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EFFECTIVENESS OF MULTI-SENSORY APPROACH IN LEARNING BOTANY AMONG THE STUDENTS WITH VISUAL IMPAIRMENT

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Abstract

Students with visual impairment (SWVI) due to loss of visual perception demand for stimulation of remaining senses. Multi-sensory approach conveys passing information through senses like touch and movement—called tactile and kinesthetic elements—as well as sight and hearing. Since, Science especially Botany heavily depends on visual instruction; students with visual impairment may face hitches in constructing abstract concept as well as the practical knowledge. In rudimentary level, the SWVI need to use their remaining senses like olfactory, gustatory etc. for better understanding of the concept of Botany and which is easily available around them. Current study was taken up with the objective to find out the effectiveness of multi-sensory approach in learning Botany among the students with visual impairment. Single subject pre test-post test control group design has been adopted by using experimental method at Hoogly district, West Bengal. Sample of 20 SWVI were selected from various schools through purposive sampling method. An observation schedule developed by the researcher was used to collect relevant data from the samples. The collected data was analysed quantitatively and qualitatively and the results of the study show that multi-sensory approach has a significant impact on the learning of Botany concepts among students with visual impairment. The study suggests initiating use of multi-sensory approach which encourages the development and integration of all remaining senses in enhancing perceptions and concepts.

Keywords: *Students with visual impairment (SWVI), Multi-sensory approach, Botany.*

Introduction

Education is a process of experience where the children irrespective of their abilities and disabilities can enhance their knowledge and skills for entire development of life. Education is the fundamental right of every individual but vision loss imposes limitations on children to acquire information in regular way. These limitations include the range and variety of

experiences, the ability to get about and the limitations in the ability to control the environment and oneself. The stated restrictions adversely affect the learning of children with visual impairments. According to University of Northern Colorado, only a thorough understanding of these limitations can lead to special methods in education of learners with visual loss[1]. According to Texas school, totally blind children who are born without sight or those who have lost their sight early in life must build up their conception of the world by the use of their remaining senses[2]. In doing this, they rely almost entirely on tactual, olfactory and auditory perception and kinesthetic experiences, which is known as multi-sensory approach. According to Berthold Lowenfeld (1974) "Education must aim at giving the blind child knowledge of the realities around him, the confidence to cope with these realities, and the feeling that he is recognized and accepted as an individual in his own right"[3].

Review of Literature

Multi-sensory techniques are frequently used for children with learning difficulties. Studies from the National Institute of Child Health and Human development (United States of America) have shown that for children with difficulties in learning to read, a multi-sensory teaching method is the most effective teaching method.

Rights of Persons with Disabilities (RPwD) Act (2016) scrutinized that "The appropriate Government and the local authorities shall endeavour that all educational institutions funded or recognised by them provide inclusive education to the children with disabilities..." It also stated "ensure that the education to persons who are blind or deaf or both is imparted in the most appropriate languages and modes and means of communication."[4] (Chapter III, Art. 16)

Majeda (2013) discovered that if sixth grade students taught mathematical concepts such as addition through a multi-sensory approach would show higher mathematical achievement than those who were not. Here he has investigated the effect of using the Multi-Sensory Approach for teaching students with learning disabilities on the sixth grade students' achievement in mathematics.[5]

Schwed&Melichar (2008) believed that using multi-sensory activities had a positive impact on students for practicing and learning their spelling words. By using these multi-sensory avenues, students were engaged in activities, which may have helped create multiple paths to the brain to store knowledge in long term memory. Next, the students enjoyed working

through these centers and would welcome similar tasks in the future. The multi-sensory activities, as students reported, brought excitement to spelling, a topic that historically has been practiced by rote memorization.[6]

Kast et al (2007) elucidated that three-month of visual-auditory multimedia training strongly improved writing skills in children with developmental dyslexia and non-dyslexic children. Thus, according to the retrieval structure model, multi-sensory training using visual and auditory cues enhances writing performance in children with developmental dyslexia and non-dyslexic children.[7]

Erwin et al (2001) emphasised that teaching science to learners with visual impairments must be firmly grounded in a multi-sensory approach if students are to receive positive benefits; the extent to which the approach applies to the learner depends to a large extent on the characteristics of the learner. To that extent, the authors concurred that proper educational intervention should be hand-tailored to dovetail with the learner's educational needs and personal attributes.[8]

Need of the Study

Students with visual impairment are expected to master the same academic subject matter as are students without visual impairment. Science classes are challenging for students with visual impairments, since instruction in this subjects often involves the use of illustration, diagram and experiment and the students often need to use adapted and modified instructional tools to understand the concepts that are involved. To promote the same curriculum with minimum adaptation as per the requirement should be provided by all the schools to maintain the laws and principle of inclusion.

Sighted students learn through incidental and planned observation of materials and activities in the classroom and in laboratory investigations. Most of the teaching in schools is done using either visual or auditory mode (visual or hearing). Students with visual impairment are facing problems in understanding the concepts related to botany by using only auditory mode. Research has shown that such students with visual impairment have difficulties in recognizing the shape, structure and functions of the in plants. In order to overcome these problems there must be an approach to learn these practical oriented concepts by using their

remaining senses in an efficient manner. Thus, this study focuses on the effectiveness of multi-sensory approach on learning botany among students with visual impairment.

Objectives of the study

1. To find out the effectiveness of multi-sensory approach in learning botany among students with visual impairment.

Hypothesis

1. There will be no significant difference in learning botany concepts between pre test and post test scores of control group.
2. There will be no significant difference in learning botany concepts through multi-sensory approach between pre test and post test scores of experimental group.
3. There will be no significant difference in learning botany concepts between experimental group and control group.
4. There will be no significant difference in the post test scores of learning botany concepts with respect to the selected variables- Multi-sensory Approach (Tactile & Olfactory senses)
5. There will be no significant difference in the post test scores of learning botany concepts with respect to the selected variables- Gender (Girls and Boys).

Methodology

Research Design

The researcher adopted the single subject pre test-post test control group design which is also called the classical controlled experimental design to study the Effectiveness of Multi-sensory approach in Learning Botany among the students with visual impairment (SWVI) at middle school level.

Selection of sample

Sampling Technique- Purposive sampling technique has been employed for the selection of the samples for the present study.

Sample Size- Total number of 20 students with visual impairment (total blindness) pursuing middle class from special school in Hoogly district, West Bengal was taken as sample for the current study. Among 20 students, 10 students with visual impairment represents experimental group and remaining were control group.

Inclusion Criteria

1. Students Age Group: 10-14 years.
2. Gender: Male and Female.
3. Nature of Visual Impairment: Total Blindness.
4. Visual Impairment without additional disabilities.
5. Visual Impairment excluding Low vision.

Research Tool

The researcher had prepared checklist which contains the items to check the knowledge of the sample about the parts of plant, types of seed, leaf and selected medicinal plant. The options used in the checklist are "yes" and "no" based on the responses of the subjects tick marks would be given to the appropriate options.

Validity and Reliability of the Tool

In order to get the research tool validated, it was given to 10 experts having experience in their respective fields. The final research tool was constructed on the basis of the response expressed by the experts. Based on the suggestion given by the experts, the final tool was prepared.

Table No. 1 - Details Of Domains

Sl. No.	Domains	No. of Items
1.	Parts of Plant	40
2.	Types of Seeds, Leaves	10
3.	Selected Medicinal Plants	7
Total		57

Variables

The table below details about the independent, dependent and variables selected for the study

Table No.2 - Details Of Variables

Independent Variable	Dependent Variable
Multi-sensory approach:	**Learning Botany Concept:**
(i) Tactile	(i) Parts of Plants
(ii) Olfactory	(ii) Types of Root, Seed and Leaf
(iii) Auditory	(iii) Medicinal Plant and Usage

Data Gathering Procedure

The researcher had selected samples from the school with prior permission from the heads of the school. After orientation, the researcher had conducted pretest to the samples. Based on the performance of the samples, treatment was provided by the researcher through using the original plants. The treatment was given for two hours of one day for each child, after which post test was conducted with the same tool to know the improvement in the performance of the sample after the treatment.

Data Analysis and Findings

In this research, the researcher performed both quantitative and qualitative analysis of the collected data. The demographic data of the samples has been analyzed using qualitative analysis and the performances of the samples have been analyzed using quantitative analysis like t-test under parametric techniques.

Analysis of the Effectiveness of the Multi-sensory Approach in Learning Botany

I. Analysis of the Pre-Test and Post-Test Performance of Control Group

Hypothesis 1: There will be no significant difference in learning botany concept between pre test and post test scores of control group.

Table No.3 Analysis Of The Pre-Test And Post-Test Performance Of Control Group

	Paired Differences					
	Mean	**Std. Deviation**	**Difference between mean values**	**Calculated value of t-test**	**df**	**Table value of t-test**
control-pre test	5.60	3.025	1.6	7.236	9	2.626*
Control-post test	7.20	2.820				

*significance level chosen = 0.05

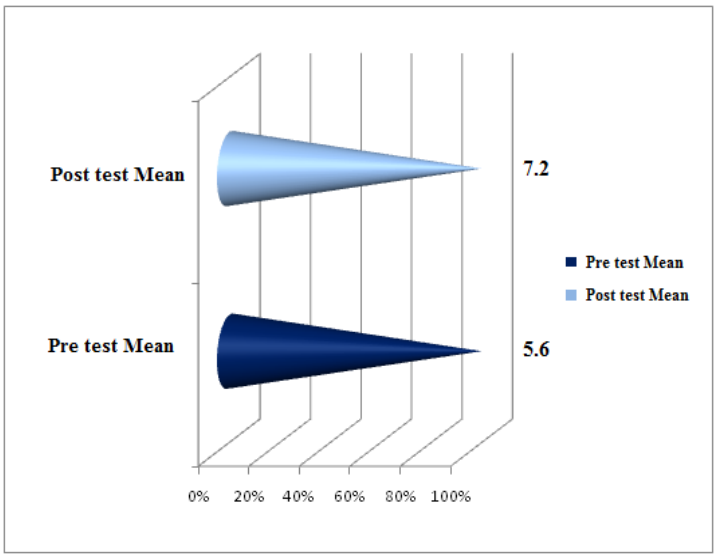


Figure No. 1 - The Pre-Test And Post-Test Performance Of Control Group

Findings#1

T-test was applied to find out the difference between the pre and post test scores of control group. The t-value of selected experiments on multi-sensory approach in control group was mentioned below.

The multi-sensory approached based experiment in botany t (9) = 7.236, P< 0.05. It was greater than the table value of t-test at 95% level of significance. It was found that, significant difference existed between the pre test and post test scores of the control group. So, these findings did not support the hypothesis. Hence it is inferred that the conventional methods of teaching showed improvement in learning botany concept among the students with visual impairment. But the degree is very less which is revealed by the pre test and post test mean. The pre test mean and post test mean is 5.60 and 7.20 respectively. The difference between two means is 1.6.

II. Analysis of the Pre-Test and Post-Test Performance of Experimental Group

Hypothesis 2: There will be no significant difference in learning botany concept through multi-sensory approach between pre test and post test scores of experimental group.

Table No.4 Analysis Of The Pre-Test And Post-Test Performance Of Experimental Group

	Paired Differences		Difference between mean values	Calculated value of t-test	df	Table value of t-test
	Mean	Std. Deviation				
Exp-Pre-test	6.90	5.109	50.5	28.109	9	2.626*
Exp-Post test	57.40	2.171				

*significance level chosen = 0.05

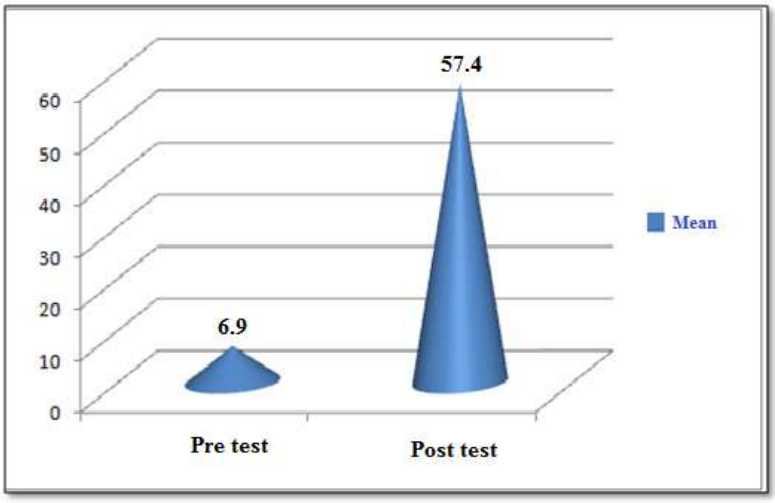


Figure No. 2 - Mean Values Of Pre-Test And Post-Test Performance Of Experimental Group

Findings#2

The multi-sensory approached based experiment in botany t (9) = 28.109, P< 0.05. It was greater than the table value of t-test at 95% level of significance. It was found that, significant difference existed between the pre test and post test scores of the experimental group. So, these findings did not support the hypothesis. It shows that the students with visual impairment in control group had improved in post test scores. . Hence it is inferred that the multi-sensory approach of teaching showed improvement in learning botany concept among the students with visual impairment.

The result is supported by the research conducted by Kritsonis (1997/1998) and they reported that the students perform statistically better on standardized achievement and attitude tests when they are taught and/or tested through a method of multi-sensory approach that appeal to their individual learning style.[9]

III. Analysis of the Performance between Experimental and Control Group

Hypothesis 3: There will be no significant difference in learning botany between experimental group and control group.

Table No.5 Analysis of the Performance between Experimental and Control Group

Post test	Paired Differences		Difference between mean values	Calculated value of t-test	df	Table value of t-test
	Mean	Std. Deviation				
Experimental group Pre test	6.90	5.108	2.083	0.550	9	2.626*
Control group Pre test	5.60	3.025				
Experimental group Post test	57.40	2.171	50.2	48.708	9	2.626*
Control group Post test	7.20	2.821				

*significance level chosen = 0.05

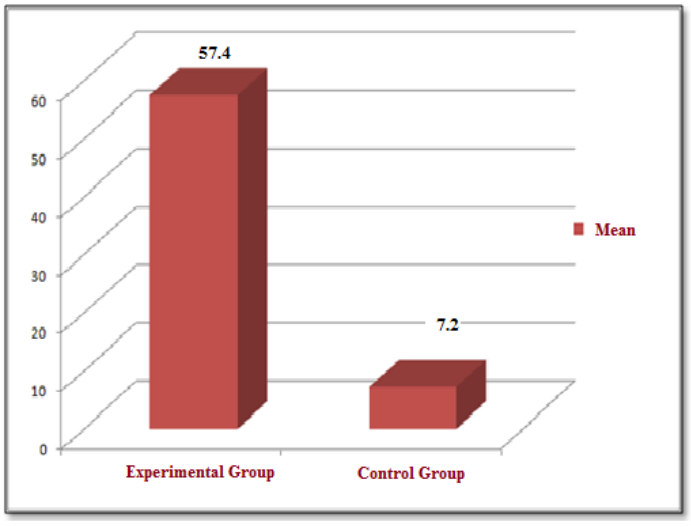


Figure No. 3 - The Performance Between Experimental And Control Group After Giving Intervention

Findings#3

The multi-sensory approached based experiment in botany for pre test of experimental and control group t (9) = 0.550 and post test of experimental and control group t (9) = 48.708, P< 0.05. It was greater than the table value of t-test at 95%level of significance. It indicated that both conventional method and multi-sensory approach had improved the knowledge to perform among the selected sample.

The result is supported by the research done by Ewy (2003) where it was proved that permanent memory is stored in the form of images, which are composed of mental images, smell, taste, and kinesthetic sensations. So, multi-sensory approach is very useful for learning and memorizing.[10]

IV. Analysis the Performance of Using Tactile Approach and Olfactory Approach

Hypothesis 4: There will be no significant difference in the post test scores of learning botany concepts with respect to the selected variables- Multi-sensory Approach (Tactile & Olfactory senses)

Table No.6 Analysis of the Performance of Using Tactile Approach and Olfactory Approach

Post test	Paired Differences		Difference between mean values	Calculated value of t-test	df	Table value of t-test
	Mean	Std. Deviation				
Tactile	92.18	3.53	3.53	-1.717	9	2.626*
Olfactory	95.71	6.90				

*significance level chosen = 0.05

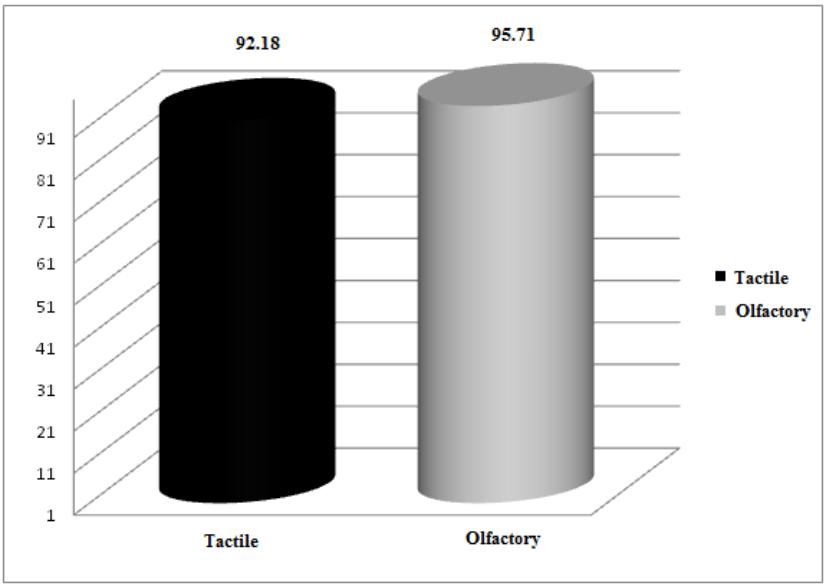


Figure No. 4 - The Performance Of Using Tactile Approach And Olfactory Approach

Findings#4

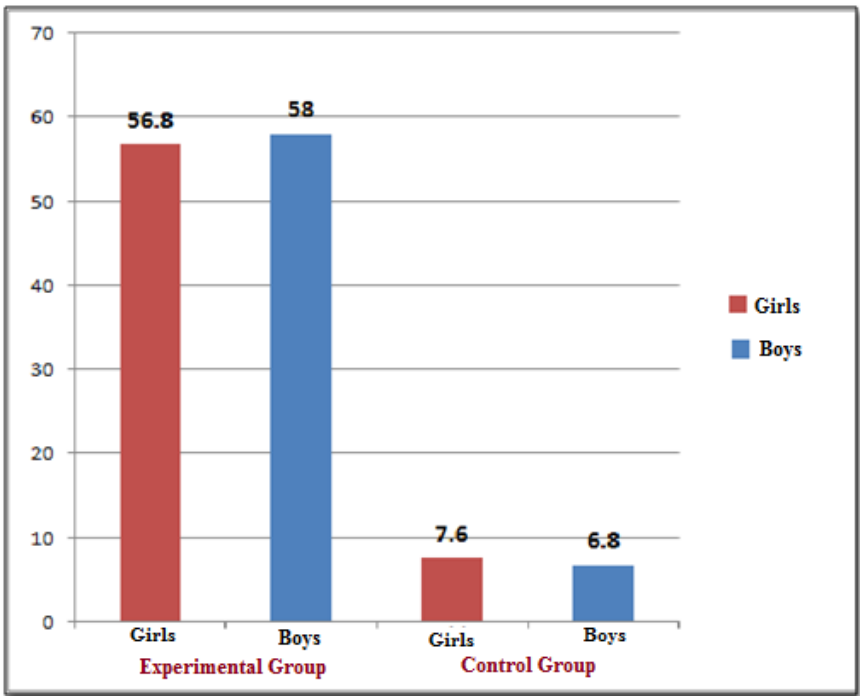
The multi-sensory approached based experiment in botany based on tactile approach and olfactory approach t (9) = -1.717, P>0.05. It was smaller than the table value of t-test at 95% level of significance. It was revealed that, there is no significant difference between using tactile approach and olfactory approach as multi-sensory approach in learning botany. So, predicted hypothesis was accepted. The result is supported by the research carried out by Wilmes et al., (2008) and it was mentioned in their result that the factors such as sound and music have been identified as possible significant contributors to the classroom learning environment. In fact, even smell has an effect on learning and work production. It, too, has its place in education and it helps to learn more effectively.[11]

V. Analysis of the Performance Based on the Gender (Girls and Boys)

Hypothesis5: There will be no significant difference in the post test scores of learning botany concepts with respect to the selected variables-Gender (Girls and Boys).

Table No.7 Analysis of the Performance Based on the Gender (Girls and Boys)

	Paired Differences		Difference between mean values	Calculated value of t-test	df	Table value of t-test
	Mean	Std. Deviation				
Girls (Exp.)	58.00	1.58	1.2	0.820	4	2.626*
Boys (Exp.)	56.80	2.68				



*significance level chosen = 0.05

Figure No. 5 - The Performance Between Girls And Boys In Experimental And Control Group

Findings#5

The multi-sensory approached based experiment in botany based on gender t (9) = 0.820, P>0.05. It was smaller than the table value of t-test at 95% level of significance. It was revealed that, there is no significant difference between girls and boys in learning botany through multi-sensory approach. It indicated that both girls and boys had improved the knowledge to perform among the selected sample.

Conclusion

Biology is one of the major parts of science subject and it contains Botany especially in middle school curriculum. Hence science seems to be complicated subject for students with visual impairment so; more innovative ideas are required to make it joyful and effective. To enhance the skills of identifying plants and the major parts of plant, multi-sensory approach plays vital role. It is useful for students with visual impairment to understand concept of plants and parts of plants with great pleasure. Thus the multi-sensory approach provides tremendous support to utilize the other remaining senses, the SWVI get confidence to explore the nature and understand the unique characteristics and physical structure of each plant. By using their tactile and olfactory senses they can realize the special characteristics of a leaf, flower and seed and identify the name of the plants by touching the other parts of plants. The present study shows the impact of using multi-sensory approach in learning science concepts among the students with visual impairment.

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