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'*Make A Change*': A Comprehensive Synthesis of School-Based Interventions for Teaching Environmental Adaptiveness, Conceptual Comprehension, and Collaborative Learning to Elementary School Children with Visual Impairments

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ABSTRACT

The spectrum of visual impairment is broad, ranging from low vision that may require glasses to total blindness. Several attempts have been made to address visually impaired children's distinct needs, however, in isolation. A systematic literature review on current, school-based practices on VI children's needs yielded a unique, comprehensive synthesis of thirteen evidence-based activities and adaptations designed to help VI children in their learning experience in mainstream schools. The proposed intervention program ('*Make A Change'*) aims to address and serve a combination of three pivotal areas of VI students' needs, namely, motor, cognitive, and psychosocial needs, by integrating activities embedded in school curriculum ranging from environmental adaptiveness, to conceptual comprehension, and peer collaboration. Activities targeted to enhance environmental adaptiveness focus on strengthening VI children's orientation and mobility, including their ability to navigate safely through the school environment and respond to emergency procedure practices successfully. Spatial awareness expands through the heightening of the other senses via blindfold activities, while sports activities aid children's motor skills and confidence with health-related fitness. Conceptual understanding of quantity, quality, and physics is enriched by 3-D interventions using basic perceptual skills such as touching, tracking, and discriminating between symbols. Lastly, collaborative learning with the use of computer technology encourages coordination as well as communication among students. Activities like treasure hunt and interacting with an audio-based computer program help VI children practice their collaborative problem-solving abilities, computational thinking skills, basic programming abilities, and social competencies. Recommendations for teachers and school authorities follow the strengths of the intervention.

keywords: visual disabilities, mainstream schools, orientation, computational skills, collaborative learning

1. Introduction

According to the University of Cambridge Accessibility and Disability Control Centre (n.d.), visual impairments (VIs) are defined as the loss of sight that cannot be corrected using glasses or contact lenses. Individuals with VIs are generally divided into two main categories: partially sighted and blind. Partially sighted suggests that the level of the person's sight impairment is moderate, while being blind points to the direction of the impairment being severe enough for the person not to be able to see at all; numerous activities that take sight for granted are therefore impossible. The Centers for Disease Control and Prevention (2022) estimate that 7% of children in the United States experience variations of visual impairments and 3% are diagnosed as blind or visually impaired.

The presence of visual impairments in children can have a substantial effect on their overall growth and well-being (Ghaderi et al., 2018). Individuals with VIs are at greater risk for poor mental health (Demmin & Silverstein, 2020), with VI teens scoring significantly higher in measures of obsession-compulsion, hostility, paranoid ideation, melancholy, and depression than normally sighted peers (Garaigordobil & Bernarás, 2009). Females with VIs also score significantly higher than males on the above measures and lower on measures of self-esteem and self-concept. Individuals with VIs demonstrate poor self-rated health, less ability to rely on friends, and increased loneliness (Demmin & Silverstein, 2020), while they struggle with collaboration, socialization and having to work with others (Thieme et al., 2007). Individuals with VIs also experience fatigue more often than normally sighted people (Schakel et al., 2019) and tend to be more accident-prone (Manduchi & Kurniawan, 2010).

Visual impairments are attributed to both congenital and acquired causes. Visual impairments of congenital origin pertain to anomalies or irregularities that are present at the time of birth (de Paula et al., 2015). Genetic disorders, such as Down syndrome or albinism (MEPEDS, 2009), as well as developmental structural abnormalities, such as congenital cataracts, glaucoma, and optic nerve hypoplasia, can impact children's vision (Ghaderi et al., 2018). Infants born preterm may experience visual impairments as a result of inadequate eye maturation (de Paula et al., 2015). Partial or complete vision loss may also arise postnatally due to infections acquired during pregnancy (Ghaderi et al., 2018), including rubella or toxoplasmosis as well as ocular injuries or traumatic incidents (Schellini et al., 2009). Medical conditions, such as untreated ocular manifestations of diabetes or juvenile rheumatoid arthritis (de Paula et al., 2015) or ocular disorders, such as retinopathy of prematurity and amblyopia (Ghaderi et al., 2018), can affect visual acuity. Lastly, neurological disorders, including cerebral palsy or brain tumors (Ghaderi et al., 2018), may impact the brain and visual pathways as well as disrupt the normal processing of visual information (MEPEDS, 2009).

1.1. The Purpose of the Program and the Methodology of the Literature Review

While several attempts have been made by researchers to attend to VI children's physical or cognitive needs (Cox & Dykes, 2001; Miyauchi, 2020; Morelli et al., 2011; Thieme et al., 2017), most practices are designed to address a single skill or goal. The present intervention program ("*Make A Change"* - MAC) constitutes a comprehensive attempt to address three fundamental areas of developmental needs experienced by children with a sensory disability such as visual impairment: *physical and motor* challenges while navigating safely in the school environment, *cognitive* requirements necessary for enriched academic learning experiences, and *socioemotional* demands for connectedness and collaborative learning.

The methodology used included a systematic review (Snyder, 2019) of the extant literature related to practices for visual impairments currently implemented in schools. Frequently used databases (APA PsycInfo, APA PsycNet, Google Scholar, PubMed, and EBSCO) were searched for evidence (primary research articles published after year 2000) that fit pre-specified methodological criteria used for inclusion/exclusion, such as purpose or research problem, originality of the methods, use of up-to-date technology, as well as effectiveness of the intervention and internal validity of the study. Information was collected and extracted from each article, and a consensus was reached among researchers about thirteen focused, technology-based (where applicable), and with a strong evidence base practices and interventions. Selecting, synthesizing, and organizing the activities into a curriculum-based program constituted a complex endeavour requiring multiple revisions to safeguard the robustness of the synthesis product.

By using a synthesis approach, the three pivotal areas of VI children's needs are attended to in a comprehensive and systematic manner. More specifically, MAC intervention program comprises thirteen activities embedded in the curriculum, to be implemented throughout the academic year on a daily and weekly basis, during class instruction. Interventions areas are coded as *environmental adaptiveness* in the classroom and school premises, aiming at honing VI children's fine and gross motor skills and space awareness; *conceptual understanding*, aiming at promoting agency over learning and comprehension of subject matter following learning outcomes; and *collaborative learning and communication*, aiming at securing a sense of connectedness, inclusion, and accountability over personal relations, as supportive peer relationships are fundamental for mental health and well-being.

Finally, the program seeks to establish and incorporate an empowering collaborative culture between VI students, their teachers, and the school support systems, setting clear outcome-oriented goals, as well as propose essential classroom accommodations to be implemented during instruction.

2. *"Make A Change"* Intervention Program Activities

2.1. Environmental Adaptiveness

Orientation & Mobility Training. Orientation training is an activity that aims to teach VI children how to safely navigate the school environment and get through their everyday school life safely (Cox & Dykes, 2001). Children with impaired vision are typically considered accident-prone as opposed to good sighted children (Manduchi & Kurniawan, 2011). The training helps VI students develop a solid understanding of the environment, as well as skilled abilities to move within it, such as perceptual and mobility skills, environmental knowledge, and decision-making (Malik et al., 2018). An O&M evaluation and training would be required, for example, in the case of transitioning to a new school, or a sudden change in visual ability (Malik et al., 2018). It is also encouraged for the family of the VI child to facilitate the continuity of O&M learning after school hours, implemented in daily living, through activities developed by the instructor and expert (Malik et al., 2018). Orientation training also maximizes safety as VI students learn to move around the school premises in a safe, graceful, and efficient manner (Goldschmidt, 2018), while also honing self-reliance by navigating independently without teachers' assistance (Cox & Dykes, 2001; Wei et al., 2022).

During orientation training, children are taught where landmarks are, for example the library, the bathroom, and main school offices. VI students also familiarize with the layout of the classrooms and common areas like the gym, the library, and the cafeteria (Cox & Dykes, 2001). The landmarks are used like reference points for the VI students to navigate safely throughout the school. The instructor provides a set of planned and clear instructions and then practices moving around and exploring the school environment along with the VI students (Malik et al., 2018). This training also incorporates emergency procedure practices, as it might be particularly challenging for a VI student to get through an emergency (e.g., fire and earthquake drills). It is strongly recommended for the O&M training to take place once at the beginning of the academic year, however, it may be repeated on several occasions where necessary.

Find the Shaker. The Find the Shaker activity aims at improving VI children's perception of distance, purposeful movement, and environmental adaptiveness skills, by familiarizing themselves and getting comfortable with the environment around them. Through the use of hearing, and via music techniques, sound localization and auditory discrimination skills are honed in a positive and fun context, making them more likely to also be used outside the school environment. The activity takes place in music classes (Coleman, 2017).

In the Find the Shaker activity, the teacher hides an egg shaker instrument (maraca-like) inside the classroom, for example under a table or on a desk (Coleman, 2017). Students are told they have to walk around the room in order to find the egg shaker. During the activity, the teacher remains in the room and plays a drum: when the student is approaching the egg shaker, the teacher's drum gets louder to indicate that the student is close and encourage the already taken direction. If the student is far from the egg's hiding spot, the teacher's drum gets softer, to indicate that the student needs to change direction. Students are guided by the audio cues and when they realize they are finally near the egg, they begin to search the area for it.

Pet-N-Punch Activity. According to Morelli et al. (2011), Pet-N-Punch activity encourages children with VIs into physical activity, as often physical training and exercising proves challenging for people with reduced vision. The present activity helps children improve their reflexes as well as performance of both the dominant hand and the non-dominant hand to even out. The game falls under the category of exergames, that is, technology-based physical activities that require large motions from the players, therefore it is effective in keeping VI children active while enhancing their motor skills. Bao et al. (2021) also found that exergames help VI children enhance their task- and scheduling-self-efficacy, their psychological well-being, and quality of social opportunities among children. When implemented and evaluated at a developmental sports camp for VI children in New York in 2010, the Pet-N-Punch activity proved a highly enjoyable game among the participants (Morelli et al., 2011). This was assessed using the Physical Activity Enjoyment Scale (PACES), including questions such as "It is no fun VS It is a lot of fun," and "I feel bored VS interested." The enjoyment factor is of great significance, because as Morelli et al. (2011) suggest, a desire to play is a prerequisite to determine long term health benefits of the game.

The Pet-N-Punch activity closely resembles the popular Whac-a-Mole game, where children whack a small plush toy when it pops up. Children have an electoral game station that has a farmer character as the instructor. The purpose of the game is to help the farmer rid the rodents off his farm. Carrots are the currency. There are rodents and cats - students have to hit the rodents on the head in order to earn carrots; if they hit the cats, they lose the carrots. Audio cues guide the students to differentiate between rodents and cats, which makes for great audio feedback for children with VIs. The action is performed by the student by using the popular Wii remote in a hammer like fashion. The student holds two remotes, one on each hand, to better manage the rodents appearing on both left and right sides. Children recognize which side the rodent appears due to audio cues being played from either left or right, and also through vibrations from the respective remote. Rodents have an audio cue that goes for 1.5 second and cat cues that go for 0.5 seconds. They are given different audios when they successfully hit a rodent or if they happen to hit a cat. VI children may engage in the game during weekly PE classes.

The Blindfold Intervention. The Blindfold exercise is designed to help VI youngsters improve their movement, senses, and communication skills (Roberts & Ardito, 2007)**,** as a response to the requirements of VI children who often struggle with mobility and socializing. Their senses, including touch, hearing, and spatial awareness are improved (Willings, 2019), as they practice them to become more aware of their surroundings and more sensitive to changes occurring within it (Malik et al., 2018).

The activity involves children playing a soccer-like game with a ball that has a bell or buzzer while blindfolded so that they would not depend on their eyesight. Students are separated into groups (both groups are blindfolded) and utilize a ball with a bell or buzzer to attempt to prevent the ball from crossing the goal line. The first team to score three goals wins. Players must interact in order to coordinate their moves and attain their objectives (Roberts & Ardito, 2007), which helps gain confidence in their motor skills and feel at ease with communicating and engaging in interactions with other players (Morelli et al., 2011). This further helps create an inclusive and friendlier environment for all students (Roberts & Ardito, 2007)**.** The intervention may take place during PE classes (for about 45 minutes) and students need to be monitored by a certified PE instructor.

2.2. Conceptual Understanding

Spot the Difference. Willings (2019) proposes numerous activities that help VI students enhance their conceptual understanding by improving their skills to read tactile graphics. The Spot the Difference game aims to expand students' basic perceptual skills, such as comparing, tracking, and discriminating symbols that look alike. VI students learn basic concepts such as far, near, next to, beside, above, below, overlapping, and parallel.

Spot the Difference is a familiar activity, where the player is asked to look at two almost identical images and spot the differences between them within a specific timeframe. In this game, the student is presented with two very similar tactile graphics. Tactile graphics include models, 2D symbols, solid embossed shapes, outlines of objects, and raised line drawings. VI students are challenged to use their sense of touch to determine the differences between the two graphics as fast as they can. They are required to systematically scan the whole graphic, while being encouraged to use a consistent pattern to explore it and to select a reference point to determine when its entirety has been explored. The activity is a useful instructional tool during a science or geometry class.

3-D Model Intervention. The 3-D model activity helps VI students gain a deeper understanding of the material being taught and makes it easier for them to maintain focus throughout the lecture (Cox & Dykes, 2001). The three-dimensional models are tactile representations of various forms and objects related to topics being discussed in class. The technique of creating items having raised or textured surfaces that can be explored by touch (before and during class) is referred to as "tactile 3D printing", a procedure that requires the use of a 3D printer.

The implementation of tactile 3-D printing technology expands VI students' educational experience across a diverse range of school subjects, including science, mathematics, social studies, and art (Chen & Chang, 2018). Students may generate three-dimensional models of molecules to acquire knowledge about chemistry, investigate three-dimensional maps to gain insight into geography, or fabricate sculptures and art pieces in art classes. Additionally, when tactile objects and equipment are used in class, whether for an experiment or during an activity, teachers are encouraged to introduce the tactile objects to VI students prior to the activity; this way, VI children will be better able to concentrate on the concept being taught (Cox & Dykes, 2001). VI students' sense of spatial awareness, spatial orientation, and comprehension of the spatial interrelationships among objects and their surroundings can also be enhanced by exploring three-dimensional models (Cox & Dykes, 2001; Fortuna & Vandermolen, 2021). Engaging in tactile 3-D printing activities also helps cultivate creativity, innovation, and problem-solving abilities as VI pupils design and fabricate their own three-dimensional models (Cox & Dykes, 2001). In this inclusive classroom environment, all students engage in hands-on learning experiences (Fortuna & Vandermolen, 2021) that foster teamwork, collaboration, and communication among members, as they need to collaborate and exchange their thoughts regarding the designs (Cox & Dykes, 2001).

Experiential Learning. Experiential learning is an innovative approach to education that entails practical and participatory learning activities aimed at enhancing comprehension and retention of information by rendering abstract concepts more tangible and comprehensible (Jones et al., 2006). Through active participation in tactile experiences and environmental exploration, VI students gain a more profound appreciation of their surroundings and become self-reliant as they learn to acquire knowledge and interact with the environment in a self-directed manner (Wild et al., 2013). Students with VIs also develop critical thinking, problem-solving capacities, and communication skills in both science and history classes (Wild et al., 2013).

Experiential learning activities for science education may include field trips to science museums or natural reserves which offer VI students practical opportunities to comprehend scientific concepts and develop an appreciation for the environment (Jones et al., 2006). Educational excursions to a nature reserve could entail exploring the various textures of tree bark or discerning the aromas of diverse plants to comprehend the significance of sensory perception in animal conduct. Experiential learning activities may also enhance understanding of history among children with VIs by rendering it more tangible and relatable (Lumadi & Maguvhe, 2012). Students may explore historical artifacts and documents in the form of tactile materials (raised line diagrams or 3D models), such as examining an ancient coin by discerning its shape and texture, or peruse historical document by discerning the raised letters of the text (Rosenblum et al., 2019). Storytelling and role-playing activities can also help bring historical events to life, for example, reenacting a historical occurrence, such as the signing of the Declaration of Independence, to enhance their comprehension of the event's context and importance (Jones et al., 2006).

Boiling Water Science Activity. The Boiling Water activity allows for a strong conceptual understanding of physics, to be implemented in physics classes (Wild et al., 2013). The field of science education fosters the development of VI children's tactile inquiry and fine motor abilities. Teachers may stimulate critical thinking and scientific inquiry by having students describe and analyze tactile observations of thermal insulation (Kizilaslan et al., 2019), further enhancing their spatial awareness and alternate sensory experiences through touch. Scientific reasoning is also practiced via conversations and by formulating conclusions.

The Boiling Water activity begins with securing a sizable jar and a glass bottle onto a wooden surface (Wild et al., 2013). The large jar contains a glass bottle. The glass bottle is insulated at its base using styrofoam pieces within the larger jar. Upon receipt of the exercise items, each student is allotted five minutes to conduct a tactile examination. VI students are granted additional time. They are then asked to test the insulating properties of double-paned and single-paned materials using hot water. Following the distribution of Braille and large type worksheets to each student, the teacher assists students with the process of filling sterilized jars with hot water. VI students need to use a talking thermometer to determine the water's initial temperature. Then they put lids on the jars and the containers, and wait 15 minutes before removing them. Blind students utilize a Braille slate and pen to answer POE worksheet questions. After 15 minutes, the jars are opened and the talking thermometer determines the water's temperature.

Sound-Based Science Activity. Sound experiments provide an innovative approach to comprehending scientific concepts in science classes designed for students with VIs (Fitzpatrick, 2007; Kizilaslan et al., 2019). By employing sound experiments, teachers make science classrooms more accessible to VI pupils allowing them to engage with scientific topics using their aural senses (Miyauchi, 2020).

The use of sound as a sensory input offers an alternative approach for students to investigate and evaluate the characteristics of various objects or substances (Fitzpatrick, 2007). Through experiments involving the measurement and comparison of pitches or volumes, students can explore the auditory properties of various materials (Kizilaslan et al., 2019). Examples include investigating the relationship between the pitch of a musical instrument and its length or the tension of its strings, or investigating the impact of distance or the presence of barriers on the volume of a sound (Fitzpatrick, 2007). Teachers may help students listen, evaluate, and analyze sound experiments. VI students can therefore strengthen their comprehension of acoustics and gain insight into the functioning of sound in diverse settings. Sound sensors and audio analysis software may also improve learning for VI pupils (Kizilaslan et al., 2019).

Scent-Based Science Activity. Activities based on scents provide an engaging and inclusive approach to science classes (Miyauchi, 2020). The olfactory sense offers an alternative method for VI students to discern and categorize objects, chemicals, or elements based on their distinct aromas. By integrating fragrant materials or substances, educators can facilitate interactive experiences that promote scientific inquiry (Miyauchi, 2020). These activities provide students with the opportunity to investigate various scents and classify them according to their similarities or differences (Wild et al., 2013). For example, VI students practice their ability to discern and contrast the aromas of diverse fruits, flowers, or ordinary household articles. Students also have the opportunity to explore the changes in scents over time or under varying conditions, which facilitates their comprehension of concepts such as chemical reactions and evaporation (Miyauchi, 2020).

Feely Bags. The goal of Feely Bags is to help VI children enhance their sense of touch, by teaching them concepts such as quality and quantity during sciences classes (Le Fanu, 2018). More specifically, the activity strengthens children's understanding of concepts such as "smaller", "bigger" and "same", while also assists them to conceptualize and describe texture and the size of an object. VI children's tactile discrimination skills are exercised and therefore enhanced (Singhania, 1992).

Feely Bags require filling small cloth bags with little daily items, like beans, rice, etc. (Le Fanu, 2018). They are created in pairs of two (e.g., two bags of rice, two bags of beans). Once filled, they are stitched up in order for their contents not to spill. The instructor randomly mixes the bags around and hands them to the VI student. The procedure that follows is simple: through touch, the child must recognize the bags that contain the same item and match them together (Le Fanu, 2018; Singhania, 1992). The instructor can try this activity first with 6 bags, gradually increasing the number of bags. The activity can be taken a step further by the children attempting to sort the bags based on their shape, size, and texture, from smaller to larger, or from softer to rougher. Although this activity is created primarily for students with VIs, it can also be beneficial for normally sighted students (with their eyes closed), further enhancing their fine motor skills and tactile sensitivity.

2.3. Collaboration – Communication

Treasure Hunt Activity. Collaborative work is a major challenge for children with VIs, as they often feel socially neglected or rejected by their classmates, making their social lives in school difficult (Salleh & Zainal, 2010). Activities that encourage and enhance children's social and collaborative skills should therefore be included in the school curriculum, as often as deemed necessary throughout the school week (Thieme et al., 2017). Collaborative problem-solving abilities, as those exercised in the Treasure Hunt game, include practicing communication, coordination, and collaboration skills, working as a team, monitoring each pair's location regularly, motivating each other, and reaching consensus together (Chibaudel et al., 2020; Rocha et al., 2023).

Chibaudel et al. (2020) proposed the collaborative treasure hunt for people with VIs. The activity resembles the popular treasure hunt game. It includes pairs of a guide and an explorer, both people with VIs, who are both equipped with a phone and headphones that allow them to communicate during the activity. The guide has a map - made of tactile lining- of the room where the activity takes place. There are 13 chairs around the room represented by foam cubes on the map, and 5 clues placed on the chairs represented by pins on said foam cubes. The map also consists of a *Cellulo* that indicates the explorer's progressive position and movement in the room in real time; a *Cellulo* is a graspable small robot developed for educational purposes for sighted people, that has recently been used for people with VIs too. The game begins with the explorer at the starting point of the room, gradually being led by the guide to the clues spread out in the room, using verbal instructions such as "take a step to the left" or "there's a chair on your right." If the explorer feels disoriented, they must work collaboratively to find a solution. Time is recorded and the game ends when the treasure is found. If it takes the pair more than 5 minutes to find a clue, then a third person intervenes and helps them find it. The third person (e.g., teacher, experimenter) is responsible for the positioning of the clues, the safety of the participants, and the moving around of the *Cellulo* based on the explorer's position in the room.

Torino Computer Program. Thieme et al. (2017) investigated how technology can enhance collaborative learning in a population of children with mixed visual abilities, ranging from blindness from birth to partial- and full-sight. Collaborative learning contributes to supportive and committed relationships, enriched social competence, a stronger sense of caring, and higher achievement and productivity levels.

Torino is an audio-based computer game aiming at teaching programming constructs and computational thinking (Thieme et al., 2007). It is based on audio-feedback and physical representations that are identified through touch. Children in pairs of two explore the program, support, and help each other, taking into consideration each other's limited visual capacities. The game uses 'instruction beads' that students need to familiarize with in order to understand their functionality. Different instruction beads include "play", "pause", and "loop". Each bead generates a specific sound that children can modify by a dial that gives them access to numerous available sounds. Additionally, the beads vary in shapes and sizes, in order to be easily identified by children through touch. The buttons and dials on the beads are easily spotted due to their high contrasting colors. Children play with the beads, manipulate and connect them, in order to create a code which generates music or a story. Children have to work collaboratively to explore this newfound technology and produce an outcome jointly.

3. General Accommodations and Support

Accommodations form a necessary part of an inclusive learning experience. In addition to the activities integrated in the MAC Intervention Program, there are core accommodations and modifications that teachers can implement across classes and at all times.

Technology-based assistance and adjustments, such as specialized software, Braille materials, or audio books, help VI students manage printed materials autonomously, thereby expanding their access to educational resources and promoting cognitive development and overall academic advancement (Malik et al., 2018). Assistive technology devices for VI students who are proficient in reading Braille can be integrated in the classroom setting. Specifically, the Braille-Note, Tiger Cub Jr. embosser (a Braille printer), and Kurzweil software and scanner are three devices that allow VI students to access curriculum materials generated by the teacher in hard-copy Braille in real-time (Farnsworth & Luckner, 2008). The Tiger Cub Jr. embosser can be utilized to produce hard copies of class materials or content to be sent directly to VI students through email, while Braille-Note instantly translates text into Braille. In addition to Braille versions of assessments, Stone et al. (2010) also proposed VI students to use large prints with high contrast details. Ojha Seema (2015) further suggests the conversion of textbooks into audiobooks as an additional means of fostering independent learning, as students will read without assistance from others (usually family members).

The seating arrangement within class should be carefully planned in order to maximize VI students' capacity to view the whiteboard, the teacher, or any visual teaching materials (Cox & Dykes, 2001). To also reduce the number of accidents among disabled students on school premises, Chen et al. (2015) proposed the implementation of barrier-free facilities, such as increased illumination intensity, enhanced color contrast on items such as warning tape at the end of each step on stairs, enlarged signs, and Braille systems for signage in different classrooms and facilities throughout the school (e.g., bathroom, library, cafeteria).

Discussions between the teacher and the VI student may also help set high expectations and gain deeper understanding of the student needs (Hewett et al., 2017). Some small gestures such as describing diagrams during lectures and writing descriptions of visual content on lecture notes may also prove helpful. Teachers could also develop a few verbal cues to signal upcoming important information in class material (Cox & Dykes, 2001).

Last, students with VIs may seek help from the Disability Support Office (DSO) (Hewett et al., 2017). The DSO's primary responsibility is to develop support plans that consist of adjustments that institutions need to implement to promote a more supportive and inclusive learning experience for all.

4. Evaluation of the '*Make A Change*' Program

The MAC curriculum, designed specifically for elementary school children with VIs in mainstream schools, offers numerous benefits and promising outcomes. For example, experiential learning has been found to motivate and inspire students, as well as encourage active participation, question asking, and engagement with their surroundings (Lumadi & Maguvhe, 2012); similarly, the Blindfold intervention promotes students' sensory awareness, spatial orientation and independent living skills (Morelli et al., 2011; Zeugner, 2017). 3-D model interventions improve cognitive and sensory skills and enhance conceptual understanding and student interest (Chen & Chang, 2018). It is essential, however, to acknowledge and address the limitations and challenges associated with the program's implementation, indicating areas and activities requiring further attention, research, or improvement to maximize the potential of this curriculum.

Experiential learning, while advantageous for VI students (Lumadi & Maguvhe, 2012), presents challenges that require further consideration. Activities like field trips or outdoor excursions may pose safety risks, potentially jeopardizing the well-being of VI students, if not appropriately supported (Reina et al., 2011). Implementing additional safety measures, precautions, and individualized adaptations are necessary in order to establish a secure and inclusive experiential learning environment for VI students. The Blindfold Intervention needs to be approached with caution, as it might unintentionally perpetuate misconceptions and stereotypes about VIs, potentially limiting understanding and empathy rather than fostering genuine comprehension (Jones et al., 2006; Mukhiddinov & Kim, 2021). Additionally, empirical evidence has shown that people without Vis, when blindfolded during physical exercises, find it difficult to translate verbal commands into moving the appropriate body parts or towards the right direction, as they are used to rely mostly on their vision for such activities (Zeugner, 2007).

Regarding the Spot the Difference activity, nationwide empirical research conducted in the United States and Canada revealed that students generally had a positive attitude toward tactile graphics, however, they occasionally faced challenges due to their complexity and density (Zebehazy & Wilton, 2014). It is therefore vital for teachers to be mindful of the difficulty levels of tactile graphics and materials introduced in the classroom. Moreover, Orientation & Mobility Training may bring forth feelings of vulnerability, frustration, or even anxiety in VI children, particularly when navigating unfamiliar or complex environments (Jones et al., 2006). It is crucial to ensure sufficient support available to promote the mental well-being of VI students during the training process (Toenders et al., 2017). Additionally, especially in schools with limited resources and large class sizes, provision of individualized attention and guidance to VI students may constitute a challenge (Reina et al., 2011).

One of the primary obstacles in the implementation of the 3-D Model Intervention in schools is the scarcity of top-notch models (Mukhiddinov & Kim, 2021). The process of producing precise and comprehensive 3D models can be both resource-intensive and costly, leading to a limited selection of available models (Tzovaras et al., 2004). As a result, educational institutions may encounter difficulties in sourcing appropriate 3D models for different subjects, thereby restricting their potential pedagogical uses (Tzovaras et al., 2004).

In sum, it is reasonable to acknowledge that the implementation of certain activities may present various challenges, whether emotional risks, resource constrains, high costs, or safety challenges. The MAC curriculum holds great promise for elementary school children with VIs, but it's essential to be aware of and address the limitations and challenges associated with its implementation. These challenges underscore the need for ongoing research and improvement to unlock the curriculum's full potential.

5. Conclusion

This paper presented and critically evaluated the '*Make A Change'* (MAC) Intervention Program for elementary school children with VIs in mainstream schools. Touching upon various categories of activities with different goals and focuses, this program attempts to help VI children experience genuine inclusion in the wider school community, even more, be immerse in a productive and tailored-to-their-needs learning environment. The program leads naturally to more opportunities for social interactions, a sense of belongingness in the community, and the elimination of barriers and stigma (Petrovska Zimoski & Dimitrova Radojichikj, 2019). While progress is being made in recent years to include various minority groups in primary education, there are still areas for continued development to secure maximum and genuine inclusion of children with disabilities and impairments within mainstream schools.

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