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Teaching techniques for blind students and possible improvements

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Abstract
The study is based on the teaching and learning strategies Molefi Senior Secondary School in Botswana adopts to support students who are blind. The interviews, documents and observations were used to collect data. The data was broadly analysed using descriptions. The research study established that there are a variety of pedagogical practices used to support students in the teaching and learning processes to accommodate students who are blind. It is recommended that the school casts its net even wider to embrace more key stakeholders like parents. The school should further consider more participatory and exploratory teaching and learning styles. This makes it difficult for visually impaired (VI) or partially sighted students included in regular classrooms to learn the concepts. Blind students on the other hand, have no visual input at all. The results of the data obtained via interviews and observations revealed that VI students need instructional and environmental accommodations to learn science.

Keywords: Improvements, science teaching, blind

Introduction
Inclusive education of students with visual disabilities, particularly with respect to sciencelearning activities, can be a challenge for teachers in the regular classroom. This is because traditional teaching mostly relies on visual resources that are not accessible to blind students, and are little illustrative for those with weak vision. These resources are widely distributed because they are low cost; however, their use requires the learner to develop additional skills in order to interpret the information they try to convey, and certainly are not attractive for students who are sighted. This characteristic makes them non-suitable for their use in inclusive classroom environments. It then becomes important the development of novel resources specially designed for inclusive education. The areas of science and mathematics have traditionally been inaccessible to students with visual impairments. Fields such as chemistry, physics, engineering, biology, and mathematics are common with visually-presented concepts and information. A literature search for existing studies on instructional materials and strategies for teaching science to VI students has revealed that there is a severe shortage in this area of study.
This study is going to investigate how teachers teach science to VI students. VI students are not necessarily learning disabled; they probably just need accommodations and more time to learn the same things as their sighted peer do. If they are given this opportunity, they can learn anything and achieve the same success as their sighted peers do. Since they are a part of society, they have the right to have equal opportunity for education. To provide an equal opportunity of education for VI students, there must be some accommodations in learning environments and in the curriculum materials.
It also means the absence of capacity to see after correction, which may result in reduced performance in most aspects of life. The impairment has a lot of implications that range from increased dependence, isolation from the social mainstream, reduced benefits and opportunities available and increased time of completion of assigned tasks (Thurston, 2010, Thurston, Thurston & McLeod, 2010). To do this, there must be relevant and enough information about teaching strategies, VI students' needs, learning environments, etc. Today, one can find a great deal of research about science education and teaching science to regular and learning disabled (LD) students.

VI students are as important as all the other students and people in the community. Therefore, it must be educators' responsibility to investigate every aspect of teaching and learning process for VI students to improve the educational settings they are taught, to improve the instruction for VI students, and to improve the VI students' success in becoming part of an educated society. Although there are studies investigating these issues for VI students, they are not sufficient in number and most of them are outdated. The terms handicapped and disabled should be identified clearly in order to serve these students better. The term impairment if often used synonymously. A handicapped person may have problems in interacting with the environment due to his/her disability or impairment. A disabled person is not necessarily handicapped in all environments. A disabled person may be handicapped if the physical disability causes problems. For instance, a person who has lost one of his/her legs or arms may be handicapped in a swimming contest but he/she, using an artificial leg or arm, most probably will have no handicap in a classroom competing against his/her classmates. Buffer and Scott (1986) described VI students as handicapped by their difficulty or inability to see. The following terms are frequently used for visual impairments: low vision, partially sighted, functionally blind, and blind (near or totally). Partially sighted students have limited vision and can see to some extent with modifications and corrective lenses. Some functionally blind students can move around classroom safely, and others may require accommodations to do so. Near blindness or total blindness are included in the blind category. These students have severely limited vision. They cannot see. Text entered on the Braille keyboard can be sent out the port in standard ASCII format. ASCII text coming in through the port can be immediately spoken by the Braille'n Speak. The Braille'n Speak has long been used by blind students and professionals as a note-taking device, and more currently, as a speech synthesizer for a computer. In addition, this study is a small scale research in terms of data collection and its purpose. Therefore, this study will be focusing on science teaching to VI students. Since science is sometimes abstract, it is often difficult to teach, and depends mostly on visual instruction. Challenges VI students may face at schools, special settings and adaptations required in learning environments, and characteristics of VI students were investigated.

Methodology

Since the purpose of the study is to describe and examine the teaching and learning strategies the school adopts to support students with vision impairment, a qualitative design was adopted. The design also helps in the identification of circumstantial and setting factors as they relate to the phenomenon under study. In addition, the design engages a variety of approaches mainly to prevent inconsistencies.

Theoretical Aspect

Most students who have visual impairments have cognitive abilities equivalent to their peers but there seems to be a large gap between teachers' beliefs about students' capabilities and instructional resources available to help these students realize their full potential. There is evidence that students with disabilities are often not given the same opportunities to experience science as non-disabled students. They emphasized the necessity for a one-on-one tutorial as the primary mechanism for learning. Including students with disabilities in regular classrooms requires some adjustments in the learning environments and in the instructional techniques. In general, successful classroom teachers have the skills to teach students with disabilities. A special group among the students with disabilities is the VI or blind students. A visually handicapped student reads and writes in Braille more slowly than sighted students read and write using printed material. As everyone would agree, VI students have the same needs in life science as their sighted peers. They adopted all of the equipment for use by the blind student by using regular physics instructional materials which included a meter stick, timer, syringes, balance, graph board, and volume cubes. This study indicates that regular laboratory apparatus can be adapted to be used by the visually impaired students. Learning is effortful and means changing and challenging knowledge. To learn an abstract concept such as those in science requires as much hands-on activity as possible. We all know that science experiences depend mostly on visual data and we may not know how hard it can be for a VI student being in a science laboratory. Eichenberger (1974) suggested that since a blind person seriously lack the skills in taking notes and recording data, it is helpful if the blind student can work with a sighted peer in conducting experiments which most of the time require taking data. If bubbles are emitted in a chemical reaction or if a chemical reaction involves a temperature change, the blind student can feel the reaction in progress by hearing or by touching. However, if a color change is involved in the reaction, the blind student will need his/her sighted partner to explain the reaction for him/her. Wagner (1995) described how to prepare tactile measuring tools for visually impaired students by photocopying sections of a meter scale onto transparencies, and pasting the cut sections into a meter long scale, and using staples or glue to emboss each centimeter marking. The visually impaired student could use this tactile.

Methods

It includes both descriptive and exploratory approaches. Data collection methods were participant observation and audio and video taped semi-structured interviews. Observations were carried out in a state-funded school for the blind in northeast United States. Researcher as a participant observer observed a science class and took notes. Mrs. Johnson (the name is pseudonym) was a science teacher at the state school for the blind for 12 years. Upon her request she was interviewed in her class after the observation session. Mr. Miller (the name is pseudonym) had a job in a wakeup service. He was very comfortable in using technological devices such as computer, printer, and fax. He was interviewed in his house at his choice of time. Mrs. Lewis (the name is pseudonym) worked as a counselor at the ODS located within the state university. ODS collaborates with instructors and students with documented disabilities to provide reasonable accommodations, auxiliary aids, and support services that are based upon documentation, functional limitations, and a collaborative assessment of needs.

Results

They were comfortable with using Braille to take notes during a class discussion. They were using computers very

well, like normal sighted students. One surprising thing was that, they could hear really well. During a computer application, they concentrated on what they were doing and were not interrupted by the other sounds. The students had talking computers and they were sitting next to each other. When they type or put something in, it is read to them out loud so that they would know what they were typing. Surprisingly, they can discern theirs from others; they tune in on theirs, and others do not distract them. Therefore, being blind may not necessarily mean that those students are not capable of doing certain activities in regular classroom settings. However, as pointed out by the science teacher, they may need more time to cover the same topics as in a regular school.

Discussion and conclusion

VI students may need preferential seating because they mostly listen to the instructor. Laboratory equipment should be made accessible to blind students to help them build self-esteem and independence. Any adaptations made must account for safety and proactively prevent any possible dangerous situations from arising. A sighted laboratory assistant could take the readings and measurements and act as the blind student's "eyes" and "arms" for some of the work such as mixing chemicals, heating solutions, etc. They may also need exam accommodations, which may include adopted technology. Teachers may help VI students by providing an orientation about the physical layout of the classroom with locations of things like low-hanging objects in the classroom. Teachers should avoid using terms such as "look at this" while they are pointing to something on the board. They should rather speak aloud about what is written on the board. It is important for VI students to have access to class materials like the other students in the classroom. In order to do that, they may need print materials in alternative formats such as materials converted to audiotapes, scanned onto disks, enlarged or imaged enhanced, and Braille Any visual materials used in classrooms need to be adapted for use by students who do not have the visual skills required for the task. Charts, models, maps, and graphs will have greater educational value for students with visual impairments if they can be "read" using the sense of touch. Auditory input provides another way students can gain information. Teachers should not assume, however, that students will understand verbal input in the same way and at the same depth as sighted students understand visual input. The student's position in the classroom in relation to visual presentations should allow for a direct view. Information written on the chalkboard should be large. All visual aids should have clear, sharp images. The academic curriculum appropriate for students with visual impairments is determined by their cognitive abilities. The goals and objectives set for students without visual impairments do not need to be changed for a VI student, but different methods may be used for accomplishing the goals. Many students with visual impairments, however, require instruction in additional curricular areas. Teachers and schools frequently need to emphasize orientation and mobility training, daily living skills, and social skills for students with visual impairments. Traditional ways can be used for assessment. Questioning and literature review help teachers to recognize whether VI students actually understood what is taught or not. In addition to these, there are guide dogs helping VI students and VI people in their daily living.

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