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Achievement in conventional Vs. hand-on experiential method of teaching science to students with hearing impairment

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Abstract
Science is a major cornerstone of every day's life. To develop scientific temper and spirit of enquiry as per Article 51 A (h) of our constitution. There is a fundamental duty of the society, that science education has a special place in the curriculum and has a responsibility to spread scientific thinking. Practical experience that was once considered the age key to build a student, who will make a will, has now disappeared from the classroom. In this study, the researcher wanted to find out a method which increased the academic achievement of hearing-impaired children when taught by two different methods. Under this, three objectives were selected by the researcher which was based on traditional and experiential methods. The researcher then formulated the hypothesis. The researcher used a single subject research design in this research and used a mixed method of sampling technique which involves random selection of schools and purposive sampling of students. This research was conducted on 8 students studying in 7th class of special school in Mumbai. In this study the researcher developed a self-made tool. All data in this study was kept confidential and all ethics were followed as per the requirement. In this study, after teaching by both the methods, it was found that the experimental method proved to be more beneficial than the conventional method. The level of achievement in the children was found to be much higher when taught with the experiential method more than the Conventional method. The alternative hypothesis is accepted because the null hypothesis is rejected.

Keywords: Conventional method, hands-on experiential method, achievement, level of achievement, student with hearing impairment, designated teacher

Introduction
"Science is a beautiful gift to humanity!"

-Abdul Kalam

Science is a major cornerstone of everyday life. It is an active subject, containing activities such as hands-on experiments. This makes Science well-suited to make students active in schools. Thus, Science is emphasized in the educational policies as a foundation for education for all children. Science means "to know" like knowledge gained through experience, accumulate body of knowledge of the physical or material world through observation or experimentation and facts of principles gained by systematic study. Through all these we learn or know something.

The word "science probably brings to mind many different pictures: a fat textbook, while lab coats and microscopes, an astronomer peering through a telescope, a naturalist in the rainforest, Einstein's equations scribbled on a chalkboard, the launch of the space shuttle, bubbling beakers.

All of those images reflect some aspect of science, but none of them provides a full picture because science has so many facts. Thus, Science is the systematic study of the structure and behaviour of the physical, social, and natural words through observation and experimentation. It is key to innovation, global competitiveness, and human advancement. It's important that the world continues to advance the field of science. Science is a way of knowing, a method of learning about nature. Rooted in common sense, its formal, systematic method is called scientific inquiry. In doing scientific inquiry, scientists use a variety of empirical approaches, techniques, and procedures to collect data from nature, examine and analyse that data, and construct knowledge based on it. This knowledge relates to living organisms, non- living matter, energy, and events that occur naturally.

The Value of Learning Science

Beyond the potential scientific breakthroughs, there are individual benefits to learning science, such as developing our ability to ask questions, collect information, organize and attest our ideas, solve problems, and apply what we learn. Even more, science offers a powerful platform for building confidence, developing communication skills, and making sense of the world around us-a world that is increasingly shaped by science and technology.

Science also involves a lot of communication with other people and develops patience and perseverance in children. Finding answers to their countless "why" questions pushes children to research and form their own opinions instead of taking others' for granted. While it's easy to go along with another child's answer or pull out a smartphone and do a quick internet search to know why the leaves fall from the trees, a healthy dose of scepticism can take children farther as they explore the world around them and tackle some of its challenging questions.

The Development of Science Education in India

Science education in India has been greatly accelerated after independence. The important landmarks in the development of science education are the following: Report of Secondary Education Commission (1953) Science is the basic component of education and culture; so, it should be made an integral part of school education. According to the UNESCO Planning Mission (1963) the USSR experts of the UNESCO planning mission visited India on technical assistance projects. Three reports were prepared by them. These reports gave the total picture of the position of science and mathematics education in India and suggested ways to improve it. Indian Education Commission (1964-66) recommended compulsory science as part of general education and stressed that methods of teaching science should be modernized and that science teaching should be linked with agriculture and technology. National Policy on Education (1986) has given much stress on science education and has recommended that science education should be designed to enable the learner to acquire problem solving and decision-making skills a s well as the ability to correlate science with health, agriculture, industry and other aspects of daily life. It has also been stressed that concerted effort be made to extend science education to all those who had to remain outside the pale of formal education.

Experiential learning

Experiential learning is also built upon a foundation of interdisciplinary and constructivist learning. Experiential methodology doesn't treat each subject as being walled off in its own room, unconnected to any other subjects. Compartmentalized learning doesn't reflect the real world, while the experiential classroom works to create an interdisciplinary learning experience that mimics real world learning. Similarly, "experiential learning is aligned with the constructivist theory of learning" in that the "outcomes of the learning process are varied and often unpredictable" and "learners play a critical role in assessing their own learning" (Wurdinger, 2005). How one student chooses to solve a problem will be different from another student, and what one student takes away from an experience will be different from the others. Experiential learning can also be defined by what it is not, or how it differs from conventional academic instruction. In experiential learning, the student manages their own learning, rather than being told what to do and when to do it. The relationship between student and instructor is different, with the instructor passing much of the responsibility on to the student. The context for learning is different-learning may not take place in the classroom, and there may be no textbooks or academic texts to study. Finally, the curriculum itself may not be clearly identified-the student may have to identify the knowledge they require and then acquire it themselves, reflecting on their learning as they go along.

Hands-on experiential teaching method

Hands-on science is simply investigating the questions that matter to us by physically doing something to learn. Children ask so many good questions and many of us learn best by touching and experimenting with real stuff, rather than just reading, watching, or listening. As parents, we want our children to think about the world to solve problems, and hands-on science is the best tool for teaching problem solving, offering real context, and making the neural connections that enhance creativity and critical thinking in a way that improves long term success for children.

Hands-on learning is effective as it involves information retention both physiological and psychological impact of the learning style. It better engages both sides of the brain. Listening and analysing processes occur in the left hemisphere, but visual and spatial processes are handled on the right. By combining multiple styles of learning, the brain forms stronger overall connections and is able to store more relevant information. Brain scans also show increased activity in sensory and motor- related areas of the brain when thinking about concepts they had hands-on experience with.

Review of Literature

According to Carin and Bass, 'there are three major ways for people to learn about the world; discover things about the world from personal observations and experiences with the environment, acquire knowledge transmitted directly from other people or construct personal knowledge by transforming discovered and acquired knowledge in meaningful ways' (2001). Kolb agrees to the above statement mentioning that 'knowledge results from the combination of grasping and transforming experience' (1984). Worth (2010) affirms that learning science is more than just gaining the facts and understanding on the particular topic. This is where learning science through hands-on experiments becomes acceptable as an effective option as it encourages students to experience and discover from observation or feeling. This will lead to the development of students' problem-solving skills, creativity skills and independent learning skills. The three main ways of learning highlighted by Carin and Bass (2001) can be performed through hands-on experiments using Kolb's theory. 'The theory presents a way of structure and sequencing the curriculum and indicates, in particular, how a session or entire course may be taught to improve student learning'. The diagram below shows Kolb's experiential learning cycle that was developed based on Lewin's social

psychology, Dewey's philosophical pragmatism and Piaget's cognitive development genetic epistemology.

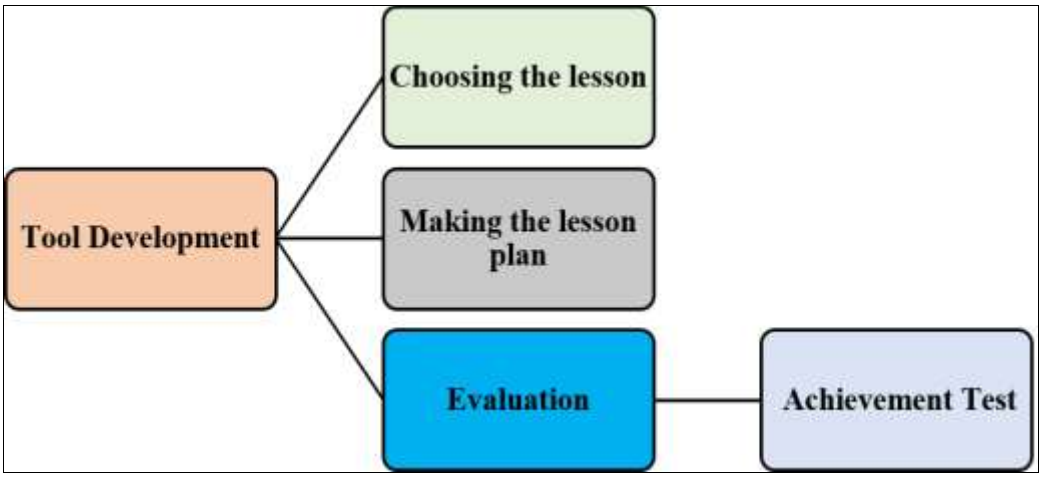
Kolb's Experiential Learning Cycle (Kolb, 1984)
The model portrays two dialectically related modes of grasping experience: Concrete Experience through feeling and abstract conceptualisation through thinking. It also represents two dialectically related modes of transforming experience: reflective observation by watching the happenings and active experimentation by doing research.

Research Methodology
The study aimed at identifying the effectiveness of two different teaching methods, Conventional Vs Hands on experience teaching on degree of achievement. Children's study in Hindi medium special schools of class 7th. For the purpose, "Using subjects as their own Control" experimental design was used. The methodology chosen was, to select a sample size of 1- group there 8 children with hearing impairment.

Sampling
The population undertaken for the study was Rochiram Thadani Special School at Mumbai. Students of class seventh were considered under a sampling frame. Sample size was 8 students of that particular class.
Sampling procedure consists of multistage sampling. As school was chosen on random sampling and class seventh was chosen on the basis of purposive sampling as in Eighth class student's move to different streams.

Data Collection
Data collection was done through conducting the lesson plans and recording the achievement by way of the Researcher/Teacher Made Test (TMT). The class teacher herself was requested to undertake the lesson execution for the ease of students. The class teacher first taught the lesson using conventional methods and then taught the lessons using the Hands-on method. This was done on single group so the group acted control for itself. The Conventional lessons were treated as control group lessons i.e. Control phase and the Hands-on lessons were treated as Experimental lessons i.e. experimental phase.

Tool Development
For the purpose of testing the effectiveness of two different methods (Conventional vs. Hands-on Experiential Methods) on teaching science lesson in term of achievement, the researcher developed tool in to three parts-



Step 1: Choosing the Lesson
For the present study two topics were selected purposively for the 8 students with hearing impaired. Both the topic selected were out of 7th std. book. For the purpose, initially the researcher had selected 5 chapters. The same were given to 5 judges to rank order the choice. The criteria of selection of judges was as follows:
Teacher should be Qualified in the field of special education for HI and having the Experience of not less than 5 years. The teacher should be currently teaching in special school and also having the experience of Hindi medium special school.

Step 2: Making the lesson plan
During a long research history, several models have been created: 'The Lewinian model of action research and laboratory training' (Kurt Lewin), Dewey's model of learning (John Dewey), Piaget's model of learning and cognitive development (Jean Piaget) and so on.
The most popular model that was developed in the 1970s was designed by David Kolb. This modern theory of experiential learning draws heavily on the work of John Dewey, Kurt Lewin and Jean Piaget. For the present study, researcher developed lesson plan which based on Kolb's experiential learning model.

Step 3: Evaluation
Achievement Test
For achievement test, the researcher used several steps first planning and prepare the blue print of the test, then testing the validity and reliability of the test and finally constructed the test.

Testing of hypothesis
To carry research study hypothesis have been formulated which are as follows:

Null Hypothesis (H0): There will be no significant difference between the achievements of Conventional vs. Hands-on experiential method of teaching science to students with hearing impairment.

Alternative Hypothesis (Ha): There will be significance difference between achievements of Conventional vs. Hands-on experiential method of teaching science to students with hearing impairment.

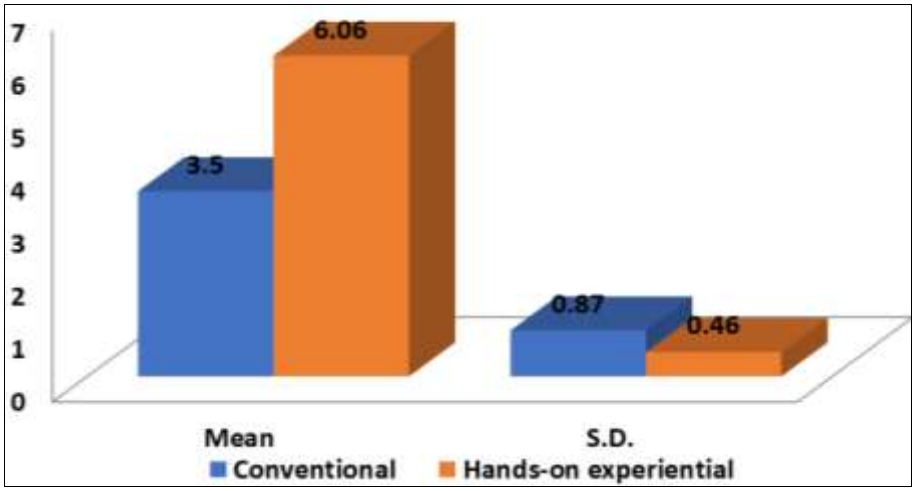
For testing above hypothesis mean and standard deviation of the scores of these sub-groups were computed.

Table 1: Achievements of students

Types of methods	N	Mean	S.D.	t- test (DF =14)	Significant
Conventional	8	3.5	0.87	6.88	Significant
Hands-on experiential	8	6.06	0.46		

The mean of achievement in conventional method and achievement of hands-on experiential method are 3.5 and 6.06 respectively. Their S.D. value is 0.87 and 0.46 respectively. With the help of these SD and mean value, critical ratio (t) is calculated, it is 6.88, and it is significant at 0.05 level of significance so that null hypothesis is rejected.

Thus, this signifies that there is significant difference between achievements in Conventional vs. Hands-on experiential method of teaching science to students with hearing impairment.



Graph 1: Achievements of students

In the table 1.1 we obtain mean and SD of achievement in conventional method and achievement of hands-on experiential method, with the help of score get and rating scale which is filled by both Conventional vs. Hands-on experiential method of teaching science to students with hearing impairment. Result of first hypothesis is not significant because t value (6.88) is greater than table value (1.96) for significance.

Result

To study the differences between the achievements in conventional vs. hands-on experiential methods of teaching on the selected parameters, parametric't' test was applied. On analysis following results were obtained.

Table 2: Consolidated result according to Hypothesis

S.N.	Hypothesis to be tested	Statistical tool used	Findings (Value obtained)	Result (Null hypothesis accepted/rejected)	Interpretation
1.	H01: There will be no significant difference between the achievements of Conventional vs. Hands-on experiential methods of teaching science to students with hearing impairment.	t-test	6.88	Null hypothesis rejected	The mean of achievement in conventional method and achievement of hands-on experiential method are 3.5 and 6.06 respectively. Their S.D. value is 0.87 and 0.46 respectively. With the help of these SD and mean value, critical ratio (t) is calculated, it is 6.88, and it is significant at 0.05 level of significance so that null hypothesis is rejected.

Discussions

The present study shows that the hands-on experiential method is better than the conventional method because the hands-on experiential method increases the achievement level of children. Hands-on teaching method is a method which children learn through doing with each other under supervised guidance of the teacher. Hands-on learning can be a form of experiential learning, but does not necessarily involve students reflecting on their product. In case of children with hearing impairment not many reviews are available. Children with hearing impairment have communication and language problems. It needs to be seen whether or not they too benefit with this method or not. Or the traditional method suits them most. With this in the background, the present study "Study of the effectiveness of Achievement in Conventional vs. Hand-On Experiential Method of Teaching Science to Students with Hearing Impairment" was undertaken. The aim of the study was to comparatively study the effectiveness of Conventional vs. Hands-on experiential method in achievement of students with hearing impairment.

Limitations of the Study

The overall limitations of the present study were-

- The research has been carried only in one school that too is limited to a single class.
- Teacher's perspective could not be studied.
- Children's opinion could not be studied.
- Impact on other subject performance could not be studied.

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