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Research Papers

TEACHING SCIENCE TO STUDENTS WITH VISUAL IMPAIRMENT: PROBLEMS AND PROSPECTS

Dr. Sushil Kumar
Associate Professor
Kurukshetra University, Kurukshetra

Abstract

The present study is conducted to find out various problems encountered in teaching/learning science with reference to students with visual impairment (V.I.). 50 students with V.I. and six teachers of three special schools situated in Haryana and Delhi were purposively selected in the study. Two questionnaires/ schedules prepared by the investigator were used to collect the data. The findings of the study reveal that although students with V.I. face few problems in learning science but they consider science as an interesting subject. Teachers also reported that science can be taught to the students with V.I. However, they also face some problems. The study underlines the importance of knowledge of science in mainstreaming of students with V.I. in the modern era of science and technology.

Science, the search for evidence and knowledge; technology, the application of scientific principles; and societal issues, the influences of science and technology on people, are important themes in the education of all citizens (Lucchi, Malone, and Olson(1986)). Due to the empirical nature of science and limited sensory experiences of students with visual impairment one may have apprehensions regarding the scope and relevance of imparting science instructions to such students but at the same time usefulness of non visual experiences cannot be underestimated. Students with visual impairment can utilise these experiences for gaining organised and systematic knowledge of their environment. Moreover, in the present era of science and technology, we cannot deprive these students from scientific knowledge and experiences where the common scientific terminology has become an integral part of household vocabulary. The present paper is an attempt to facilitate science education of the visually impaired by exploring difficulties encountered during the process of teaching/learning science with reference to students with visual impairment.

INTRODUCTION

Formal education of visually impaired started with the inception of the very first school for the blind in Paris by Valentin Haüy in 1784. After one century similar pioneer effort of educating blind was made by Miss Annie Sharp, a Christian Missionary in1887. She founded first school for the blind at Amritsar. In 1947 when India became independent, we had 33 educational institutions for the blind, the number has now risen to over 450 institutions that provide educational and rehabilitation services to the visually impaired. Schools for the blind before independence, lacked academic environment. Educational facilities and environment slowly improved after independence. However, subjects

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like science and mathematics are still marginalised in these schools, which is neither desirable nor justified.

The study of nature in the primary schools forms a group of subjects full of topical interest and often of great practical value to blind children. The study of environmental science facilitates the meaningful interaction with it and enables the students with visual impairment to fill up the gaps in his knowledge of everyday things. Studies carried out by various researchers underline the importance of imparting science instructions to students with visual impairment. Science instructions increase the manipulation skills, logical thinking and cognitive reasoning among students with visual impairment (Frank, 1975, Linn & Thier, 1975 and Jean Piaget, 1970). Scientific attitude can be inculcated by teaching science which in turn contributes to the removal of superstitions. Science instructions develop healthy food habits and create awareness for personal hygiene.

The vision brings an enormous amount of information in just a glimpse and enables seeing students to have rich experiences in a natural way. They learn the experience as a whole. But the learning of students with visual impairment is not whole but in bits of information. Thus, seeing students learn naturally whereas learning among visually impaired is a mediated process. Lack of incidental learning delays the process of concept formation. Providing planned concrete experiences in a proper sequence is useful in developing science concepts among students with visual impairment. For such a systematic effort, a teacher needs to be highly enthusiastic, thoughtful and resourceful. A zeal to surmount difficulties in imparting science instructions to students with visual impairment is also required.

According to Ross, D.B. and Robinson, M.C. (2009), science is one of the critical content areas in the academic curriculum. In most cases the special teacher of students with visual impairment collaborates with general education teachers and content area specialists to ensure that students with visual impairment benefit from the classroom instruction. The specialist in visual impairment provides adapted materials and equipment and teaches special skill prior to their use in the classroom.

The teacher of students with visual impairment also provides information to the content teachers of modification in the presentation of the material. He/she makes suggestions on ways to ensure the inclusion of the students in all aspects of the class and on ways to make learning as rewarding for the students who is visually impaired as it is for other students.

RATIONALE OF THE STUDY

As mentioned earlier, science does not occupy an important place in the school curricula for students with visual impairment. There are many factors responsible for such an unwarranted situation. Lack of opportunities to study science at secondary and senior secondary stage, non availability of trained manpower and adapted science material for the visually impaired, unfavourable attitude of the school authorities towards teaching science, various difficulties in teaching/learning science etc. are some of the factors leading to present state of affairs. Solution of problems related to teaching/learning science with reference to students with visual impairment requires empirical data which can be generated only through the process of scientific research. Although some studies have been conducted to study the effect of science instructions on different areas of learning deficits, but, not much research work is available concerning the problems related to teaching/learning science with reference to students with visual impairment. In view of these facts, investigator has decided to undertake the study in the said area with specific objectives in mind. The findings of the study will not only help in taking appropriate measures to solve different problems related to teaching/learning science but will also be helpful in designing appropriate science pedagogy for students with visual impairment.

Invention of different assistive and other useful technology has opened new gateways of educational and vocational opportunities for individuals with visual impairment. Special educators realise the potential of such technology to engage visually impaired in various technical jobs in various fields such as information technology, computers, light engineering, etc. Knowledge of science is necessary to integrate students with visual impairment in vocational and technical courses. Recent development in the field of technology is likely to improve the prospects of teaching science to students with visual impairment. The present study also attempts to study the said prospects.

THE PRESENT STUDY

Purpose

The present study is designed to achieve the following objectives:

1. To study different problems related to teaching science to students with visual impairment.
2. To study different problems related to learning science by students with visual impairment.
3. To study prospects of teaching/learning science with reference to students with visual impairment.

Sample

The present study is a survey conducted with a purposive sample of fifty visually impaired students studying in class seventh to tenth and six science teachers drawn from three special schools situated in Haryana and Delhi.

Tools Used

Two schedules/questionnaires were prepared by the investigator to collect necessary information from the students and teachers. Schedule/questionnaire to study the problems encountered during teaching science to students with visual impairment contains 21 items. Out of which, 18 questions are closed one with options yes/no whereas 3 questions are in open form. Schedule/questionnaire to study the problems encountered during learning science by students with visual impairment contains 22 items. Out of which, 21 questions are closed one with option yes/no whereas one question is in open form.

DATA COLLECTION

After selecting the sample and preparing the tools for data collection, the investigator visited three special schools situated in Haryana and Delhi. He met the principals to get permission to meet the teachers and students for administering the schedules/questionnaires. The schedule was administered on students after the school hours as students were available after school hours in the school premises. The students were taken to a quiet room as provided by the school authority to collect the data. Students were brought individually to the room one by one. After establishing the rapport and collecting background data, relevant instructions were given to each student. The investigator asked the questions to the students and noted their responses in a response sheet. Similarly, investigator also administered questionnaire/schedule on the six teachers and noted their responses in a response sheet.

RESULTS

The results of the study are discussed in two sections. First section pertains to problems related to teaching science whereas section second is concerned with the problems related to learning science with reference to students with visual impairment.

Section I: Problems Related to Teaching Science

It is observed from first, second and third entries of Table No.1 that science textbooks in Braille are easily available in all the schools. However most of the teachers (83.33%) consider the number of other science books in Braille as insufficient and the same percentage of the teachers are satisfied with the availability of science books in auditory form.

Fourth entry of the same table reveals that five teachers (of two schools) reported that there are science rooms in their schools. But only three teachers believe that teaching material in science rooms is sufficient.

It can be further seen from sixth, seventh, eight and ninth entries of the table that none of the schools as the facility of science laboratory and botanical garden. Therefore, responses regarding the use of botanical garden and laboratory in teaching science are negative. Tenth, eleventh and twelveth entries of table reveal that all the teachers teach complete syllabus of science majority of the teachers (66.67%) believe that sufficient teaching materials e.g. charts, modals etc. are available in the schools. However most of the teachers (83.33%) use modals, charts etc. in teaching science.

It can be further observed from thirteen and fourteen entries of the table that all the teachers consider number of embossed diagrams in science textbooks as in sufficient. However 50% of the teachers believe that students understand such diagrams.

Table 1. Responses of Teachers

S.No	No. of Teachers		Percentage of Teachers	
	Yes	No	Yes	No
1	6	0	100	0
2	1	5	16.67	83.33
3	5	1	83.33	16.67
4	5	1	83.33	16.67
5	3	3	50	5
6	0	6	0	100
7	0	6	0	100
8	0	6	0	100
9	0	6	0	100
10	6	0	100	0
11	4	2	66.67	33.33
12	5	1	83.33	16.67
13	0	6	0	100
14	3	3	50	50
15	5	1	83.33	16.67
16	6	0	100	0
17	3	3	50	50
18	6	0	100	0

It is inferred from fifteenth entry of the

table that most of the teachers (83.3%) find it difficult to teach chemical equations and formulae. Sixteenth entry of the table reveals that all the teachers adapt teaching content before its delivery to the students. 50% responses in seventeenth entry are affirmative, therefore, 50% of the teachers believe that science should be taught to the students with visual impairment in higher classes.

It is further seen from eighteenth entry that all the teachers teach science with interest. Responses of question no. 19, 20 and 21 provide following information.

1. Problems in teaching science concepts

a) Teaching science concepts is a time consuming process.

b) The problem of verbalism is common.

c) Teachers find it difficult to teach concepts related to chemical reactions.

d) Teaching colour concepts is not possible.

e) It is also difficult to develop space related and other visual concepts among students with congenital visual impairment.

2. Other problems in teaching science

a) It is difficult to introduce the topic on the basis of limited experiences of the students.

b) Teaching /learning aids for students with visual impairment are not easily available in the market.

c) It is difficult to teach three-dimensional concepts with the help of to dimensional embossed diagrams.

3. Suggestions to improve the process of teaching / learning science with reference to students with visual impairment.

a) Science equipments and other material need to be adapted for students with visual impairment.

b) Remedial measures should be taken for low achievers in science.

c) More and more innovative teaching aids should be used to make science instruction more interesting.

d) There should be a provision of a laboratory and well equipped science rooms in every school.

e) Science textbook in Braille should be modified according to the special needs of students with visual impairment.

f) Science field trips should be arranged periodically for students with visual impairment.

g) Teachers need to be enthusiastic in teaching science.

h) Science should be viewed as a useful subject for students with visual impairment.

Answer of question no.22 underline the importance of knowledge and skills related to science in realising the possibility of mainstreaming the students with visual impairment in technical vocational courses like computer science, information technology, light engineering assembly and repair of electrical /electronic gazettes etc.

Section II: Problems Related to Learning Science

It is observed from table 2 that 86% responses for question are affirmative, therefore, one can say that most of the students view science as an interesting subject. 86% negative responses for question no.2 suggests that most of the students do not perceive science as a difficult subject.

It is further seen from the same table that 78, 34 and 74 percent of responses for question no. 3, 4 and 5 respectively are affirmative. Therefore, it can be said that most of the students are satisfied with the availability of science textbooks in Braille, whereas, most of the students find other science text books in Braille as insufficient. It may be further inferred from the responses of question no. 5 that majority of the students are satisfied with the availability of science books in auditory form.

62 and 80 percent affirmative responses for question 6 and 7 reveal that majority of students like to read science related books and articles. Most of the students also like to listen science-related programmes on radio and T. V.

All the students gave affirmative response for question no. 8. It means trained science teachers are available in all the schools.

78% students reported that they have the facility of science rooms. However, responses for question no. 10 and 11 reveal the fact that none of the school has the facility of laboratory or botanical garden. Obviously, answers of question no.12 and 13 pertaining to the use of laboratory and botanical garden are negative.

It is further seen from the responses for question no.14 in table no.2 that 44% of the students find it difficult to solve numericals. From the responses for question no. 15 it may be interpreted that most of the students (78%) believe that entire course is being taught to them.

72 and 68 percent affirmative responses for question no. 16 and 17 suggest that majority of the students are satisfied with the availability and use of teaching /learning aids.

Responses for question 18 and 19 reveal the fact that most of the students (76%) are satisfied with the number of embossed diagrams.

80% of the students do not find any difficulty in understanding such diagrams.

It is observed from the responses of question no.20 and 21 that 84% of students find it difficult to read and write chemical equations and formulae.

Table 2. Responses of the Students

S.No	No. of Students		Percentage of Students	
	Yes	No	Yes	No
1	43	7	86	14
2	12	38	24	76
3	39	11	78	22
4	17	33	34	66
5	37	13	74	26
6	31	19	62	38
7	40	10	80	20
8	50	0	100	0
9	39	11	78	22
10	0	50	0	100
11	0	50	0	100
12	0	50	0	100
13	0	50	0	100
14	28	22	56	44
15	39	11	78	22
16	36	14	72	28
17	34	16	68	32
18	38	12	76	24
19	40	10	80	20
20	37	13	74	26
21	37	13	74	26

CONCLUSIONS

Most of the students with visual impairment consider science as an interesting but not difficult subject. Sufficient number of science text books in Braille and auditory form are available; however, general books on science are inadequate. They like to read science related books and article and listen programmes pertaining to science on T.V. and radio. All the three schools have trained science teachers but lack the facility of laboratory and botanical garden. Students with visual impairment faced difficulty in doing numerical and understanding chemical equation and formulae.

Most of the teachers are satisfied with the availability of text books in Braille and auditory form. However, they feel, Braille books lack sufficient number of embossed diagrams. They also feel more general books on science should be made available. Teachers also reported the lack of laboratories and botanical gardens in their schools. They find difficulties in teaching chemical equations and formulae. 50 % teachers want that science should be taught to students with visual impairment in higher classes. Teacher face difficulties in teaching vision oriented concepts and consider it as time consuming process. Teaching/learning aids for students with visual impairment are not easily available in the market. Responses of the teachers underline the importance of the acquisition of the science related knowledge and skills for mainstreaming of the students with visual impairment in the modern era of science and technology.

EDUCATIONAL IMPLICATIONS

The findings of the study have ample educational implications for special teachers, science teachers, school authorities and parents of the blind students.

- Appropriate science pedagogy for students with visual impairment can be designed on the basis of the findings of the study.
- Study reveals that blind students perceive science as an interesting but not difficult subject. It means that blind students can learn science concepts satisfactorily, if appropriate teaching strategies are adopted and adequate facilities are provided to the students.
- Sufficient number of general science books in Braille should be provided to the students.
- Science concept should be made clear by adopting experimental methods.
- There should be provision of laboratory and botanical garden in the school.
- Science room should be properly equipped.
- Special attention should be paid to teach embossed diagrams.
- Science codes should be standardized so that students can understand chemical equations and formulae properly.

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