students, which can be used in learning and activated in daily life since the focus of these programs is limited to conducting medical examinations and visual aids without focusing on training and using the visual remnants properly (Cheng& Lai, 2020).

Residual vision is not automatic, so there is a need to develop unique training programs, commonly referred to as vision stimulation programs or residual vision activation programs. It is rare for visual system development to occur without educational programs that Increase the functional vision of visually impaired students since visual function is both a developmental and a learned behavior (van Nispen, Virgili, Hoeben, Langelaan, Klevering, Keunen & van Rens, 2020).

A study (Bittner, Yoshinaga, Rittiphairoj & Li, 2023) has proven that The provision of rehabilitation services for the visually impaired has the potential to help people with vision loss maintain their functions and activities of daily living, as well as their social and psychological well-being; Therefore, interest in sequential visual activities and stimulation is significant to help the visually impaired Increase their visual function in all visual tasks and to make the best use of the child's remaining vision.

The more severe and complex the disability, the greater the need and demand for AT devices and services. Researchers have argued that people with visual impairments greatly need AT devices and services (Lorenzini& Wittich, 2021).

Such tools make it easier for those who have lost sight to resume everyday tasks such as reading, studying, cooking, and traveling. This can increase the subjective quality of life and self-esteem (Board, 2021).

In addition, teachers often face significant challenges when teaching students with visual impairments due to the complexity of their learning needs (Kizilaslan, Zorluoglu& Sozbilir, 2021).

Previous research has demonstrated that using AT can assist students who are visually impaired in expressing their goals and requirements (McNicholl, Casey, Desmond & Gallagher, 2021).

This indicates a great need to increase the use of AT devices and provide other related services to students with visual impairments facing such complex problems to overcome the challenges and reduce the achievement gap.

The following central question thus defines the problem of the study:

What is the effectiveness of a training program in improving the functional vision of Partially Sighted students using assistive technologies according to the SETT framework in Buraydah, Saudi Arabia?

Purpose and Significance of the Study :

Many visually impaired people have visual residuals but have not learned to interpret what they see into valuable concepts. However, scientific studies through training programs have shown that an organization can increase the effectiveness of functional vision in visually impaired individuals with visual impairments (Barraga, 2004).

Nonetheless, the programs and services provided in Saudi Arabia and Arab countries are presented on the basis that all visually impaired people are blind, without considering the need for visually impaired people for training programs that help increase the effectiveness of their functional vision. Although some studies have recently attempted to serve this group of visually impaired people, they have been limited to providing eyeglasses and corrective lenses without training these individuals.

There is now much interest on a global scale in training the visually impaired to Increase the efficacy of their functional vision.

Therefore, this research aims to investigate the possibility of increasing the effectiveness of functional vision in visually impaired students using AT, increasing the independence and adaptation of these individuals, their achievements, academic communication, and social communication skills. T

he findings of this study will assist decision-makers at the Department of Education in KSA in creating an action plan for utilizing AT to enhance partially sighted students' functional vision and find out how much the framework of the existing AT training may be altered. In addition, the results of this study will provide valuable information for schools to Increase their learning programs by incorporating different types of AT so that future teachers are better prepared.

Research Questions:

This study focuses primarily on low-vision students in the primary stage of KSA and is guided by the following three questions:

- Are there statistically significant differences in the mean ranks on the functional vision scale between the experimental and control groups in the post-measurement for students with low vision in the primary stage?
- Are there statistically significant differences in the mean ranks on the functional vision scale between the experimental group members in the pre-post-measurement?

- Are there statistically significant differences in the mean ranks on the functional vision scale between the experimental group members in the post-measurement and the follow-up measurement?

Research Design:

Quasi-experimental designs allow implementation scientists to conduct studies in a subset of participating patients or sites randomized to a control condition, especially for high-profile or high-urgency clinical issues (Handley et al., 2018).

The current research relies on the quasi-experimental approach as an experiment that aims to identify the effectiveness of a training program in improving the functional vision of students with low vision using assistive technology according to the SETT framework in Buraydah, Saudi Arabia (independent variable) in improving the functional vision of students with low vision (dependent variable) among students with low vision. In addition, the research uses the experimental design with two equivalent groups (experimental and control) to determine the effect of the program (post-test) on the study variables, as well as the design with one group to determine the continuity of the program's effect after the follow-up period (follow-up test for the experimental group).

Participants :*The study population in Buraydah, Saudi Arabia, is comprised of all students with low vision.*

Sampling :*The training program was applied to a sample of (20) students with low vision who were selected according to the purposive, hypothetical, or intentional method. They have functional vision impairment from the Al-Noor Institute for the Blind (boys) in Buraydah, Saudi Arabia. They were divided into two groups, one experimental and the other control, each consisting of (10) students with a chronological age range of (6-8) and an average age of (6.65) and a standard deviation of (0.813).*

Instrument :

- The research instrument was a Functional Vision Scale (prepared by the researcher).
- A training program to increase the functional vision of partially sighted students considering assistive technology through the SETT Framework (prepared by the researcher).

Procedure: *To conduct the study, the researcher first conducted an equivalence study between the experimental and control groups before applying the program, using the Mann-Whitney Test to verify the equivalence of the two groups regarding chronological age and functional vision. Table (1) illustrates that.*

Table (1) Significance of the differences between the mean ranks of scores among the individuals in the experimental and control groups in chronological age and functional vision level

Dimensions	Groups	Mean Rank	Sum of Ranks	U Value	Z Value	Significance Level
Age	Experimental	10.9	109	46	-0.336	0.737
	Control	10.1	101			
Visual Response and Attention	Experimental	9.95	99.5	44.5	-0.458	0.647
	Control	11.05	110.5			
Receiving visual information and searching and exploring visually	Experimental	10.1	101	46	-0.321	0.748
	Control	10.9	109			
Voluntary control of eye movements and arousing Visual Attention	Experimental	11.9	119	36	-1.103	0.27
	Control	9.1	91			
Visual-motor coordination	Experimental	8.95	89.5	34.5	-1.238	0.216
	Control	12.05	120.5			
Visual discrimination through distinguishing colors, shapes, objects, and their images	Experimental	10.3	103	48	-0.155	0.877
	Control	10.7	107			
Distinguishing shapes of letters and numbers	Experimental	10.25	102.5	47.5	-0.197	0.844
	Control	10.75	107.5			
Total	Experimental	9.8	98	43	-0.537	0.591
	Control	11.2	112			

From Table (1), it is evident that there are no statistically significant differences between the experimental and control groups in terms of age, overall functional vision, and dimensions. This is indicated by the p-values in all dimensions greater than 0.05, indicating the equivalence of the two groups before implementing the training program. Then, the researcher applied the study tools, such as the Functional Vision Scale (prepared by the researcher).

Description of a scale and its purpose:

The Functional Vision Assessment Scale for the Visually Impaired is an assessment tool designed to determine the ability of visually impaired students to use their vision in daily life skills and activities. The scale consists of 29 statements distributed across six dimensions: visual response and Attention (5 statements), visual information reception, search and exploration (5 statements), voluntary control of eye movements and visual

Attention (3 statements), visual-motor coordination (5 statements), visual discrimination through color, shape, object and image recognition (6 statements), and letter and number shape recognition (5 statements).

The statements are presented individually to the child, and their responses are recorded based on the evaluator's observation. The scale is corrected according to a three-point Likert scale, where each statement is scored from 1 to 3 according to the child's level of response. The scale helps to identify strengths and weaknesses in the child's functional vision and to determine appropriate educational goals and plans.

The psychometric properties of the functional vision scale:

The internal consistency validity was calculated by applying it to (35) students with low vision by finding the Pearson correlation coefficient between the scores of each item and the total score of the scale after deleting the item score from the total score of the scale and also calculating the correlation coefficient between the score of each dimension and the total score of the scale and showing that in the Table (2) as follows:

Table (2) Correlation coefficients between each score and the total score of the dimension to which it belongs after deleting the paragraph score for the functional vision scale

Visual Responsiveness and Attention		Visual Information Reception, Search, and Exploration		Voluntary Control of Eye Movements and Visual Attentional Arousal		Visual-Motor Coordination		Discrimination of Colors, Shapes, Objects, and Images		Discrimination of Letters and Numbers	
N	Correlation	N	Correlation	N	Correlation	N	Correlation	N	Correlation	N	Correlation
1	0.721**	6	0.822**	11	0.533**	14	0.634**	19	0.873**	25	0.769**
2	0.608**	7	0.570**	12	0.873**	15	0.510**	20	0.800**	26	0.686**
3	0.706**	8	0.624**	13	0.800**	16	0.720**	21	0.850**	27	0.686**
4	0.731**	9	0.940**			17	0.599**	22	0.850**	28	0.585**
5	0.608**	10	0.631**			18	0.783**	23	0.803**	29	0.523**
							0.784**	24			

Table (2) clearly shows that all the items of the functional vision scale have positive and statistically significant correlation coefficients at (0.01), which means that the scale has a high degree of validity.

Internal consistency (the dimension with the total score of the scale):

The internal consistency validity was calculated by using the scores of the standardization sample (the survey) by finding the Pearson correlation coefficient between the scores of each dimension and the total score of the scale and showing that in Table (3) as follows:

Table (3) Correlation coefficients between the score of each dimension of the scale and the total score of the scale after deleting the dimension score from the total score n=(35)

Dimensions	Correlation coefficient
Visual Response and Attention	0.821**
Receiving visual information and searching and exploring visually	0.717**
Voluntary control of eye movements and arousing Visual Attention	0.667**
Visual-motor coordination	0.822**
Visual discrimination through distinguishing colors, shapes, objects, and their images	0.819**
Distinguishing shapes of letters and numbers	0.921**

Table (3) clearly shows that the correlation coefficients are high and significant at the level (0.01), which indicates the scale's validity.

The reliability of the scale by two methods: Cronbach's alpha coefficient and the split-half method

The reliability of the study tool was calculated using Cronbach's alpha coefficient and the split-half method, which are shown in table (4)

Table (4) Reliability coefficients of the study tool using Cronbach's alpha coefficient and the split-half method n=(30)

M	Dimensions	Cronbach's alpha	Split-half
1	Visual Response and Attention	0.785	0.786
2	Receiving visual information and searching and exploring visually	0.67	0.596
3	Voluntary control of eye movements and arousing Visual Attention	0.677	0.648

4	Visual-motor coordination	0.717	0.89
5	Visual discrimination through distinguishing colors, shapes, objects, and their images	0.833	0.801
6	Distinguishing shapes of letters and numbers	0.926	0.982

Table (4) clearly shows that the reliability coefficients of the study tool using Cronbach's alpha coefficient, and the split-half method range from 0.596 to 0.982. This means that the tool has a good to excellent level of internal reliability and can be relied on to measure the study variables.

The researcher applied the Training Program to Increase the Functional Vision of Partially Sighted Students in Buraydah, Saudi Arabia, Considering Assistive Technology through the SETT Framework. This program aims to help students with visual impairments increase their visual, functional, educational, and social skills through a series of organized steps using assistive technology appropriate to their condition and needs.

The objective of the program is to help students with visual impairments. Increase their visual, functional, educational, and social skills through a series of organized steps using assistive technology appropriate to their condition and needs.

This program uses the SETT framework, which stands for Student, Environment, Task, and Tool. This model helps to identify the appropriate assistive technology for each student based on their characteristics, environment, tasks, and available tools. By considering these factors, the SETT framework ensures that the chosen technology is tailored to the students' needs and is most effective in enhancing their functional vision.

This program includes a comprehensive set of objectives that cover all aspects of the student's needs and challenges:

- ***Diagnostic objective***: This objective aims to assess the condition of students with low vision regarding the degree of visual impairment, visual abilities and weaknesses, methods used in using residual vision, and potential impacts on learning and integration.
- ***Rehabilitation objective***: This objective aims to develop the skills of students with low vision in using assistive technology, increase their receptivity to visual, auditory, and kinesthetic stimuli and signals, and increase their ability to learn, communicate, and interact with the surrounding environment.
- ***Awareness objective:*** This objective aims to increase awareness among students with a low vision of their rights, potential, and value as active individuals in society and encourage them to participate in educational, social, and cultural activities with confidence and independence.
- ***General objectives of the program:***
  - Increase the functional vision of students with low vision using assistive technology according to the SETT framework in Buraydah, Saudi Arabia.
  - Increase the ability of students with low vision to use residual vision effectively and creatively in their daily lives.
  - Provide a suitable and stimulating educational environment to increase the academic achievement and social integration of students with low vision.
  - Increase self-confidence and self-satisfaction among low-vision students by appreciating their abilities and highlighting their achievements.
  - Increase the level of awareness and education among parents of students with low vision about the nature of visual impairment and its effects on development, as well as how to support their students and encourage them to use assistive technology.

Procedural objectives:

These objectives are the practical applications that are achieved through the program sessions and include the following:

- Participants acquire skills using the assistive technology selected based on the SETT framework and can apply it in various educational and life situations.
- Participants Increase their performance in various visual, functional, educational, and social domains after using assistive technology and show increasement in functional vision, learning, communication, and interaction.
- Participants increase their awareness and self-confidence in their rights, potential, and value as active individuals in society and participate in educational, social, and cultural activities positively and independently.
- The level of awareness and education among participants' parents increases regarding the nature of visual impairment and its effects on development, as well as how to support their students and encourage them to use assistive technology.

The techniques used in the program to Increase the functional vision of students with low vision include:

- SETT framework: This is a model that helps to identify the appropriate assistive technology for the student based on their characteristics (Student), environment (Environment), tasks (Tasks) they perform, and tools (Tools) available. This framework includes four main steps: identifying the student's needs, identifying the environment's requirements, identifying the targeted tasks, and identifying the suitable tools.
- Training on using assistive technology: This training includes providing students with low vision with devices, programs, or systems that help them Increase their visual and functional abilities, such as light sources, colored images of letters, numbers, and geometric shapes, white papers and screens and pens for various shapes in multiple sizes, models suitable for students with low vision. This training includes teaching students how to use this technology in various educational and life situations, such as reading texts and images, writing letters, numbers, and shapes, distinguishing colors, sizes, and shapes, tracking light and movement, visual-kinesthetic cooperation, visual Memory, visual discrimination, recognizing new

objects.

- Training on functional vision skills: This training includes teaching students with low vision skills that help them use residual vision effectively and creatively in their daily lives, such as responding, paying Attention to, and tracking visual objects of different light and movement, dealing with contrast, lighting, background, distance, and angle, and using low vision aids such as magnifiers, glasses, and magnified screens.
- Training on learning, communication, and interaction skills: This training includes teaching students with low vision skills that help them Increase their educational performance and social integration by using assistive technology, such as reading and understanding texts and images better, writing fluently and creatively, solving arithmetic problems efficiently, participating in educational and cultural activities confidently, communicating with teachers and peers effectively.
- Training on stress and pressure management skills: This training includes teaching students with low vision skills that help them reduce stress and pressure that they may face in their academic and personal lives, such as deep breathing, muscle relaxation, meditation, mindfulness, positive thinking, positive visualization of the future.
- Training in self-awareness and self-confidence skills: This training includes teaching students with low vision skills that help them increase their awareness of their rights, potential, and value as active individuals in society. These skills include setting personal goals and values, appreciating self and achievements, identifying strengths and weaknesses, dealing with criticism and challenges constructively, and decently demanding rights and needs.
- Training on communication and interaction skills with parents: This training includes teaching students with low vision skills that help them Increase their relationship with their parents and get their support and encouragement in using assistive technology, such as expressing feelings and opinions honestly, listening attentively and understanding the opinions and feelings of parents, asking for help and advice when needed, exchanging information and experiences about visual impairment and its effects and how to overcome it. The activities used in the training program to increase the functional vision of students with low vision include activities that help achieve the program's preventive, therapeutic, and procedural objectives.

Data Analysis :

In order to reach the results that achieve the objectives of the study and analyze the data, a set of various statistical methods were used, using the statistical package for human and social sciences Statistical Package for Social Sciences (SPSS-25) after the data were coded and entered into the computer, the statistical methods that were used in this study are:

- To calculate the scale's psychometric characteristics, Pearson correlation coefficient, Cronbach's alpha, and split half using Spearman's equation were used to verify its validity and reliability.
- The Mann-Whitney test, Wilcoxon test, and Spearman's rank correlation coefficient were used to verify the study's assumptions regarding the program's effect on the participants' level of functional vision.

Results :

Results of the first assumption: It states that "There are statistically significant differences at the significance level ($\alpha \leq 0.05$) in the mean ranks on the functional vision scale between the experimental and control groups in the post-measurement for students with low vision in the primary stage".

To verify the validity of this assumption, the Mann-Whitney test (U) and Z value were used as one of the non-parametric methods to identify the significance of the differences between the mean ranks of the student's scores in the post-measurement in order to determine the significance of what may occur on the functional vision of students with low vision and to calculate the effect size of the program, and the researcher relied on calculating the Spearman's rank correlation coefficient (r prd) in case of Mann-Whitney test for two independent samples.

Table (5) Significance of the differences between the mean ranks of the scores in the post-measurement and the effect size for the experimental and control groups in the functional vision scale for students with low vision

Dimensions	Groups	Mean Rank	Sum of Ranks	U Value	Z Value	Significance Level	r prd
Visual Response and Attention	Experimental	15.5	155	0.000	-3.823	0.000	1.0 Very large
	Control	5.5	55				
Receiving visual information	Experimental	15.5	155	0.000	-3.807	0.000	1.0 Very large
	Control	5.5	55				
Voluntary control of eye movements and arousing Visual Attention	Experimental	15.5	155	0.000	-4.108	0.000	1.0 Very large
	Control	5.5	55				
Visual-motor coordination	Experimental	15.5	155	0.000	-3.886	0.000	1.0 Very large
	Control	5.5	55				
Visual discrimination through distinguishing colors, shapes, objects, and their images	Experimental	15.5	155	0.000	-3.808	0.000	1.0 Very large
	Control	5.5	55				

Distinguishing shapes of letters and numbers	Experimental	15.5	155	0.000	-3.832	0.000	1.0 Very large
	Control	5.5	55				
Total	Experimental	15.5	155	0.000	-3.787	0.000	1.0 Very large
	Control	5.5	55				

It is clear from Table (5) that there are statistically significant differences between the experimental and control groups in the functional vision as a whole and in all its dimensions, where the significance level value in all dimensions is less than 0.05, which indicates the superiority of the experimental group over the control group after applying the training program.

The Table also shows that the value of Spearman's rank correlation coefficient r prd in all dimensions is equal to 1.0, which indicates a robust correlation between the scores of the two groups in each dimension. Finally, the Table shows that the effect size of the training program in all dimensions is enormous, which indicates the program's effectiveness in improving the functional vision of students with low vision.

2-Results of the second assumption: It states that "There are statistically significant differences at the significance level ($\alpha \leq 0.05$) in the mean ranks on the functional vision scale between the experimental group members in the pre-and post-measurement".

To test the validity of this assumption, the Wilcoxon test and Z value were used as one of the non-parametric methods to identify the significance of the differences between the mean ranks of the scores of the experimental group in the functional vision scale for students with low vision and its dimensions in the pre-and post-measurement and to calculate the effect size of the program, and the researcher relied on calculating the Spearman's rank correlation coefficient (r prd) in case of Wilcoxon test for two related samples.

Table (6) Significance of the differences between the mean ranks of the scores in the pre-and post-measurement and the effect size for the level of functional vision among students with low vision

Dimensions	Pre/Post measurement	Number	Mean rank	Rank sum	Z value	Significance level	r prd
Visual Response and Attention	Negative ranks	0	0	0	-2.814-	0.005	1.0
	Positive ranks	10	5.5	55			
	Ties	0					
Receiving visual information	Negative ranks	0	0	0	-2.812-	0.005	1.0
	Positive ranks	10	5.5	55			
	Ties	0					
Voluntary control of eye movements and arousing Visual Attention	Negative ranks	0	0	0	-2.825-	0.005	1.0
	Positive ranks	10	5.5	55			
	Ties	0					
Visual-motor coordination	Negative ranks	0	0	0	-2.814-	0.005	1.0
	Positive ranks	10	5.5	55			
	Ties	0					
Visual discrimination through distinguishing colors, shapes, objects, and their images	Negative ranks	0	0	0	-2.816-	0.005	1.0
	Positive ranks	10	5.5	55			
	Ties	0					
Distinguishing shapes	Negative ranks	0	0	0	-2.	0.005	1.0

of letters and numbers	Positive ranks	10	5.5	55	825-		
	Ties	0					
Total	Negative ranks	10	5.5	55	-2.821-	0.005	1.0
	Positive ranks	0	0	0			
	Ties	0					

Table (6) indicates that there are statistically significant differences between the mean ranks of the experimental group’s scores on the functional vision scale and its dimensions in the pre-and post-measurements, where the significance level value in all dimensions is less than 0.05, which indicates the superiority of the experimental group in the post-measurement over the pre-measurement after applying the training program.

The Table also shows that the value of the rank correlation coefficient r prd in all dimensions is equal to 1.0, indicating a robust correlation between the scores of the experimental group in each dimension in the pre-and post-measurements.

3-The results of the third hypothesis: "There are no statistically significant differences at the significance level (α ≤ 0.05) in the mean ranks on the functional vision scale between the experimental group members in the post-measurement and the follow-up measurement.

To test the validity of this hypothesis, the Wilcoxon Wilcoxon test and the Z value were used as non-parametric methods to identify the significance of the differences between the mean ranks of the scores of the experimental group on the functional vision scale for students with low vision and its dimensions in the post- and follow-up measurements.

Table (7) Significance of the differences between the mean ranks of the scores of the post and follow-up measurements of the functional vision scale for students with low vision

Dimensions	The post/follow-up measurement	Number	Mean rank	Rank sum	Z value	Significance level
Visual Response and Attention	Negative ranks	4	3.63	14.5	-.715-	0.475
	Positive ranks	2				
	Ties	3	5.5	16.5		
Receiving visual information	Negative ranks	6	4.75	28.5	-.877-	0.38
	Positive ranks	1				
	Ties	4	4.75	19		
Voluntary control of eye movements and arousing Visual Attention	Negative ranks	3	3	9	-.539-	0.59
	Positive ranks	3				
	Ties	3	6	18		
Visual-motor coordination	Negative ranks	6	4.5	27	-.862-	0.389
	Positive ranks	1				
	Ties	5	3.8	19		
Visual discrimination through distinguishing colors, shapes, objects, and their images	Negative ranks	2	4.5	9	-.862-	0.389
	Positive ranks	3				
	Ties	3	3	9		
Distinguishing shapes of letters and numbers	Negative ranks	4	4.75	19	-.256-	0.798
	Positive ranks	3				
	Ties	5	5	25		
Total	Negative ranks	5	6	30		
	Positive ranks	0				
	Ties					

The results from Table (7) show that there are no statistically significant differences between the mean ranks of the scores of the experimental group on the functional vision scale and its dimensions in the post and follow-up measurements, where the significance level value in all dimensions is more significant than 0.05, indicating no noticeable changes in the scores of the experimental group after applying the training program. This means that the program continued to Increase the functional vision of students with low vision, which means the continuation of the effect of the training program.

Discussion :

This study focused on the effectiveness of training programs to increase functional vision and considered assistive technology, particularly for partially sighted students, through the SETT Framework in Saudi Arabia. The results showed statistically significant differences between the experimental and control groups in functional vision and all its dimensions. In addition, the effect size of the training program is enormous on all dimensions, indicating the program's effectiveness in increasing the functional vision of students with low vision. The researcher explains this result by pointing out that the training program positively impacted the functional vision of students with low vision by providing them with the appropriate assistive technology for their needs and abilities and training them to use it effectively in daily activities. Also, the training program was based on the SETT framework, which focuses on the student, environment, task, and tool. It helped identify the best assistive technology for each student and adapt it to their environment and tasks.

Therefore, the training program contributed to improving functional vision among students with low vision and increasing their independence and self-confidence. The continuity of the program may be attributed to the techniques used, such as using fading to gradually reduce the support provided to students, increasing the level of challenge and difficulty in the activities, motivating them to be independent and confident in themselves, using shaping to gradually modify students' behavior, providing positive or negative feedback on their performance, and encouraging them to Increase their visual skills. Using various and stimulating activities to Increase functional vision in each dimension, such as using a light source to Increase light response and tracking moving light using colored images of letters, numbers, and geometric shapes to Increase visual discrimination, using white papers, screens, and pens for various shapes in multiple sizes to Increase visual-kinesthetic synergy, and using models suitable for students with low vision to Increase visual Memory.

The result of the current study, which is also consistent with the findings of other researchers, proved the effectiveness of programs and training in improving functional vision. Hu et al. (2019) showed an increase in the effectiveness of visual acuity in all children who underwent programs to develop visual perception. The study of Markowitz (2006) concluded that training in the use of visual remains led to an increase in functional vision. The study by Cheng & Lai (2020) demonstrated that training for 16 weeks through rehabilitation on using visual remains led to increased functional vision and self-confidence in the visually impaired.

The results of the second assumption indicate statistically significant differences at the significance level ($\alpha \leq 0.05$) between the experimental group participants' pre- and post-measurement mean scores on the functional vision test.

The training program's effect size in all dimensions is vast, indicating its effectiveness in improving the functional vision of students with low vision.

The researcher explains this result by saying that the training program positively impacted the functional vision of students with low vision by providing them with the appropriate assistive technology for their needs and abilities and training them to use it effectively in daily activities.

The training program also relied on the SETT framework that focuses on the student, the environment, the task, and the tool, which helped to identify the best assistive technology for each student and adapt it to their environment and tasks. Thus, the training program contributed to improving functional vision among students with low vision and increasing their independence and self-confidence.

It can be said that the training program achieved its general and specific objectives in improving the functional vision of students with low vision by using effective teaching techniques such as reinforcement, prompting, fading, and shaping, and using assistive technology suitable for the needs and abilities of students, such as light sources, colored images, papers, pens, and models.

The training program also relied on the SETT framework that focuses on the student, the environment, the task, and the tool, which helped to identify the best assistive technology for each child and adapt it to their environment and tasks. Thus, the training program contributed to improving functional vision among students with low vision and increasing their independence and self-confidence.

This finding echoes previous studies, which focused on identifying the challenges facing students with visual disabilities in using assistive technology. The current study focused on introducing assistive technology as an effective means to increase functional vision and develop the skills of students with visual disabilities Dos Santos et al. (2022). Additionally, via this earlier research, Bilyalova et al. (2021), Isaiah (2014), and Dursin (2012) both emphasized that using technology by students with visual impairments has a substantial influence on raising their social integration and academic skills. Isaila (2014) noted that students with visual impairments use assistive technology applications like screen readers for social communication and learning other languages.

Dorsin's (2012) findings also showed that providing information in different ways provides great independence and reduces dependence on sighted people, and this was applied in the training program for the current study.

Once the team has discussed the student's characteristics, the environments, activities, and tools for communication, it must consider whether there is a need to implement AT (including AAC devices and adaptive equipment) to support the student's communication goals and skills. Ultimately, the team is synthesizing the information collected to identify the tools, devices, services, and strategies that the student requires to optimize their communication across the identified environments. The SETT framework can support multiple phases of identifying AT for communication development for students , This includes support device selection, measuring frequency of use, and overall implementation across environments. Therefore, it is important to periodically reengage in the collaborative team conversations using the SETT framework as a guide(Brum, ; Probst & Buckley, 2025).

The researcher explains this result of the third hypothesis, that there are no statistically significant differences between the mean ranks of the scores of the experimental group on the functional vision scale and its dimensions in the post- and follow-up measurements, by saying that the training program had a continuous impact on the functional vision of students with low vision by providing them with the appropriate assistive technology for their needs and abilities and training them to use it effectively in daily life activities.

The training program also relied on the SETT framework, which focuses on the student, the environment, the task, and the tool. It helped identify the best assistive technology for each student and adapt it to their environment and tasks. Thus, the training program contributed to improving functional vision among students with low vision and increasing their independence and self-confidence. The continuity of the program may be attributed to the techniques used, such as using reinforcement to encourage students to use their vision in different skills and activities and providing material or verbal rewards for them when they show increasement in functional vision—using prompting to guide students on how to use assistive technology correctly and providing clear and simple instructions for them during the activities.

Conclusion :

Considering the aforementioned, the control group's lack of increase on the functional vision scale and comparison with the experimental group's results on the same scale, which changed, give us additional proof and evidence of the program's effectiveness and unmistakable contribution to improving functional vision. The fourth hypothesis' findings revealed no differences between the post- and follow-up measurements of the experimental group's kids on the functional vision scale for visually impaired kids and its sub-dimensions. This is another sign that the program's effects are still being felt.

In addition to children's motivation and desire, as well as their feelings of happiness and pleasure during the sessions, this can be attributed to the child needing to use functional vision in every small and significant aspect of his life's diaries. It is also known that the repetition method helped the child learn the necessary skills and retain them in Memory. One of the most effective strategies for consolidating learning is repetition, and the evaluation techniques used both during and after the session's implementation helped to ensure that the skills were mastered before moving on to a new objective in the following session.

Limitations:

This study has several limitations that must be recognized. The research sample is the first limitation. Only students who were partially sighted were included in this study. The response rate was relatively low, and all the participants were chosen from Buraydah, Saudi Arabia, the only city used. Our results are thus less applicable to different circumstances, such as other parts of the country. Another limitation is that this study examined the extent to which teachers follow the SETT framework guidelines when selecting and using AT; as a result, it is outside the purview of the current study to look at different approaches and standards.

Recommendations for Future Directions :

The current study reached the following recommendations:

- Offering training and rehabilitation sessions for staff members at blind centers to keep them up to date on advancements in enhancing and growing functional vision for the visually impaired.
- Leading those who work with visually impaired students and educating them on the value of training and increasing functional vision to develop their talents and practical skills.
- Explain the importance of using visual remains and improving functional vision for visually impaired children and their families, as well as the importance of this in learning and their daily lives.
- Using assistive technologies to develop life skills helps the visually impaired become more independent, enabling them to enter the workforce and boosting their economic empowerment.
- The necessity of utilizing assistive technology in rehabilitation and empowerment initiatives for people with disabilities in general and for those with visual impairments in particular.

Considering multiple variables, Additional studies will be carried out to enhance functional vision in visually impaired students.

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