



IMPLEMENTATION OF EXPERIENTIAL LEARNING PROGRAM TO DEVELOP SCIENTIFIC TEMPER AMONG HEARING IMPAIRED STUDENTS IN CLASSROOM

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Abstract

According to our Constitution, 42nd Amendment, one of our fundamental duties is to promote the scientific temper. Classroom is a beehive of activity. To impart experiential learning students should be engaged in Science based activities. Fact with the Hearing impaired students is they cannot be taught through sound sense. In multisensory approach researcher has focused on the remaining four senses that are taste, sight, touch, smell to enhance students knowledge in science. Inclusive education is about how we develop and design our schools, classrooms, programs and activities so that all students learn and participate together. An experiential learning Program was developed in which set of science activities was demonstrated with active participation of hearing impaired students to overcome their hearing inability. Multiple choice question based achievement test was conducted to study the impact. Thus providing an experience that would strengthen student's scientific attitude to counter hearing impairment with which scientific temper was enhanced.



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Introduction: To develop scientific temper, humanism and the spirit of inquiry and reform is one of the fundamental duties of the people of the Republic of India, according to the Constitution of India. The world really needs is people who have skills and go beyond mere knowledge of facts. Skills though require a more complex performance oriented testing which requires more teacher attention. Facilitative strategies for hearing impaired students are primarily concerned with various aspects of communication. Other problems arise because deafness is an invisible disability. Students who have a hearing loss can greatly benefit from inclusion. When teachers understand the educational and social impacts of hearing impairment, teaching strategies can be put in place to promote acceptance and enhance learning.

Usually, the teacher is so busy delivering content and carrying out fixed procedures of experimentation that the aim of fostering the spirit of discovery remains unfulfilled. Besides, we are so obsessed with 'right answers' that even in practical classes students are

preoccupied with the task of 'getting the expected reading or result' instead of observing changes with an open mind. In any case, the sense of wonder with which children enter school has by now been irretrievably lost. The teacher will provide many learning manipulatives and opportunities for small group learning. In the inclusive classroom, a teacher will differentiate instruction (activities, games, role play) which will benefit both the students with and without disabilities, since it will provide more individual attention. An impairment in hearing, whether permanent or fluctuating, that adversely affects a child's educational performance. Education refers to any act or experience that has a formative effect on the personality of an individual. Throughout most of human history, people with disabilities were segregated from the rest of society.

Children with special needs with their constitutions, experience this world as a bombardment of sensory impressions that weaken their life forces. They live quite often in a cloud of anxiety, fear, compulsions, aggression, insecurity or withdrawal. At these moments, the experience of the Arts -painting, music, movement and drama opens them up to a space of their own inner world. Science "happens" all around us every day, and we have endless opportunities to invite a HI child into the wonders of science. Without expensive chemistry sets, equipment or kits, a child can be introduced easily to the natural world and encouraged to observe what goes on in that world. When you least expect it, a moment for learning will occur: A bit of ice cream drops on the sidewalk and ants appear; some cups float and some sink when you're washing dishes; static electricity makes your hair stand on end when you put on a sweater.

Need and Importance of the Study:

The learning processes of students with a hearing loss may be affected in the following ways:

- Students who have been deafened in early childhood can be very different to students who have lost hearing later in life in terms of educational disadvantage. For example, their range of vocabulary may be limited, which in turn may affect their level of language literacy.
- Deaf and hard of hearing students can sometimes prefer visual learning strategies. This can be a challenge in an environment where much essential information is delivered exclusively by word of mouth. Students with a hearing loss may need to use assistive technology to participate in class.

Signs & Symptoms of Hearing Loss

- Conversations become increasingly difficult to understand, particularly if there is background noise.
- Difficulty understanding sound on the television.
- Fails to respond to name.
- Frequently asks for conversations to be repeated.
- Tinnitus, a constant ringing sound in one or both ears.
- While many sounds may be muted, others seem very loud and can be irritating.

Conductive hearing loss is caused by a mechanical problem along the route from noise in the environment to the inner ear. It could be a problem with one of the three small bones collectively called the ossicles (the stapes, malleus, and incus), or other parts of the ear that fail to conduct sound to the cochlea. Sometimes the ear drum is unable to vibrate sound properly.

A **low-frequency sensorineural hearing loss** caused by damaged inner ear hair cells impacts the frequencies 2000 Hz and below. These are the deeper pitches. A low-frequency hearing loss is also known as a "reverse slope audiogram" because someone with low-frequency hearing loss may still hear sounds in the higher frequencies. Due to that, people with low-frequency hearing loss often can still understand speech well. Mixed hearing loss is a term used to describe hearing loss caused by a combination of both conductive and sensorineural hearing loss.

Science for Deaf students – In this day and age of energy problems, depleting natural resources and the need to make sound personal choices based on scientific knowledge and concepts, there is a need for greater emphasis in science literacy among all individuals including children with special needs. There are various methods of science teaching such as experimental method, demonstration method, play way method, observation method, project method, assignment method, problem solving method, tutorial method, descriptive method, question answer method etc. But all of these methods cannot be applied directly to teach the children with hearing impairment because speech and language problem is a barrier for them. So, while teaching the children with hearing impairment the same method could be used, but it has to be modified using concrete experiences according to the needs of children with hearing impairment. These methods should be improvised to suit the needs of children with hearing impairment.

Experiential Learning – Experiential learning theory is a cognitive-learning theory which is considered a “constructivist” learning theory (Kolb 1984). Students must be engaged in such higher-order thinking tasks as analysis, synthesis, and evaluation, to be actively involved. Thus strategies promoting multisensory activities that involve students in doing things and thinking about what they are doing may be called experiential learning. Thus experiential learning is anything course-related that all students in a class session are called upon to do other than simply watching, listening and taking notes.

In one of his books on the education of deaf students, Juan Pablo Bonet (1620) discussed the importance of active learning. In this environment, students develop conceptual knowledge and acquire language through engaging in activity and experiences. Experiential learning involves the student taking responsibility for discovering, constructing, and creating something new (Bonwell and Eison, 1991). Experiential learning leads HI learners to gain a sense of empowerment as they construct meaning through experience and discussion.

Research has made it clear that the quality of teaching and learning is improved when students have enough opportunities to clarify, question, apply, and consolidate new knowledge. There are many teaching strategies that can be employed to actively engage students in the learning process. Some of these are demonstrations, role plays, field trips, and structured learning groups. The benefits of using such activities include improved critical thinking skills, increased retention and absorption of new information, increased motivation, and improved interpersonal skills (R.M. Felder & R. Brent, 2003).

Experiential learning is involving students directly and actively in the learning process itself. This means that instead of simply receiving information verbally and visually, students are receiving, participating and doing. Thus experiential learning is:

- Asking students to observe demonstrations and confirming it through their own experience
- Multisensory experience involves touch, smell, taste based experiences equally contributing in the learning process.
- Engaging students in doing something other than listening to a lecture and taking notes
- Students may be involved in small group activities and reflecting on it through discussion

Rationale- Scientific temper describes an attitude which involves the application of logic. Discussion, argument and analysis are vital parts of scientific temper. Science is an attitude forwards life: a way of thinking. Thus knowledge of science is necessary to help us to understand the things that happen around us. So, science knowledge is necessary to every individual. Children with normal hearing can receive scientific knowledge easily. But the question arises that are these scientific advancements limited to whom called normal population? If no, then why children with hearing impairment are not imparted with scientific knowledge and experiences. But researches shows that the main motto of education of children with hearing impairment is to teach them language & communication. Lang, (2006) stated that in a five year period from 1996 to 2000, not one article in there American annals for the Deaf related to science instruction was published. It is shown that there is not any research related to the teaching science to children with hearing impairment. So, the present study aims the teaching of science to children with hearing impairment with multisensory experiential learning method. Learning to observe carefully is an important step leading to scientific explanations. Experiencing the world with HI child and exchanging information with him about what you see are important, too.

Considering inclusion:

Deaf and hard of hearing students can more efficiently learn to communicate with their hearing peers, they may feel less physically and socially isolated from other children, and they may have more access to certain academic or vocational opportunities. One way to encourage feelings of inclusion and confidence when teaching children with hearing impairments in the regular classroom, is for teachers to familiarize themselves with finger spelling or basic sign language. Understanding equipment like hearing aids, cochlear implants and FM systems will eliminate any fear or anxiety about these devices, increasing the chances of positive interactions with the students who use them.

Children who are diagnosed with hearing impairment usually have difficulty coping with real world. If not properly guided, they might become develop lower self- esteem, and distant themselves from family and people in general. Hence, educators of the deaf have a great responsibility in ensuring that the classroom becomes a learning environment, where the mood is positive and where students will always want to go back to because they feel a sense of belonging.

Statement of the research study: Implementation of experiential learning program to enhance **Scientific temper** among hearing impaired students in inclusive classroom.

Definition of Keywords

Experiential learning programme – It include various multisensory activities like Demonstrations, Group activities and hands on experiences .

Scientific temper : Scientific temper is a way of life which uses the scientific method and which may, consequently, include questioning, observing physical reality, analysing, and communicating.

Science- Science is a systematic study of the facts and discovery of reason of happening Science is the combination of physics, chemistry and biology.

Scientific attitude: A **scientific attitude** is a disposition to act in a certain way. The **scientific attitude** involves curiosity, questioning, reflection and humility.

Hearing Impairment- Hearing impairment means a loss of 60 dB or more in the better ear in the conversational range of frequency (PWD Act,1995).

Objectives:

- To instruct the HI participants to indulge in a set of experiential learning Activities.
- To select a set of experiential learning Activities.
- To conduct a set of Experiential learning activities
- To orient the HI participants about developing Scientific temper
- To Study the effectiveness of this programme

Research Design- The overall experience of this multi-sensory activity package is expected to foster scientific temper among hearing impaired students Quasi experimental design of the research was used for this study. Total 32 students from V.R. Ruia school ,Pune were considered in this study.

Assumptions: There is exist a level of scientific attitude among HI students.

There is exist a level of scientific temper among HI students.

Sampling – Total 32 students were considered through Purposive sampling for the study.

Research Tools – Implementation of set of activities and testing its effectiveness through an achievement test as a Post test .

Limitation: Only classroom activities considered for this study.

Procedure- Learning often relies on a child's sight to look at text and pictures and to read information. It also relies on a child's hearing to listen to what the teacher is saying.

Multisensory teaching isn't just limited to reading and listening. Instead, it tries to use all of the senses. Every lesson won't use all of a child's senses (taste, smell, touch, sight, hearing

and movement). But in most multisensory lessons, students engage with the material in more than one way. That's multisensory teaching. It conveys information through things like touch and movement—called tactile and kinesthetic elements—as well as sight and hearing.

Like hearing students, hearing impaired students need an individualized mix of traditional and experiential learning that reflects their individual learning needs, styles, strengths and weaknesses. This experiential learning program begins with understanding equipment like hearing aids and cochlear implants will eliminate any fear or anxiety about these devices, increasing the chances of positive interactions with the students who use them. The important thing to remember is when teaching students with hearing impairments and using a peer buddy, the buddy can help the hearing impaired student "hear" all the directions and lectures he/she needs to, and he/she should feel like he can help his/her peer buddy in return.

Some Activities and experiments undertaken by researcher in the classroom in presence of interpreter :

Prizm experiment to explain light propagation, reflection and refraction supported with charts and digital images and 3D-animations.

Herbs like Tulsi and mint were demonstrated to explain leaf structure and their medicinal properties.

Different sized Crystals of sugar were shown to them and given them to taste (Sakhar, Khadi sakhar). Litmus test to identify acid base and their properties. Examples of acid bases we use in kitchen were shown to them. These activities club together by preparation of Nimbu Sharbat at the end. Solubility was also explained to them in mean course of the experiment.

Thermometer were given in small group and body temperature, room temperature concepts were explained.

Experiment of Assembling bones in feet and palm in human skeleton was undertaken to create body awareness and its care during various movement and sports was explained to them.

Deep breathing, rope jumping activities were taken in play ground before explaining life processes like respiration and blood circulation supported by charts and 3D animations.

Musical Bumps – using hand signals or flashing overhead lights to alert deaf children to the music's pause. This approach also works for 'statues' – where children 'freeze' on the spot instead of bumping to the ground.

Oranges and apples were distributed in the class. Student have the chance to visually examine, touch, smell and taste oranges and apples—instead of just reading and listening to

his teacher speak about how they grow. Then he might hold a halved apple and count the number of seeds inside, one by one. Shades of orange colour can be explain to boost scientific attitude through observation. Correlating colour of apple and taste of apple gives the insight and make them think critically. Uncovering orange and tasting it contribute to interest and joyful way of learning.

Laboratory signs and equipment labels were displayed in large print, with high contrast . Both written and verbal instructions were provided . By doing lab experiments and activities, the students become able to problem solve and to see that there's a thinking process about being able to ask a question, make a guess about what might happen if they did such and such a thing, then follow through a set of procedures, and then at the end evaluate if indeed what they did answered the question that they were asked in the beginning. So helping them to be problem solvers, helping them to be critical thinkers, is a really important part of science.

Interpretor were informed to follow some precautions like:

- Include regular opportunities to review what has been covered.
- Well structured sessions are important for all students, but particularly for those who lip-read
- Indicate when a new concept is being introduced, by writing on the board or holding up an appropriate book or article.
- Try to break up the session with opportunities to look at illustrations, pass round hand-outs or complete individual tasks.
- preferential seating to view demos and watch instructor captioning for video presentations
- written instructions prior to class must be given to students

Analysis and interpretation of data-

The total score was calculated for each individual student's marks separately and the data was analyzed by the using **t test** for comparison between Conventional method & experiential learning method. Teachers using multisensory teaching methods look for ways to actively involve the students and their senses in classroom activities. Using two or more senses at the same time increases learning retention.

Suggestions: Curriculum can be adapted to incorporate multisensory elements. Additional multisensory classroom activities can be used to enhance and build upon textbook curriculum.

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Rainbow writing: Highly Formatted multicolour texts with bold-faced section titles, outlines, and graphically pleasing layout.

Image based computer program: It includes photographs, diagrams, pie charts and concept maps.

- Multimedia: television provides visual effects which can illustrate complex or abstract concepts; it can be supplemented by workbooks or other materials;
- computers/internet can be used as teaching tools (simulations, online learning communities, professional development of teachers), content delivery tools (online libraries, journals, books), and management tools (assessment, record keeping); can also be used to form community telecentres and virtual schools.
- multi-media integrates radio, television and or computers.

- In an inclusive classroom setting, students are often divided into small groups learning groups with special needs students grouped separately from general education students. With multisensory learning, special education and general education students can be in the same learning group for some activities.
- A good example activity for a group like this would be: Students are given an orange. Each student touches, smells and tastes the orange. The students write descriptive words for the orange on a piece of paper. Although the students write descriptive words with varying degrees of difficulty, they are able to complete the activity together. Allowing special education and general education students to complete activities together enables important social interaction between special education and general education students in the inclusive classroom.
- Objects are passed around for the students to touch or taste or smell. Mint and Tulsi leaves were distributed to the students and Leaf structure was explained using diagram. Photosynthesis was also explained to the students with the help of Interpretor. Medicinal properties of Mint and tulsi leaves were explained to them.
- **Experimental Procedure.** Find a big bushy plant from the **mint** family. Pull up five good sized plants **with** five or six good sized lateral stems on them. Bring the plants inside and put each one in a jar, **leaving** the roots intact. Take your first plant and label the jar "control" **using** a permanent marker.
- The branches of trees are what make them so fun to climb. Each branch starts out as a tiny shoot that grows out from a stem.

Easy understanding of the questions **How is the growth of shoots along a stem regulated? They answer this question after repeated trials which was indicator of scientific attitude generation. Students were very much expressive during this activity as they identify the leaves and plants. Joy of accomplishment was visible during the activity.**

- Multisensory learning is an interactive experience for students. Interactive classroom activities create an enjoyable learning environment for students. Students that enjoy learning are more successful in school.
- to effectively meet them in outdoor a predictable pattern of activities - warm up, drills, minor game, cool down, deep breathing etc. This gets students into a routine knowing what happens and where each task usually occurs. Life processes like Respiration, blood- circulation were taught afterwards. Arranging buddy systems was arranged in the playground to benefit HI students if they are missing information.

- Another helpful strategy is to pair younger children with older hearing impaired students for sharing of their own personal experiences .

- A foam tray (like the kind meat comes in) or a piece of non-corrugated cardboard
- A tray, bowl, or cookie sheet full of water
- Liquid dish soap
- A toothpick

Cut the foam tray or cardboard into a boat shape

A good size seems to be about 2 inches long.

Dip the toothpick into the liquid soap and use the toothpick to put soap onto the sides of the notch at the back of the boat.

That's it! Now carefully place the boat onto the surface of the water and watch it scoot across the water for several seconds – you've made a soap-powered boat! To demonstrate the boat again, you will need to rinse out the tray to remove any soap from the previous demonstration.

How does it work?

Soap is a surfactant – that means that it breaks down the surface tension of water. As the surface tension is broken up, it creates enough of a force to push the lightweight boat across the surface.

MAKE IT AN EXPERIMENT

The project above is a DEMONSTRATION. To make it a true experiment, you can try to answer these questions:

1. Does liquid soap last longer than a solid piece of soap?
2. Does warm water work better than cold water?
3. What materials make the best floating boat?
 - Fresh Lemons
 - A knife
 - A small measuring cup & measuring spoon
 - Baking Soda
 - Liquid dish soap
 - A clear cup for the reaction

What to do:

1. Roll the lemons on the counter like dough. This releases the juice inside the lemon.
2. Cut the lemon in half (adults only, please) and carefully squeeze out the juice into a small measuring cup. Note how much juice was created from each lemon and put the juice aside.
3. Into the empty glass place 1 Tablespoon of baking soda.
4. Add 1 teaspoon of liquid dish soap to the baking soda. Stir these up a bit.
5. Pour the lemon juice into the cup and stir. Now watch the lemon suds erupt!

How does it work?

This is a classic example of an acid-base reaction. This is often done with vinegar and baking soda, but we liked Kari's "lemon twist." The baking soda (a base) and the lemon juice (an acid) combine to release Carbon Dioxide gas. The liquid soap turns the bubbles into a foam that often erupts right out of the glass.

Teaching Techniques for Students with a Hearing Loss

A lack or loss of hearing can affect a child's learning progress, particularly in the understanding and production of spoken language. While many theories have emerged over the years as to which approach is most effective, experts agree that the teaching method should adhere to the individual student's capabilities, needs and personality. Many students can get the information to the same degree if the materials and the information is made accessible to them. It requires a bit of creativity, and it takes a lot of time.

If information in that classroom is being presented in the form of models, in the form of auditory information, in the form of experiments that involve the students getting up and moving around so they're kinesthetically getting some information through their movement, if they've having a chance to smell things.

Teacher and three students at a lab table handling and smelling Mint plants.

There are several strategies that a student can use. One of those includes developing of models, both using models and having students create models.

NARRATOR: Teacher presents a large three-dimensional cell model depicting various structures for students to touch and examine.

Teacher allows the student to handle cell models, many of which are three dimensional, that students can look at and examine. So that works for the whole class, not just the student with visual impairments.

Another activity that is very important for students that helps with concept development is actually building a model themselves.

Students are examining cell models constructed with a glue gun and placing objects within the model.

You can have a student create a model of a cell. For example, the teacher could provide a large piece of cardboard with a large ring drawn in glue with a glue gun.

And that's a very tactual membrane, so that would represent the cell membrane of the cell. And then provide the student with a variety of odd objects--caps, bottle caps, cotton balls, seeds, and other things.

Another activity that's a very typical activity in elementary school is understanding the human body.

And one of the many, many activities in life sciences is understanding the difference between organisms that have backbones and organisms that don't, so chordates. So we're chordates. A really fun activity for students would be creating a backbone, creating a model of a backbone.

NARRATOR: Students examining models of vertebrae and exploring bags containing material to construct model backbones.

FRASER: So what we do to model this is use either a pipe cleaner or a string, again depending on the hand skills of the student and the length of backbone that we wish to model. There are a number of concepts that I hope they'll come away with from building a model backbone. One is the idea that the backbone is composed of vertebrae, that, in fact, backbones have discs between the vertebrae, and that, in fact, our backbone encloses our spinal cord.

When students are learning about the traits and characteristics of different animals, one of the expectations within the curriculum is that they're able to identify differences among various species of animals.

Inventions in the field of science have always played a major role in the course of history.

Keep the habit of stimulating your brain for every science activity you do, and chances are more of you outwitting others when you grow older.

The most common educational approaches include:

- Bilingual-Bicultural: In this approach, [American Sign Language is the only method used in the classroom](#). Traditional English is taught through exposure to printed words on paper.

- Auditory/Oral: This teaching approach does not use sign language, but instead teaches [the English Language through residual hearing and speech](#).
- Total Communication: This method combines [auditory and visual communication](#) for instruction. A combination of sign systems can be used, including American Sign Language, signed English, speech and sign language used simultaneously, cued speech and/or other communication methods.

Child learns best from pictures and images?

You can use the visual learning strategies and activities listed below for teaching your child.

The list of visual learning strategies and activities below will provide you with great ideas for teaching your visual learner.

If you're working through our multisensory lesson tutorial, you will select a Visual learning activity to add to your multisensory plan from the list below. As you recall, in the previous step you selected an auditory learning activity for your multisensory lesson.

Even if you're not working through the multisensory lesson tutorial, you can use the list select activities specifically for your visual learner.

If your child is not a visual learner, she will still benefit from instruction that includes input from each learning modality—as we've learned about in this multisensory teaching tutorial.

Thinking about the specific lesson you are designing this multisensory lesson for, write down one of the visual learning strategies or activities listed below. You can also come up with your own ideas.

Bar Graphs	Flow Charts	Manipulatives
Charts	Concept Maps	Models
Demonstrations	Highlighted texts	Multimedia
Diagrams	Picture Flash Cards	Photographs
Drawings	Image-based Computer Programs	Pie Charts
Educational DVDs	Highly Formatted texts with bold-faced section titles, outlines, and graphically pleasing layout.	Rainbow Writing
Graphic Organizers	Geographic Maps	Timelines
Hands-on Experiments	Color-coded worksheets	Webquests
Make Dioramas	Field Trips	Visually Rich books

Illustrations	Picture Vocabulary	Visualization techniques
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Add the visual learning strategies or activities you've selected to your previously selected auditory learning activity. You will add a kinesthetic learning activity and an activity for the tactile learning style as you visit the next two pages. Adding an activity from each learning style helps build a multisensory lesson plan for your child's optimal learning.

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