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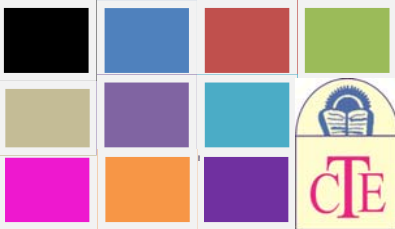
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**Including SwVI in Science Classrooms: Understanding Teacher's Concerns!****Dr. Bharti,**

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Abstract

The present paper deals with problems faced by regular science teacher while teaching science to Students with Visual Impairment in an inclusive set up. Paper presents questions or fears of science teachers gathered during visits to 6 organisations for blind and 9 inclusive schools in Delhi and NCR. The visits were made to observe the available resources for teaching science to children with Visual Impairment, teaching tactics and safety related issues during teaching learning of science and teachers perception regarding significance of teaching science to children with VI. The present paper is based on the interaction experiences with the regular science teachers teaching science to Students with Visual Impairments (SwVI), in inclusive education settings.

Key Words:- Science Teacher, Teaching, Visual Impairment, Inclusive Education

Including SwVI in Science Classrooms: Understanding Teacher's Concerns!

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Introduction

Educational environments are better when diverse students learn together...

(American Educational Research Association, 2003)

Equality of opportunities and equity-based support services are essential for attaining the utopian dream of inclusion in education where each child, irrespective of their abilities, disabilities or socio-economic background, will be encouraged to pursue their academic dreams with appropriate support. It is often emphasized in policies and legislature that all students should have the equal educational opportunities leading to no restriction in pursuing academic and career interests. Contrary to the policy recommendations, Students with Disabilities (SwD), particularly Students with Visual Impairments (SwVI) are often deterred from pursuing Science.

There is no doubt, that learning Science requires intensive use of the senses, particularly the sense of sight for making observations. The significance of sense of sight for making observations should not be the limiting block serving as agent of exclusion for keeping away SwVI from studying science. The limitations arising either due to complete lack of sense of sight or other challenges related to sight can be bypassed through appropriate modifications and accommodation, multisensory learning techniques, ICT based interventions. These approaches to teaching learning in collaboration with advancement in ICT, may lead the way for making Science learning accessible to SwVI. *With the right methods and assistive technology, the SwVI, can learn and do the same assignments as other science students (Rice, 2011).* There is no reason for a SwVI to be excluded or discouraged from studying science. *Every piece of material, instrument, or text can somehow be modified to make science*

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accessible for the blind and visually impaired population with creativity, skill, and tenacity (Winograd,2007).

Methodology:

To understand the status of inclusion of (SwVI) in Science Classroom, and to identify the problems faced by regular science teachers teaching science to SwVI in inclusive set up, informal individual interaction was held with the teachers, teaching in 9 different inclusive schools in Delhi and NCR. Inferences drawn from the response analysis of the informal interaction are presented below--

Findings:

1. 44% of Regular teachers were found to be against the idea of inclusion of SwVI in mainstream schools.

When SwVI have well equipped Blind schools with well trained teachers and caring staff, it is not fair to burden regular teachers with this extra responsibility.

2. 86% teachers were of opinion that Special educators should be given the responsibility of SwVI.

Inclusion is fine, they will have sighted friends, will feel part of society. But responsibility of teaching and making accommodations for SwVI in school should be primarily of the Special teacher.

3. 56% teachers were aware of some (max. 3) pre- requisite skills required by SwVI for academic success. 44% teachers replied they have no idea at all about the pre-requisite skills.

When I came to know from Principal, that I have new admission this year in class and the child is Blind, I felt terrible; thinking how I would teach him. I would have to be after him all the time. But to my surprise the child was well trained to navigate his way using white cane. He was proficient in reading writing in Braille and also in the use of computer. During science activities I noticed, he could very efficiently use his olfactory and tactile senses to make observations.

4. No regular science teacher was found to have training on how to teach SwVI. It was found that there is little communication of successful teaching strategies and resources available for teaching science to SwVI.

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When for the first time I had SwVI in my class, to my surprise student has IQ at par with his peers, he was hard working and sincere. Seeing his dedication, I tried my level best, but failed to explain visual concepts, as I was not aware of those tactics, using which visual concepts can be taught to SwVI. I wish our school management or government take some initiative to train regular teachers for teaching Children with Special Needs.

5. 90% teacher had positive attitude towards collaborating with experts from Organizations for Blind. Collaborations helped teachers to learn few appropriate instructional methods for teaching science to CwVI.

On advice of expert from NAB, I started using real objects for supporting my explanations, and allowed my SwVI to explore it through touch or smell (where ever applicable). This strategy benefited not only SwVI but everyone in class.

6. Only 12% teachers said they explored internet to search for teaching strategies used to teach SwVI.

Even after several repetitions, I could not explain certain concepts in science like, shadow formation, dispersion of light, oscillation etc. to SwVI in my class. And every time I fail to do so, the child would politely say its ok Ma'am and would go back to his seat. This was killing, the teacher inside me. I felt so ashamed. I also consulted senior teachers in my school, but no body has idea how to teach SwVI. Then one fine day I took out time from my busy schedule and searched internet. It was of great help. Now when the child says, I understood Ma'am, its fills my heart with immense pleasure and pride.

7. 63% teachers were of opinion that SwVI should not be included in science laboratory.

Even if, we take SwVI in laboratory, what could they do there? They can't observe the results or changes, they can't participate actively during experiments, and they can't do any thing independently. They will just stand in one corner, what's the use then.

8. Teachers were found to have no knowledge of safety measures to be taken with SwVI in Science laboratories.

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We have acids, harsh chemicals, heat, electric devices, glass wares etc. in laboratory, how I would manage everything in presence of SwVI, safety of all students including SwVI, is a big concern for me.

9. Only 10% of teachers said they have read CBSE guidelines for Evaluation of SwVI for both written and practical examinations.

We follow CBSE guidelines for evaluation, but who has the time to read all those details; I consulted teacher who last year evaluated SwVI. She briefed the main points, which were enough, for me.

During visits the regular science teachers shared their concerns regarding teaching science to SwVI in inclusive classrooms. The paragraphs below present the shared concerns in the form of questions. The answers to the questions were prepared post visits.

Ques: Why CwVI should be burdened with science when they can easily make their carriers in other subjects who don't rely heavily on vision?

Solution: Science should be within the reach of all children including children with special needs. (NCF, 2005, pp 46-48)

It is about respecting one's decision and wish to study science. All students must get equal opportunity. Science is just not a subject; it is a way of life. Science allows one to question; it gives reasoning of why we practice certain things in our life. Science helps student to explore world around them. Science has many students –centred benefits like development of cognitive skills, development of numerical and spatial abilities. It is essential for personal growth of students.

Ques: What are the resources available for teaching science to CwVI?

Solution: We have enough resources in and around school than we use. Real objects like leaves with different venation can be shown to student to teach concept of venation in leaf. Teaching learning material can be prepared by teachers using waste material, fabric paint, pipe cleaner and glue gun. Apart from real object and TLM, technology can be optimally used to teach CwVI. These are as follows—

1. For reading and writing text

- Human audio recorded books
- Braille
- Optical and electronic magnification tools (for low vision students)

- Computers with screen magnifiers
- Computers with screen readers
- Digital accessible information system (DAISY)

2. Science specific activities

- Tactile scientific diagrams such as animal cell, cell division etc.
- 3D models such as human skeleton, atoms
- Braille version of periodic table
- Liquid level indicator
- Talking digital scale
- Talking digital thermometer
- Light probe
- Colour probe

Ques: What are the general teaching tactics a teacher must adopt while instructing SwVI, in inclusive classroom?

Solution: Given below are few suggestions that a science teacher could adopt to enrich learning experiences of CwVI

- Always give clear instructions. Avoid saying this, that, here, there. Teacher can say Aman answers this question instead of pointing towards a child and saying ok, you answer this question.
- Verbalize all that is written on blackboard.
- While giving instruction do not assume that student has knowledge of seemingly common items.
- While showing models explain the relative sizes of actual object. For example, while showing model of plant cell, inform the student that plant cell is actually very small in size and it cannot be seen by naked eye; what's in their hand is the enlarged version of the same.
- Use comparisons to indicate size and scale. For example, a cave would be as big as this room.
- Use Braille labelled model and tactile diagrams (where ever possible) to explain pictures in text books.
- Use real objects to explain if possible.

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- When presenting teaching learning aids, allow the student to smell, touch, taste, and hear the aid where applicable. (multi sensory teaching)
- Devote some time while explaining model and other teaching learning materials (TLM), do not rush as concept learnt properly remains forever.
- Size of TLM should be such that it can be easily hold by CwVI. It should not be too small or too big, otherwise child would not be able to explore and make sense easily.

Ques: How specific visual concepts can be taught to CwVI?

Solution: Multi-sensory approach should be used by teacher while explaining to CwVI. For example, CwVI may not be able to observe the colour change but they can feel the effervescence, temperature change and could smell, if any change in odour takes place. According to Trowbride, Bybee & Powell, (2004), “Students with visual impairments learn through sensory channels other than vision, primarily hearing” .

Teacher can relate concepts to real life situation to enhance their understanding of visual concepts.

Ques: Graphs, diagrams and pictures are essential part of science teaching and learning. How SwVI can be instructed for the same?

Solution: Velcro Board and Wikki Stix can be used to draw graphs and pictures.

Velcro board is a flat board which has one portion of the fabric attached to the board while the other part remains independent to allow the designing of various graphs on the board.

Wiki stix are strips made of wax and yarn. They are soft and easy to shape. They can stick onto board, bench and even on sheet of paper. Strips could be positioned straight, curved, folded to display any diagram.

Ques: Safety is the biggest challenge while involving SwVI in laboratory activity. How can I deal with it?

Solution: Safety is a concern for every student and is not specific to SwVI. We can say SwVI may become more vulnerable due to vision challenge. Hence, teacher should orient student about placement of chemicals, water source, heat source and sitting arrangement. To improve general safety in science laboratory, few precautions could be taken, such as:

Precautions related to Chemicals –

- Chemical should always be kept organized in the same place.

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- All Chemicals should be labelled in Braille.
- Hazardous chemicals should be labelled in different textural form like sandpaper. CwVI must be made aware of this.
- Syringe with tactile marking can be used to measure chemicals safely.

Precautions related to Glass apparatus –

- Glass apparatus could be replaced with plastic apparatus if possible.
- If using Glass objects, it should be placed in stands or clamps to avoid unintentionally knock over by students.

Precautions to be taken while dealing with heat –

- Hot plates can be used as an alternative to Bunsen burners.
- If using Bunsen burner, place a tripod stand around the burner or wire gauze to identify the position of the flame.
- Using match stick is one of the basic skills that every child should possess including SwVI. The use of match stick can be made safer by using long handled matches so that student's hand is away from flame as suggested by *Dion, Hoffman and Matter, 2003*.

Other desirable safety measures –

- Pathways in laboratory should be free of any obstacle
- Doors in laboratory should be either closed or open to avoid bumping of CwVI
- Floors should be clutter free to avoid any unexpected obstacle during the movement of CwVI
- Electric devices should be placed over the raised platform with their connecting wires close to the outlet and the cord gather and secured in place to avoid any hindrance to the student's mobility around the devices.

Ques: How these practices can be extended to inclusive classrooms?

Solution: Teaching learning material (TLM) prepared for teaching SwVI may be used while teaching the students with autism, hearing impaired as well sighted students. CwVI can be called in front to feel and observe the object while rest of the class can learn by seeing the same.

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Precautions suggested for SwVI while performing activities in laboratory can be extended to other students.

As home assignment, peers of SwVI can be asked to prepare models and tactile diagrams of the related scientific concept. This way, other students of the class will learn by doing it and the same material can be used by SwVI as a learning source.

Conclusion

In inclusive set up, it becomes a great challenge for teacher to recognize and respond to student diverse needs and abilities and encourage all students to participate fully in science learning. Teachers play a vital role towards the overall development of students. Implication of appropriate instruction and learning resources in inclusive science education with an emphasis on hands on activities and real-life experiences could yield benefits for students with disability in facilitating their everyday functioning in the context of functional academic skills acquisition.

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