Effectiveness of Multi Sensory Approach for the Enhancement of Concept Formation And Academic Achievement of science students

Dr. Rajinder Kaur Gill
Associate Professor
Rayat College of Education,
SBS Nagar (Punjab)

Received: 10 May Revised: 18 May Accepted: 26 May

Abstract

The purpose of this study is to investigate the effect of using Multi Sensory Approach for teaching students science of sixth grade. To achieve the purpose of the study a pre/post test was constructed to measure students 'concept formation and academic achievement in science. The sample of the study comprised of 80 students of sixth grade. The sample of the study was divided into four groups according to their intelligence. Forty in the experimental group and forty in the control group. Experimental group was taught by using multisensory approach and the control group by traditional method of teaching. The findings of the study indicated that the students in the experimental group showed more effective results as compared to the control group students. Also there was significant difference in gain scores of concept formation of students when taught with multi sensory approach.

Keywords: Multi sensory approach, Concept formation, Academic achievement.

Introduction

Human beings learn through different modalities and learning styles. Each person uses multiple “Learning channel” and each person has strength in terms of which style works best. It is essential that the individual primarily uses his or her learning style strengths and talents to improve acquisition of information.

Multi sensory approach teaches reading and writing through using auditory, visual and kinesthetic pathways. This gives multiple pathways for the information to reach the brain. It is a diagnostic as it involves constant testing and reflection on the knowledge of the student. It is systematic and seeks to unite the components of written language conversations and handwriting in an organized and integrated manner.

Multisensory learning involves teaching your child through each of the senses at the same time.

- **Auditory** (hearing and speaking).
- **Visual** (seeing and perceiving).
- **Kinesthetic / Tactile** (touch, movement, and doing).
Definitions of Multisensory Approach

McIntyre and Pickering (1995): “The Multi Sensory approach is a model of language instruction which holds that learning or acquiring knowledge and skills in given subject area is best facilitated by involving more than one of senses.”

The Department for Education and Skills (2004) defines “Multi-Sensory as using visual, auditory and kinesthetic modalities, sometimes at the same time’. Kinesthetic refers to perceiving through touch and an awareness of body movements.”

Birsh (2006): “Multisensory teaching and learning is a form of direct instruction of the Phonologic, morphemic, semantic and syntactic layers of language. Multisensory Strategies simultaneously involve visual, auditory, tactile-kinesthetic sensory Systems, and/or articulatory-motor components while linking listening, speaking, Reading, and writing; this means it directly involves students in seeing, hearing, Saying, and writing during instruction.”

Sprenger (2008): “Multisensory approach to learning continual use of five senses, including the use of body movements, to teach abstract concepts, making them concrete and accessible for memory, usage and interference. Using several modalities at one time to strengthen newel pathways.”

Concept Formation

Concept formation is a process by which a person learns to sort specific experiences into general rules for classes. It is an inductive teaching strategy that helps students, form a clear understanding of a concept (or idea) through studying a small set of examples of the concept. It is the process based on developing abstract rules or mental constructs based on sensory experience.

Definitions of Concept Formation

Burner and Austin (1967) defined as “the search for and listing of attributes that can be used to distinguish exemplars from non exemplars of various categories.”

Jean Piaget and Lev Vygotsky, (1980) have researched the way children form their own concepts through experience, assimilate existing concepts such as cultural values, norms, and beliefs from adults, and further create and develop their own concepts as they mature toward adulthood.

Significance of the Study

Students learn in different ways. In order for instructions to reach all the students, teaching method must relate to each child’s own learning preference style. Multi sensory teaching techniques and strategies stimulate learning by engaging students on multiple levels. They encourage students to use some or all their senses. The use of more than one of the child’s senses, especially touch (tactile) and movement (kinetic) helps the child brain to develop tactile and kinesthetic memories to hang on to as well as the auditory and visual ones. Researchers suggested that when students are taught using techniques consistent with their learning style, they learn more easily, faster, and can retain and apply concepts more readily to future learning. The present study being an effort to assess the extent to which multi sensory approach can replace traditional method of teaching science.

Related Studies

Neill & Rowan, (2001) investigated that when students are able to represent a problem or mathematical situation in a way that is meaningful to them, it becomes more accessible.
representation—whether drawings, mental images, concrete materials, or equations—helps students organize their thinking and try various approaches that may lead to a clearer understanding and a solution.

Dev, Doyle, and Valente (2002) examined the impact of multi-sensory approach by the use of Orton-Gillingham technique (Institute for Multi-sensory education, 2000), which involves visual, auditory, and kinesthetic modalities, with first grade children at the special education level. These children improved enough in their reading abilities to advance them out of the special education level. The maintenance of the gains that they achieved with the use of the multi-sensory approach was evaluated after a two year period.

Joshi, Dahlgren, and Boulware-gooden (2002) examined the effects of using a multi-sensory approach to teaching reading with first graders. Language Basics: Elementary, based on Orton-Gillingham and Alphabetic phonics, is the multi-sensory method used for this study as the treatment. A based reader was used for the control group. When given tests of phonological awareness, decoding, and reading comprehension, the treatment group performed better than the control group. The authors noted and concluded that using the multi-sensory approach was effective with the first group.

Ozdemir et al. (2006) examined the effects of Multisensory Approach on retention of vth graders. They placed students randomly into one of two science groups. One group, the control group, received "traditional" science instruction with lectures and worksheets. The second group, the experimental group, targeted the multiple intelligences in instruction. Students in the experimental group completed tasks such as drawing pictures, composing, watching a performance, dramatizing and playing with puzzles—all instructional methods appealing to multiple senses. At the end of the study, it was discovered that students in the experimental group had better acquisition and retention of knowledge than students in the control group.

Ranasinghe and Leisher (2009) found that teaching student the use of technology as a learning tool enhances their learning. They facilitate learning by giving exposure to native speakers' correct pronunciation and interesting conversations between them.

Obaid, Majeda Al Sayyed (2013) investigated the effect of using the Multi-Sensory Approach for teaching students with learning disabilities on the sixth grade students' achievement in mathematics. A pre/post-test was constructed to measure student's achievement in mathematics. The sample of the study was divided into four groups (two experimental and two control groups). The experimental group was taught using multi-sensory approach while the control group was taught using the current approach. The findings of the study indicated that there were statistically significant differences in the post-test between the control and the experimental groups in favor of the experimental group.

Swini Garimella Venkat Srinivasan (2014) studied on the large scale the efficacy of multi-sensory technology for language learning and for acquisition of reading skills specifically. The learners came from poor economic backgrounds and the school settings were infrastructurally weak. In spite of such limitations, assessments of changes in proficiency levels reveal significant gains across the board in the 6 states at all grade levels and across different facets of language learning—reading, reading comprehension, vocabulary, spelling and grammar. The study provides strong validation that multi-
sensory technology can improve English language proficiency levels and reading skills dramatically, with less effort, and potentially in a shorter time period.

**Objectives of the study**

- To find out the difference between mean gain scores of Academic Achievement of experimental and control group of high intelligence students.
- To find out the difference between mean gain scores of Academic Achievement of experimental and control group of low intelligence students.
- To find out the difference between mean gain scores of concept formation of experimental and control group high intelligence students.
- To find out the difference between mean gain scores of concept formation of experimental and control group low intelligence students.

**Hypotheses:**

- There is no significant difference between gain scores of Academic Achievement of experimental and control group of high intelligence students.
- There is no significant difference between mean gain scores of Academic Achievement of experimental and control group of low intelligence students.
- There is no significant difference between mean gain scores of concept formation of experimental and control group of high intelligence students.
- There is no significant difference between mean gain scores of concept formation of experimental and control group of low intelligence students.

**Sample**

The research investigation was carried on 80 students of class 6th of G.G.S.T.P high school, Rupnagar.

**Methodology**

In order to realize the above said objectives, Experimental method was employed.

**Research Design**

The present study was employed on the variables of Instructional treatment which was studied at two levels namely experimental group (TI) which was taught by Multi sensory approach and control group (T2) which was taught by traditional instruction. The variable of intelligence was studied at two levels i.e. high intelligence (I1) and low intelligence (I2) levels.

**Tools**

The following tools had been used for the purpose of data collection:
1. Jalota Intelligence test to measure Intelligence levels of students.
2. Achievement test prepared by the investigator in science subject.
3. Concept formation test prepared by the investigator in science subject.
4. Lesson plans developed on the basis on multi sensory approach.

**Achievement Test In Science**

The achievement test on 3 units in science i.e. Food, Components of Food and Fibre to Fabric from the syllabus of 6th class was developed in scene to determine the achievement of the students in science. There were 30 items with wide range of difficulty. Time limit was 30
Achievement Test in Science

The concept formation test on 3 units in science i.e. Food, Components of Food and Fibre to Fabric from the syllabus of 6th class was developed in scene to determine the concept formation of the students in science. There were 35 items with wide range of difficulty. Time limit was 35 minutes one mark is given for the right answer and no mark is answered for incorrect answer.

Procedure

The following procedure was adopted for conducting the study:

Stage I: Selection of the sample

The present study was conducted on 80 students of class VIth in G.G.S.T.P. high school, Rupnagar, affiliated to P.S.E.B. Students were selected for experimentation after administration of Intelligence test on 120 class VIth students. The Intelligence test scores of students were arranged in descending order and randomly allocated to two groups viz. the experimental group and the control group. Thus, there were 20 students in each group.

Stage II: Conducting the experiment

The experiment was conducted in three phases as given below:

PHASE I Administration of the pre-test

This phase involved the administration of the concept formation and Achievement test in Science to students of the experimental and control group.

PHASE II Implementing the instructional program

The instructional treatment was manipulated in the form of teaching based on use of Multi sensory and traditional instruction method. The instructional treatment was given for 12 days to the two groups. Students the experimental groups were taught science for 12 days by Multi Sensory technique and students of control group were taught by the traditional instruction. The content taught to both the groups was same. The instructions were conducted through well structured lesson plans on the content selected for experiment. The treatment was implemented by one of the authors in the two groups so as to minimize teacher variable maximize precision.

PHASE III Administration of the post-test

In this phase, after the completion of Instructional programme, the post test of concept formation and Achievement test was conducted for both the experimental and control group students.

Statistical Technique Used

t-test was employed for the analysis of data, mean and S.D were also computed.

Data Analysis

HYPOTHESIS: I There is no significant difference between mean gain scores of Academic Achievement of experimental and control group of high intelligence students.
Table -1
Mean, Standard Deviation, t-test of Academic Achievement of gain scores of Experimental and Control group of High Intelligence students of 6th Class.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-test</th>
<th>significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20</td>
<td>18.85</td>
<td>3.27</td>
<td>6.12</td>
<td>Significant at 0.01 level.</td>
</tr>
<tr>
<td>B</td>
<td>20</td>
<td>10.95</td>
<td>4.8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table -1 shows the comparison of gain scores of group A i.e. Experimental group and group B i.e. Control group. The mean of group A is 18.85 and of group B is 10.95. Their SD’s are 3.2 and 4.8 respectively. The t value works out to be 6.12 which is significant at both 0.05 and 0.01 levels. Thus, the results show that the hypothesis H1 i.e. there is no significant difference between mean gain scores of academic achievement of experimental and control group of high intelligence students is rejected.

HYPOTHESIS:II There is no significant difference mean gain scores of academic achievement of experimental and control group of low intelligence students

Table -ii
Mean, Standard Deviation, t-test of Academic Achievement of gain Scores of Experimental and Control group of Low Intelligence students of 6th Class.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-test</th>
<th>significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>20</td>
<td>15.40</td>
<td>6.9</td>
<td>2.70</td>
<td>Significant at 0.01 level.</td>
</tr>
<tr>
<td>B</td>
<td>20</td>
<td>10.10</td>
<td>5.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table II shows the comparison of gain scores of group A i.e. Experimental group and group B i.e. Control group. The mean of group A is 15.40 and of group B is 10.10 Their SD’s are 6.9 and 5.4 respectively. The t value works out to be 2.70 which is significant at both 0.05 and 0.01 levels. Thus, the results show that the hypothesis H2 i.e. there is no significant difference between mean gain scores of academic achievement of experimental and control group of low intelligence students is rejected.
HYPOTHESIS: III There is no significant difference between mean gain scores of concept formation of experimental and control group of high intelligence students.

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-test</th>
<th>significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Experimental</td>
<td>20</td>
<td>9.10</td>
<td>2.62</td>
<td>6.91</td>
<td>Significant at 0.01 level.</td>
</tr>
<tr>
<td>B Control</td>
<td>20</td>
<td>4.05</td>
<td>2.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table III shows the comparison of gain scores of group A i.e. Experimental group and group B i.e. Control group. The mean of group A is 9.10 and of group B is 4.05 Their SD’s are 2.62 and 2.00 respectively. The t value works out to be 6.91 which is significant at both 0.05 and 0.01 levels. Thus, the results show that the hypothesis H3 i.e. there is significant difference between the mean gain scores of concept formation of experimental and control group of high intelligence students is rejected.

HYPOTHESIS: IV There is no significant difference between mean gain scores of concept formation of experimental and control group of low intelligence students.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Mean</th>
<th>Standard Deviation</th>
<th>t-test</th>
<th>significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Experimental</td>
<td>20</td>
<td>5.65</td>
<td>2.83</td>
<td>1.17</td>
<td>Insignificant at both levels.</td>
</tr>
<tr>
<td>B Control</td>
<td>20</td>
<td>4.60</td>
<td>2.86</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table IV shows the comparison of gain scores of group A i.e. Experimental group and group B i.e. Control group. The mean of group A is 5.65 and of group B is 4.60 Their SD’s are 2.83 and 2.86 respectively. The t value works out to be 1.17 which is not significant at both 0.05 and 0.01 levels.
Thus, the results show that the hypothesis H4 i.e. there is no significant difference between mean gain scores of concept formation of experimental and control group of low intelligence students is accepted.

**Discussion of results**

On the basis of data, experiences and observations Multi sensory approach was found very effective as far as increasing the achievement level in science is concerned. The students were more engaged in learning when they were given chance to use all their senses. Further using, multisensory approach is a powerful tool in which students can make more meaning concepts, while regarding and learning. There was a significant difference in the achievement level of students when taught using four instructional approaches. Experimental group performed significantly better than the control group with the multisensory approach. Also there was significant difference in mean gain scores of concept formation of students when taught with multi sensory approach.

**Conclusions**

The results obtained lead to the following conclusion:

- The students who were given experimental treatment i.e instruction through Multisensory approach were more engaged in learning than those who were given instructions through conventional method of teaching.
- The instructions through Multi sensory approach are better than traditional because they generate greater capacity for learning.
- Multisensory approach provide an greater transfer of learning
- The results suggested that the Multisensory approach has improved the attitude of students towards learning
- The results suggested that the use of Multisensory approach has overall positive effect on Academic Achievement.
- The inclusion of Audio visual aids in the classroom makes it possible for teachers and learner’s to have more meaningful communication.
- The high intelligence students achieved higher scores than low intelligence students.
- The significant outcomes of movement can impact all learners. Students who learn kinesthetically will be able to remember the movements of the body and use this as a bridge to make connections to the information learned.
- This study found that when sixth grade students were taught science concepts through a multi-sensory approach showed higher science achievement than those who were not.
- After analyzing the data, it was found that there was a significant difference between the mean gain scores of subjects who had participated in the multi-sensory approach than those who had not participated. The Multi-Sensory approach to teaching science to sixth graders showed a significant level of science achievement gained.
- It is also found that that intelligence and the instructional strategy also interact significantly with regard to achievement.
Educational Implications

After reporting the results of the present study in the preceding paragraphs, some of the practical implications are pooled together here to consider their importance.

- Multi-sensory teaching approach can help teachers to develop student-centered classrooms.
- This approach is an effective instructional method, that, when utilized correctly, can encourage academic learning and assist in building a positive, student-centered classroom environment.
- Teachers of science should present curriculum material in many different modalities so all students are capable of learning. The Multi-Sensory approach appeals to children through auditory, visual, and tactile senses.
- It can assist teachers to be prepared to meet the diverse needs of all students.

References


Websites
www.en.wikipedia.org
www.learninghelp.org.au
www.lexiconreadingcenter.org
www.britannica.com