

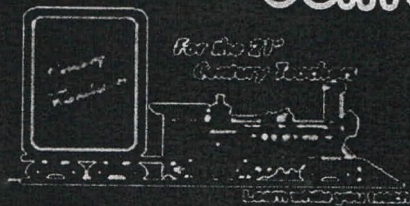
State Level Seminar

Enhancing Teaching through Innovative Technology in Education

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INNOVATION STRATEGIES IN TEACHING OF MATHEMATICS TO VISUALLY IMPAIRED

***Mrs. R. Nagomi Ruth**

A thorough review of the literature reveals that achievement in mathematics among visually impaired and severely visually disabled persons is, and always has been, extraordinarily low. There are several reasons for this unfortunate situation. The first and perhaps most important reason is that mathematics is very visual in nature. Visual reference is the basis for much of the language of mathematics, with the description of such things as direction, quantity, and shape as fundamental elements. The development of spatial and directional concepts, as well as understanding of the concepts of object permanence and conservation of mass and volume is often delayed in visually impaired children; and the student who is visually impaired must piece together information which is perceived as a whole, in its entirety, by the sighted student.

For a person who has no sight or very little useful sight, the study of mathematics is difficult. It requires considerably more effort on the part of the student who is visually disabled than does the study of fields which are more verbal in nature. Generally, in order to achieve at reasonably high levels in mathematics, visually impaired students must possess greater aptitude for the subject than their sighted counterparts. Since mathematics is difficult for visually impaired persons to learn, students are unlikely to demand more emphasis on the subject.

Barriers to Achievement in Mathematics

Common Difficulties in Learning Mathematics is the pace of learning mathematics by visually impaired children is an important issue. Their pace is comparatively 'slower' than that of sighted children. This is due to the visually impaired child's limitations in organising ideas, methods and devices used for solving the mathematical problems.

Another reason for inadequate mathematics instruction is that only a small minority of individuals who join the field of special education and rehabilitation have technical background

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in which mathematics was a major portion of their study. That lack of expertise in mathematics results in a lasting deleterious effect on the students' further education and training, and thus, it has a deleterious effect on the individual's entire life.

Insufficient preparation in mathematics also has a profound effect upon visually impaired persons. The disadvantages in daily life are numerous, including difficulties and unnecessary limitations in normal tasks of daily life as well as educational and occupational opportunities. If fundamental mathematics skills are poorly developed, then the general aptitude score will be depressed, impeding entrance into higher education or professional programs. In a modern technological society, well-honed quantitative skills are very important.

Collaborative/Inclusive Strategies

1. Adapted educational aids are a necessary component of any mathematics class. They are especially needed to supplement textbooks that have omitted tactile graphics or contain poor quality ones.
2. Math teachers need to verbalize everything they write on an overhead or blackboard and be precise with their language. If the Braille learner still has difficulty keeping up, the math teacher should be encouraged to give the student a copy of their overhead transparencies prior to class if pre-prepared or immediately after. Another alternative might be for a classmate to make a copy of their notes to share.
3. Math teachers need to give worksheets, tests, etc. to transcribe into Nemeth far enough in advance, so that the Braille student can participate with their fellow students in class - not later alone.
4. Visually impaired students should not be excused from learning a math concept because they are visually impaired: "Visually impaired students can't graph." "Visually impaired students can't do geometric constructions." Consideration should be taken into account however with regard to number of problems assigned. It is permissible to shorten the assignment, as long as the student can demonstrate competence in the content area.
5. It is very important for all students to use as many senses as possible when learning a new math concept. They need to read a new math problem, write it, listen to it, tactually explore it through manipulative, and when possible move their body and/or manipulative

through space. If it's a fractional problem involving food for example, they can even taste and eat the problem.

6. For classroom test taking, the student should be given the test in Braille (with an option for partial oral administration; for example, in the case of students with learning disabilities who need word problems read) and supplied with appropriate tactile graphics, aids, abacus, and/or talking calculator. Visually impaired students should be given at least twice the time to complete tests.

Strategies for teaching math to visually impaired:

The possibility of the learning of mathematics by children with visual impairment is often questioned by highlighting some of the areas in mathematics which demand vision. However, many such visual ideas can be converted into non-visual experiences so as to enable them to get the required learning experience. The following strategies describes various factors contributing to the learning of mathematics and also explains the different approaches in learning this subject.

- Break down the process into simple steps and ensure the child understands the importance of each step in the method.
- Explain each step verbally while demonstrating hand over hand, or hand under hand.
- Have the child say each step aloud.
- Use hands-on manipulatives within areas consisting of tactile boundaries.
- Have the child repeat key information aloud.
- Experiment working while in a standing position or sitting on a sensory cushion.
- Use fun and engaging stories to set up the problem to associate real world objects and issues with mathematical concepts. Try including the child as the character in the story.
- Use textures or raised line images/stickers in place of color printed images.
- Use bright and bold contrasting colors for background and text for low vision children.
- Repeat. Repeat. Repeat. Children learn with practice so just because your child doesn't catch on right away, keep at it each day (taking breaks will all with a positive and encouraging attitude to build confidence and self-esteem).
- Involve children in daily living activities around the home or classroom. For example, helping to put silverware away in a divided tray with a sample in each section provides practice in matching, sorting and categorizing; helping to sort different sizes of towels or different items of clothing provides additional practice with these concepts.

- Have children copy simple shapes on geoboards; later they can make their own shapes based on names or clues such as "four corners", etc.
- Use shapes, sizes, orders, patterns, planes, and eventually numbers in the real life environment (classroom, home) to teach concepts (e.g., compare the size of books to each other and to the size of tables, use corners of rooms to demonstrate angles, etc.).
- To practice positional ordering, have a student line up the rest of the children in a group, and then identify each as first, second, third, . . . last.
- A mnemonic device for remembering factors

Instructional Aids for Teaching Mathematics to the Visually Impaired:

Following is a list of examples of tools which are use by visually impaired people, or modified through easy, non-technical means.

- Braille rulers
- Braille measuring tape
- Tape measure with notches at each inch, staples at each foot
- Battery operated level indicator
- Long handled metal spoon, handle bent at 90 degrees to form dipper
- Standard plastic measuring containers with overflow holes punched out at certain levels
- Braille scales, Talking scales
- Balance scale with trays and tactile needle, for weighing liquids and small objects
- Braille thermometer, for liquids
- Talking thermometer, for liquids, air, and body
- Braille clocks and watches
- Talking clocks and watches
- Abacus
- Talking Calculators
- Taylor Frame
- Geo board
- Tactile Aids

- Braille Writer
- Tactile Geometrical Aids

Conclusion:

In summary, these are the reasons why it is so important to improve the effectiveness of mathematics education for students who are visually impaired. Mathematics are visual in nature and can therefore present many challenges for students with visual impairments. To help students gain a thorough understanding of concepts, hands on experiences with real materials should be provided. Also students need hands on experiences and to be encouraged to independently, or to the extent possible, perform math skills rather than depending on those around them.

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MODERN TECHNICAL APPLIANCES FOR VISUALLY CHALLENGED STUDENTS

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ABSTRACT

Innovation captures a grand place in the minds of students as well as teachers in the field of education. Technology has opened many educational doors to children, particularly to special children. Technology can be a great equalizer for visually challenged individuals that might prevent full participation in school, work, and the community. Most visually challenged students can and do benefit from technology in the classroom. Incorporating technology increases students motivation to learn and personalizes lessons to a student's individual needs. Even the students with the most severe and profound needs can use assistive technology to join a classroom of typical students, and their potential can be reached in ways we didn't have before. Computers are engaging and more advanced than the typical modified lesson allows. Teaching students in ways that keep them engaged and interested in the material can sometimes be a challenge. Teachers have found that technological innovations can help level the playing field for special needs students and enable these students to succeed in the regular classroom. In this paper we know about the various technical appliances available for visually challenged students to function effectively in the school setting and show progress in their education.

Keywords : Assistive technology