# SCIENCE UTSAV 2012

*One Day Teachers' Conference*

*On*

## 'Hands - on Science in Schools'

**5th Febuary, 2012**

**Gujarat Bhavan, Sector 15,**
**Vashi, Navi Mumbai.**

*Organised by*

**Navi Mumbai Science Foundation**

*In association with*

**Shree Gujarati Samaj, Vashi**

# Navi Mumbai Science Foundation (NMSF) : A Concept Portal for Innovations in Education

**Philosophy**:

*'Freedom to innovate'* is a basic component to healthy growth of every individual and if guided properly will lead to a technologically advanced yet socially balanced Nation

**Focus**:

Enable students in the receptive age group of 10 – 15 years to innovate in a collaborative spirit

**Vision**:

Kindle and nurture Student's scientific temperament.
Support their ability to convert information into knowledge.
Enhance their Soft Skills including communication skills.
Enable their Creativity.
Nurture a sustained growth of scientific and collaborative outlook.
Build problem solving attitude in child's personality.

**Approach:**

Build problem solving attitude in child's psyche.
Develop a network of proactive research professionals and personalities who would further the *'pupil-centric' approach* in education.
Expose students to a rich variety of subjects, highlight the linkages in various disciplines and emphasize their relevance to real life. \
Mediate periodic interactions between leading educationist and teachers.

**Activities:**

**Science Club:** Multiplexes Formal and Informal Education Modes.

**Guidance sessions for "Homi Bhabha Young Scientist Award Examination"** : Focuses on *"Pupil-centric" enrichment to Formal Mode.*

**National Children's Science Congress (NCSC):** Provides an "Informal Intervention" into Formal Mode of Science Instruction.

**Fun with Science:** Promotes Process Motivation on sustained basis.

**Exhibition of experiments:** A "Learning through Doing" endeavor.

**Teachers' Conference:** A platform for teachers to share and disseminate the best teaching practices.

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# Navi Mumbai Science Foundation

## Science Utsav 2012

**Teachers' Conference Sunday 5th Feb 2012**
**Theme: Hands On Science in Schools**

**Program**
**Inaugural Session:**

| | | | |
|---|---|---|---|
| 09.30.. 09.35 | : | **Introductory speech** | Dr. A.M. Bhagwat |
| 09.35 .. 09.45 | : | **Welcome Address** | Dr. Kulwant Singh |
| 09.45 .. 10.30 | : | **Plenary talk** | Dr. H.C. Pradhan |
| 10.30 .. 11.15 | : | **Keynote Address** | Dr. A.S. Manekar |
| 11.15 .. 11.20 | : | **Vote of Thanks** | Mr. S.P. Agarwal |
| **11:20 — 11:40** | | **Tea Break** | |

**Session I**

| | | |
|---|---|---|
| 11.40 .. 12.10 | : | **Invited Talk:**'*Project method of Learning'* by Prof. Chitra Natarajan |
| 12.10 .. 12.50 | : | **Oral presentation** by Ms. Sangeetha Mishra, Ms. Aparna Mukerji, Mr. Sudhakar Golla and Mr. S. P. Agarwal |
| 12.50 .. 13.30 | : | **Poster presentations** |
| **13.30 .. 14.00** | | **Lunch Break** |

**Session II**

| | | |
|---|---|---|
| 14.00 .. 14.30 | : | **Invited Talk:** *Make Science Teaching interesting: Why and How:* by Mr. Balasaheb Jadhav' .....' |
| 14.30 ... 15.20 | : | **Oral presentations** by Ms. Teena Rokade, Ms. Angelika Sen, Ms. Neelam Sharma, Ms. Bhaswati Chakraborty and Ms. Sumitra Madathil |
| **15.20 .. 15.40** | | **Tea Break** |

**Session III**

| | | |
|---|---|---|
| 15.40 .. 16.10 | : | **Invited Talk** *Geogebra* by Dr. Aaloka Kenhere |
| 16.10 .. 17.00 | : | **Oral presentations** by Ms. Alka Gadewal, Mr. Venugopal, Ms. Vishalaksh Gnesh, Ms. Anita Choudhary, Ms. AnagahaTagare , Ms Alka Dureja |

**Concluding Session**

| | | |
|---|---|---|
| 17.00 .. 17.05 | : | **Feedback Forms** |
| 17.05 .. 17.15 | : | **Concluding remarks** |

# Science Utsav 2012

**Sunday, 5th February, 2012**

**Gujarat Bhavan, Sect – 15 ,Vashi**

Teaching is a noble profession. Particularly in our country, where the student to teacher ratio is large, our teachers cope with this significant and sensitive job rather very well. While handling large number of students, the teachers use their training as well as their experience and expertise in not only teaching the students the lessons of the curriculum but also a way of using them in life for the students benefit. In this process of teaching the young minds, teachers do learn a lot of techniques of doing so more efficiently and effectively. Successful teachers utilize them for making their work more efficient and improve the infrastructure that is required for a better teaching.

A lot is known about ideal methods of teaching young and fresh minds. A lot of improvements are also developed through systematic research and so on. However, in my opinion, the channels or forums for sharing the experience of the teachers in a methodic topical focused way are too limited to be meaningful for large scale participation.

A common platform where science teachers could come together to discuss their ideas and methods of teaching has more than one advantage. Getting to know teachers from other schools is only one of them which, will inculcate a feeling of community and make their efforts more efficient by introducing elements of both healthy co-operation and competition. The sharing of knowledge would lead to involvement to the extent of innovation.

This one day science teachers' conference is aimed at such an interaction on the topic of teaching practical classes in high schools in such a way as to aid the present curriculum of demonstration of experiments in the class eight and practical classes in the ninth and tenth classes.

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# CLASSROOM ORGANIZATION AND MANAGEMENT TECHNIQES

**Mrs. M . Sumithra**

**TGT (Maths/Physics)**

**Atomic Energy Central School no. 2,n Anushaktinagar, Mumbai- 400094**

We define classroom organization as managing and structuring the physical and social organization of the classroom and learning activities to promote behaviour and learning. The environment that the students receive can influence their learning behaviour. Effective classroom organization should be done during the first weeks of school.(It is crucial in determining expectations, behaviour patterns and procedures that will continue throughout the school year.)

Seating arrangement inside a classroom

Students will spend more time on activities and they are constructive in their work if there is an increase in physical space between them.

Some arrangements that can be followed while organizing a classroom are-

- Seating arrangement should be done in such a way that teacher can see all the students in order to interact with them.
- Arrangement for students with learning disabilities-They should be made to sit alongside well motivated children with whom they can ask their clarifications either during or after the class.
- Place the students with learning disabilities in the front or in the middle of the class-This reduces the angle of eye to teacher to board to the work contact he does. This minimizes the distractions to some extent.
- Left hander-Place left hander next to each other to reduce the arm conflict or seat left and right hander together with the non writing arm next to each other.
- Surround the poorly behaved children with well behaved and motivated children.

Other arrangements inside a classroom.

- Display areas-stimulating colourful and inviting-appreciate students work by displaying it prominently in the room .This allows them to feel valued and raises self esteem
- Minimize noise and visual distractions in and outside the classroom, including flickering lights.
- Check the visibility of the blackboard from all areas of your classroom.
- Some activities require group work –enables students to move more rapidly from receiving knowledge to generating knowledge-small group work is one way of ensuring active participation of students. It is important to change the members of the group frequently. The group should be a mixture of students with all abilities.
- Resources in the class room should be clearly marked and neatly arranged-If there are cupboards or shelves in the class room, keep the resources and other teaching materials there. Some reference books, activity materials, charts, chalk, duster etc can be placed in the cupboard).
- Ensure proper ventilation in the class room.
- Bulletin board-Create a bulletin board that helps learning. Bulletin board should be informative, relevant and related to class activity .

- Based on the activity or class room situation and availability, we can also play soft background instrumental music

A class room can be arranged in any other way that suits the lesson, activity or topic.

After organizing a class room, how do we manage a Science class?

The kind of class room climate created by a teacher has a lot of relevance with how much the children will gain from this approach. Managing the class room therefore becomes an important area which needs attention. A science class room is usually activity based. Children love activities. So we can never expect a science class to be a calm and quiet class. There will be continuous movement and discussions in the class.

- Class room management is a term used by many teachers to describe the process of ensuring that class room lessons run smoothly despite disruptive behaviour.
- Discipline problem can be greatly reduced if students are properly motivated.
- Create a climate for learning.-Teachers should create a good climate for learning at the start of the year itself.

Some steps for effective class room management :-

- Patience with self and students-children are after all children, they have lots of questions against each topic or point. We should have the patience to hear them properly and clear their doubts.
- Start at the very beginning and end at the very end of the class.
- Active involvement-All students should be kept actively involved
- Story telling-Children love stories. Stories about great scientists, their achievement etc fascinate children. Children like to hear small incidents from the lives of scientist. This motivates them and thus we can create a back ground for that day's class. Almost all students have heard the story of Archimedes and how he ran in the streets crying *EUREKA* but still they like to here the story. Even 10 th std students asks for stories once in a while.
- Conducting some science lectures cum demonstration-inviting some scientist to our class room on a regular basis like once in a month or so – will create interest in them. They can have interactive sessions with them.
- Some class routines and procedures-When students do not know what to do and when to do exactly, they start misbehaving. This can be avoided by forming some class routines and procedures where by students begin to work immediately at the start of the class. Some fun problems on interesting topics – eg reflection, magnetism can be put on the black board or OHP to occupy the students. These problems or activities should directly lead to the days lessons.
- Managing, Power seeking, Attention Seeking and stubborn children.-These children should be disciplined privately and quietly. Confrontation with an unwilling students can make the teacher appear weak in front of the class
- Keep all students actively engrossed in every lesson or activity.
- Relate any science phenomenon/properties etc. to daily life experiences.

With all these management techniques and skills ,we can develop scientific temperament in children to a great extent, thereby making science learning highly enjoyable.

# PRACTICAL CLASSROOM MANAGEMENT TECHNIQUES

**Mrs. Neelam Sharma**
**AECS-2 Mumbai**

I have always believed that the mark of a great teacher is not only found in the depth of knowledge he/she possesses but also in his/her ability to pass on this wealth of knowledge effectively to others. A teacher is like a farmer, whose responsibility is to cultivate the minds of his/her students with the fertile seeds of knowledge and to reap the benefits of a good harvest. The beginning of this cultivation, however, must start within the confines of the classroom, a teacher's sanctuary and a safe haven for healthy and wholesome teaching and learning. Coupled with this fact, a teacher's style of teaching, and classroom management and organizational skills are the factors that more often than not determine failure or success. Therefore, teachers must have a great understanding and insight into the intricacies of their craft and the versatility and flexibility required to tailor their style of teaching to meet the learning needs of all students in their classroom.

Elements of classroom management vary. In researching this topic, it is clear that a common understanding for the term management might be useful. For this purpose, management refers to issues of supervision, refereeing, facilitating, and even academic discipline. Not all student behaviors require intervention or confrontation while some are serious enough in nature to warrant formal disciplinary action. Rest assured that while there are current studies in higher education literature that suggest agrowing trend of rudeness and even overtanimosity towards faculty by students, the vast majority of classroom experiences are not dramatic.

Typical classroom management topics are listed in faculty handbooks to reflect pragmatic concerns such as policies on classroom breaks, adds and drops, disruptive and dangerous students, emergency procedures including weapons and drugs in the classroom, location of phones, etc. A rule of thumb for faculty is to keep current on policies regarding student and faculty interactions as well as the role of your teaching assistants, if you have one. Know your college and state policy onstudent conduct.

Some common conduct issues identified by Gerald Amada in his research for Coping With Misconduct in the College Classroom (1999) are listed below. Issues:

1. Undermining the instructor's authority
2. Leaving class too frequently
3. "Spacing Out" or Sitting With Back to Instructor
4. Poor hygiene (possible cultural considerations)
5. Verbal or physical threats
6. Gum, Food, Pagers, and Cell Phone Disruption
7. Monopolizing Discussions
8. Sleeping in class
9. Repeated Tardiness
10. Refusal to Participate or Speak

11. Sexual Innuendo, Flirting, or Other Inappropriate Suggestion

12. Sharing/Copying Work

13. Plagiarism or Lying

14. Too Much Chit Chat

15. Disrespectful Behavior

A few notes on confronting the behaviors listed above:

Avoid calling a student to the carpet publicly. This can behumiliating and break down respect and the sense of a safe environmentthat students need in the classroom. Start with a positive statement if possible: for example, if a studentis monopolizing class discussion, you might start by saying, "I'm really pleased that you take such an interest in discussions and have a lot to share. But I was wondering if you might have suggestions to help others get equally involved?" Document incidents that you feel might continue or are egregious enough to warrant a paper trail. Keep in mind that your dean will likely suggest you take a graduated approach: verbal warning, written warning, meeting with the dean, etc.

You may wish to revisit and reflect upon the importance of the firstday of class. A successful first day and week often contributes to a semester free of classroom management problems. Setting ground rules can be particularly helpful. If you have an early morning, after lunch, or after dinner class time, you might notice some problems with rhythm and attentiveness. You might start these classes with brainteasers or wake up exercises that get students ready to focus. Being aware of circadian rhythm might save you some frustration in getting used to timing issues with your class. Breaking the ice is essential in establishing this connection. Research into student retention suggests that students drop out of college most frequently citing lack of connection as the key factor.With this in mind, it is good practice to pepper the first few classes of the term with connection building activities. Having established a connection amongst peers, students will be more likely to contact each other outside of class for support, ask each other for missed notes,feel safer to offer answers aloud during discussions, and ask for advice regarding other academic and personal concerns. One of the most gratifying feelings as a new faculty was to witness my students staying after class to chat informally. Remember that you were once a student. Think before you act. Take a deep breath if necessary before saying or doing anything you might later regret.

Thus all in all practical classroom management techniques may require more time and energy than any other normal day but the end result is truly rewarding.

# DAY TO DAY OBJECTS AS TOOLS OF LEARNING SCIENCE

**Venu Gopal and Krishna Teja**

The Why? What? When? Where? and How? About the things around us simply can be termed as science. There is no formal way of learning science. You feel, you sense and you learn.

To learn science we need not go to the laboratory every time. Every object around us will tell something about science. Learning science is to be a pleasant experience than a laboratory activity. Here are some of the day to day activities through which concepts of science can be explained.

**Cooking of vegetables:**

***Procedure:*** cut the vegetables in bigger size and cook them on a heater. Cut the same amount of vegetables into finer size and cook them. We observe that when the vegetables are cut finer they get cooked easily.

***Scientific principle:*** More surface area of the vegetables will be in contact with the heat supplied results in faster cooking.

**Apply of ghee in the toaster:**

***Procedure:*** Take a toaster and use it for to make sandwich. When we remove the sandwich from the toaster a part of it stick to the toaster and gets spoiled. Now apply ghee in the toaster, we get the sandwich without spoil.

***Scientific principle;*** Oil is made up of heavy molecule which do not break the bond between them. Hence it prevents sandwich particles sticking to the toaster.

**Use of straw to drink juice from a bottle:**

***Procedure:*** Take a cool drink bottle containing drink in it. Try to drink the juice without lifting the bottle. Put a straw in it, you can drink without lifting the bottle.

***Scientific principle:*** It happened due to air pressure. When we suck the drink through a straw the low pressure created in straw allows the cool drink to rise up

**Home made fridge:**

***Procedure:*** Take an earthen pot, soak it in water, put some vegetables in it and place it in a sunny spot. Observe the vegetables remain fresh even after sometime.

***Scientific principle:*** The pores in the earth-ran pot, trap air in it and do not allow the outer temperature, to reach inside. Since the outer temperature is greater than the inner temperature, water wrapped in the air condenses on the pot and keeps it cool.

***Balloon:*** one of the basic things that we see in every day life is the balloon. In a balloon the principle used is the uniformity of pressure and the pressure difference that exist between the air inside it and the outer atmosphere. Now consider yourselves going into a balloon,as you are increasing the pressure the balloon expands uniformly. When it reaches the maximum limit of expansion, the pressure inside the balloon exceeds the pressure outside the surface and the balloon burst.

**Chalk piece:** Chalk is one of the most easily available object around us. We can write on the board because of the friction that exists between the chalk and board surface. When we move the chalk across the blackboard, the friction causes the deposition of chalk powder on the surface of the board. The same principle works for pens and pencils, etc.

**Fan, Calendar:** observe that when the fan blows air, the calendar pages moves outwards. This is because the fan is pushing the air towards the calendar; it creates a low pressure area upward. There by forcing the air below to rush upwards to the low pressure area. This blows the calendar pages upward. This is the principle proposed by Bernoulli and used in the working of aero plane.

**Light Bulb:** contrary to what we actually believe the light bulb emits heat instead of actually generating light. The light is a secondary product of high heat radiation emitted by the tungsten filament inside the bulb. The flow of electricity is resisted by the filament which generated the extreme heat. That is why we are advised not to touch the bulb when it is glowing.

**Rocket:** rockets work on very simple principle that every action has equal and opposite reaction. This principle can be extending in a class room by using a rubber band. When we stretch the rubber band it generates equal force when it was released. In the rockets the exhaust gases ejects at very high velocities from the nozzles provided at the bottom. This causes action and the rocket propelled upwards due to reaction.

**Pichkari:** while playing holi we use this object called pichkari, the velocity of the liquid which comes out of the nozzle is high because the fluid is forced to emerge out of a narrow orifice. The same liquid has a lesser velocity when the area of projection is more. This gives us the simple fact that Area x Velocity is constant. This is also known as equation of continuity.

**Bouncing Ball:** the principle in bouncing ball is simple. Once the ball is bounced and left, due to its high coefficient of restitution the ball keeps bouncing for a longer time until it looses all its energy. At the point where the ball is at a height it contains potential energy. While it is coming down it looses potential energy and gains kinetic energy. When it hits the ground the total potential energy converted to kinetic energy and the amount of energy imported to the ground reduces its kinetic energy and it rises back to a height less than the previous height. Thus it continuously looses its energy and comes to rest. This shows law of conservation of energy.

Above are the some of the examples which creates interests in knowing science from experience rather than simple practical in the lab. Thereby, emphasizing the fact that the day to day objects around us are the tools for learning science.

# DAY TO DAY OBJECTS AS TOOLS OF LEARNING SCIENCE

**Mrs. Visalakshi Ganesh**

Science is a way to unravel the mysteries of the world through exploration. Children are the Investigators. Children start the investigation through questions like 'what', 'why' and 'how'. School is the place for the children to explore and teachers are their guide. Teachers act as key to open their knowledge. There is no rigid rule book for the teachers to follow. Teachers should always follow the easy way so that the students understand. There are many objects in our day to day life which acts as tool for learning science.

Classroom should be in such a way wherein students can be seated so as to have their discussions in a group of five or six and a table should also in the middle to enhance their group activity as well as to share and present their unique ideas between peers.

**How to teach science**

Scientists develop hypotheses to explain science to the world. Then they ask themselves what could happen if their hypotheses are correct. Testing these predictions—and analyzing the results—is the essence of the scientific method. A good way to start a topic is to initiate the students to the subject area and bring out the results.

Teaching simple activity to investigate:

Make **science tools** as day to day object. Once child becomes familiar with using such tools, keep them available throughout the day, not just for activities. (Science kit: ruler, balance, magnifying glass, bar and horse shoe magnet, plane mirrors, concave and convex, thread, small bob pendulum)

**Encouraging to mix paint colours or explore shadows** is a fine idea. But it makes little sense to tackle the physics of light waves.

**Exploring sound** students can: Bring in electric guitars or jaltharang. Draw others' ears, Make moulds of ears from clay, Simply close their eyes and note sounds that can be heard and interview a hearing impaired person.

**Playing in water with different objects and some materials** – understanding buoyancy, solubility and density. Even preparing solutions with ink gives an idea of diffusion.

**Mud and water** – suspended particles, sedimentation, decantation, and filtration, loading also can be understood by giving a piece of alum.

**Encouraging students idea:**

**Teaching the phases of the moon**: Get students to look at listings of tide, sun and moon rise in newspapers, explore the phases of the moon sometimes listed on calendars, exploring astronomical events close to students birthdays.

**Motion objects**: Everyday life can be used as triggers: Exploring shock absorption by dropping old runners, with weights, onto the floor. Watching how others walk to explore speed, motion and the changing centre of gravity. Talking about physical forces in amusement rides

**Reflection of light**: plane mirror , any object , a chess board -lateral inversion , virtual image, one coin on the chess board and a mirror kept in front of the coin leaving few squares gives a clear picture of how the image is at the same distance at the object is. Arranging two mirrors in different angles with a coin is placed in the middle clears the concept of multiple images.

**Magnetic walk** in the school ground: magnetic materials, collection of iron filling poles of the magnets are powerful

**An electric kit**: .A bulb, a piece of wire, 2cells ,key–arranging a circuit –learning terminals of battery, closed circuit and open circuit .Introducing a plastic, iron piece, eraser , pencil, metal objects in a circuit – conductors and insulators.

**Friction**: carom board with powder sprinkled, movement of ball in different surfaces, lubricants, sports shoe

**Nurture natural sense of adventure and curiosity and introduce to basic elements of scientific reasoning (seeking evidence; testing predictions).**

**• Cause and effect sequences pertaining to every day objects.Students usually have good connections to science and it is up to us as teachers to draw out those connections.**

**1. An introduction** to get students familiar with the **element's name**, its properties and its symbol. Here are some of the questions to answer: Name the following

-Liquid at ordinary temperatures, Used In coins, Used in water pipes, Can be polished , Good at conducting heat or electricity, Used in lamps, light metal used in aeroplanes, Non metallic, Light, Flammable, used in crackers, used in the purification of water, Abundant in nature, Your symbol starts with the letter M, Heavy, Used in batteries, Soft and can cut with a knife, used in photography, burn, resistant to corrosion, used by a dentist, used in jewellery, used in medicine, used in paper, used in rubber industries.

**2. Identifying** acid, base, neutral: collection of items like lemon, tamarind, soap, baking soda-identifying the acid and base .Indicators- turmeric, litmus paper.

Activity: turmeric on a piece of cloth- rub with the soap water gives red colour –indicates base.Rub with lemon it changes into yellow –acid neutralises

**3. Magic of chemistry** (sublimation).Agarbathi, camphor- change of solid into gas.

**Introduce the topic by what they already know:** Learning about something completely unfamiliar is relatively hard. It's much easier to learn more about something you are already familiar with. Therefore introduction of the topic with a familiar term will help the the student to understand better.

**Using the home in science like:**

**In teaching nutrition of food**: Explore best food to take on a camp and taste food and rank it for energy .Collect food nutrition labels and record food intake over 4 days. .Explore and discuss other cultures' foods – climate connections? .Fast food – Explore new angles on McDonald's and Pizza Hut such as the anti-McDonald's website that explores nutritional facts: By exploring the pantry students can find food wrappers and nutritional details that can be used when exploring nutrition.

• **Structure and function** – Compare the diet of different animals and teeth of them. Egg of hen is a single cell and compare other cell.

• **Variation and classification**—the idea that different objects or organisms have distinct properties .

• Compare the activities of different animals and the energy required.

- How living things grow and change and reproduce.
- Movement of different living things

We learn 10% of what we read, 20% of what we hear, 30% of what we see, 50% of what we both see and hear 70% of what we discuss with others, 80% of what we experience personally (emotional). Some science activities permit the students to explore on their own—-without making them conscious of the scientific method and these activities are extremely valuable. But Students can also enjoy more structured activities that explicitly teach the scientific method.

***"It is nothing short of a miracle that the modern methods of instruction have not yet entirely strangled the holy curiosity of enquiry; for the delicate little plant, aside from stimulation, stands mainly in need of freedom; without this it goes to wreck and ruin without fail. It is a very grave mistake to think that the enjoyment of seeing and searching can be promoted by a means of coercion and a sense of duty."***

**--Albert Einstein.**

# EVOLUTION OF DESIGN

**Ms. Aparna Mukerji and Ms. Ganga Rawat**
**DAV International School, Kharghar**

You can teach a student a lesson for a day; but if you can teach him to learn by creating curiosity, he will continue the learning process as long as he lives. Every child is an individual developing at his or her own pace and differing in needs, abilities, interests, cultural influence, learning patterns and behaviors. Since teaching methods vary as to the conditions they can create and different types of types of learning objectives require different condition for achievement, the premise guiding the framework is that the choice of teaching methods should be based primary on the type of learning objective. The development of framework yields two important conclusions. First, single teaching method typically cannot create all the conditions necessary for a given learning objectives. Second, learning objective involving complex skills require teaching methods that promote active learning on part of students, while learning objectives involving simpler skills can be achieved with more passive methods. As a teacher of science, we have used variety of techniques to accomplish the objectives, faced problems, and witnessed successes, but all methods have been welcome by some or other quarter of learners. Activities can be simple, but should be well planned anticipating the practical consequences of implementation. We hereby list an example that we have implemented and received wonderful reciprocation.

A **thinking activity** that is wonderful to introduce a topic such as **Heredity**. This activity **incites curiosity and enhances creativity.**

**Activity/ Procedures:**

**1. Warm-up / Do –Now :** The students are asked to respond to the following prompt( written on board prior to class) : " Focus your attention on the physical features of the students of your class. You can have five minutes to write as much as you can about this. What do you think is responsible for the variety in appearance? Can we alter the design? Where the factors are responsible found? Can you make something better? If so, How?, After a few minutes, the students are allowed to share their answers. The students are asked brainstorm a list of characteristic desirable in everyday objects, which meet the personal or community requirements.

**2. Next, the class is divided into pairs and each pair is assigned an object with new design from the list.** The students are explained that they will be creating an exhibition of everyday objects for a new design and culture museum. Each pair of students will research the object, then prepare a display board and written entry for the museum's catalog, addressing the following categories of information (written on the board or copied in a handout for easier access).

**3. " Evolution of design "** : Drawing, schematic diagrams, photos and other visual aids can be included that will enhance the exhibition of this item. All research sources should be sure to cite in the catalog entry. The students can be asked to bring in models of examples of their object to be included on a display board for a classroom exhibition. Students can be allowed to design an exhibit for each object using drawings schematics, photos they collected, as well as the objects themselves, other classes or parents can be invited to attend the exhibition.

**4. WRAP –UP/HOMEWORK** : individually, students should write as essay to be included in the catalog that explains how the development of this object would change daily life. Students should be encouraged to work towards broadening and enriching their readers' appreciation for this simple, everyday object by including personal experiences and details.

# INCLINED PLANE-A SIMPLE MACHINE

Ms.Sangeetha Mishra

An inclined plane—commonly referred to as a ramp—is a kind of a simple machine,as they allow a given amount of work to be done with less application of force. They achieve this result by altering the size or direction of the required force.

### The Concept of Work in Physics

In order to understand the utility of any simple machine, the concept of *work* needs to be precisely defined. It is closely related to the concept of energy, but the two terms are not quite synonymous: energy is the capacity to do work, while work is defined as *force acting through a distance* or *transmitted over a distance.* Provided that the applied force remains constant and that it is in the same direction as the displacement, the precise mathematical definition of work need not involve either calculus or trigonometry:

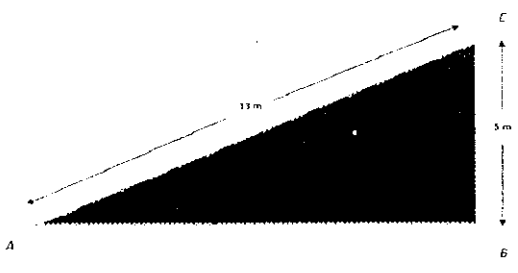
***(Work) = (Force) × (Displacement).***

This is just simple multiplication. If force is measured in newtons and displacement is measured in meters, then the standard unit of work is defined as the *newton-meter.* Another name for this standard unit is a *joule*, which is also the standard unit for energy. (In the British system of measurement, work is measured in *foot-pounds.*) As a quick example, a constant force of 7000 newtons lifts an elevator cab through a vertical displacement of 9 meters. The total work done is (7000 newtons) × (9 meters), which works out to 63,000 newton-meters (or joules).

The equation indicates that work is directly proportional both to the force and to the displacement: if the weight of the cab increased by some percentage—requiring that much greater force to move it—then the total work would increase by the very same percentage, provided that the displacement remained unchanged. On the other hand, if the displacement were increased by some percentage, work would also increase by that same percentage, provided that the applied force did not change.

### Using an Inclined Plane

An inclined plane is a ramp, so it may be described as a rectangular area at some angle relative to the horizontal, the angle being something greater than 0 and less than 90 degrees. The length of the ramp means the distance from point A to point C. The "side view" could be pictured as a right triangle, as below. If an inclined plane were wrapped around a cylinder, the result would be a screw. If two inclined planes were put back-to-back, the result would be a wedge. If steps were cut into the inclined plane, the result would be a staircase. An inclined plane—commonly referred to as a ramp—is a kind of a simple machine,as they allow a given amount of work to be done with less application of force. They achieve this result by altering the size or direction of the required force.



The task is to lift a fairly heavy object from the ground up to point C. Say that it is a bag of cement with a weight of 118 newtons. The ramp is constructed so that it has a height of 5 meters (the distance from point B to point C). The length of the ramp's slope is 13 meters (from point A to point C). Lifting the bag straight up in the vertical direction a total distance of 5 meters from point B to point C would mean doing work directly against the force of gravity. What would be the total work done in that case? By the work formula given above, it would be (118 newtons) × (5 meters), or 590 joules.

On the other hand, pulling the same bag up the ramp over a distance of 13 meters would require the application of much less force. How much less? In order to answer that question, there's no need to find the net force by identifying and calculating the resultant of each and every force acting on the bag. The key physics principle to remember is that the amount of total work must be the same in either case. Since the displacement has been increased to 13 meters, the net force required would be decreased to about 45.4 newtons.

Here is the quantitative summary, where the force required without the ramp and which is directly against gravity is called the load, and the smaller force required with the aid of the ramp is called the effort:

(Load) × (Height of ramp) = (Effort) × (Length of ramp).

T he tradeoff should now be clear: in return for having to use less force, that force must be applied over a greater distance. There are three variables in all: if one of them stays the same (i.e., work) and one of them decreases (i.e., force), then the third variable (i.e., displacement) must increase. This is a general principle applicable to all simple machines, not just inclined planes: what we save in terms of force, we pay for in terms of displacement. Put another way, simple machines allow us to cut down on the required force, but they never allow us to cut down on the total work.

**Calculating Mechanical Advantage**

By allowing a given amount of work to be done with less applied force, simple machines confer what is termed a mechanical advantage. Without the ramp, this task would have required 2.6 times the force than with the ramp. Thus, the mechanical advantage is slightly more than two and a half times. This is easily obtained by dividing the length of the ramp—which is 13 meters in this example—by the height to which the bag has to be raised—in this example, 5 meters.

In the particular case of inclined planes, the general equation would be the following:

(Mechanical advantage) = (Length of ramp) ÷ (Height of ramp).

It should be obvious that in order to maximize mechanical advantage, the ramp could be made *extremely* long: if the ramp pictured above were 1600 meters long (i.e., about 1 mile), the mechanical advantage would come out to be 320 times. This is neither practical nor necessary, since a real-world project operates under time and budget constraints.

One other real-world consideration has to do with friction, which may be temporarily ignored in theory, but never in practice. The above example illustrates *ideal* mechanical advantage, since the force of friction is ignored.

# EFFICIENT TECHNIQUES TO MANAGE PRACTICAL CLASSROOMS

**Mrs. Angelika Sen.**
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Classroom management is a term generally used by teachers to describe the process of ensuring that lessons run smoothly. It is possibly the most difficult aspect of teaching for many teachers.

Practical Classroom management is linked to issues of motivation, discipline and safety. Maintaining good order in practical classrooms is one of the most difficult tasks faced by young and inexperienced teachers. Lab management is an essential skill for any science teacher. Teachers must evaluate and refine the laboratory teaching techniques used to prepare students to safely conduct experiments. Teachers are also responsible for inspecting and maintaining laboratory workspace, storage spaces, and equipment. The laboratory should have a pleasant environment, where the teacher is enthusiastic and active and encourages student's keen participation. It should be a healthy, safe, and productive workplace. Methods of practical classroom management vary. Through this write-up I would like to suggest some methods of effectively managing practical classrooms:

(i) The teacher should start with a positive note, remembering that he/she was also once a student. The risk of confusion and accidents decreases when students know where to find equipment, and have sufficient room to work.

(ii) Students learn a great deal from observing the teacher in the laboratory. When the teacher speaks calmly and works deliberately, he/she sets a positive tone for student behavior and work ethic. When a teacher takes unsafe shortcuts or does not focus on the work at hand, students are likely to take it easy.

(iii) The teacher should never assume that students already know how to perform basic laboratory skills when they enter the classroom. Lighting a Bunsen burner, using a pair of tongs, or disposing of a match are essential skills that, when done improperly, can cause dangerous situations.

The teacher must teach these skills, and monitor and provide feedback to students as they perform them.

(iv) The teacher should outline his expectations for student conduct in the laboratory. Students must know that the teacher is watching them closely and will not tolerate behavior that could create a dangerous situation.

(v) If a reminder does not work, the teacher should immediately move onto reprimand- a strict **warning**.

(vi) Students should be familiar with the procedure before beginning an experiment. They should read through the entire experiment one or more days prior to conducting it, to make sure they are comfortable with each procedural step. Let them know when they should stop work and begin to clean up.

(vii) The potential for accidents increases when students rush through an experimental procedure. The lengthy experiments can be spread over multiple days.

(viii) Teachers' proximity to the students operates as a source of protection, strength, support and most of all love. If the teacher walks up and down the laboratory and stops beside the student, it improves students' confidence.

(ix) The teacher should provide ample time for students to clean and dry glassware, dispose off chemicals, and return equipment to a central location before class ends.

(x) Structuring the needs of the student, giving clear guidelines for work and behavior helps anxious and hyperactive students. The student can then predict what is expected of him, thus reducing unruly behavior.

# EXPERIMENTATION IN SCIENCE AT SCHOOL LEVEL

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In our school curriculum, experimentation is mostly being viewed as an extended learning of scientific principles a student learns in class room. If carefully designed, it can be other way too. So, whatever the case may be, experimentation has an important role to play not only in learning science but also progress of mankind. An attempt is made here to discuss good practices in conducting an experiment.

**1) Scientific Method- A systematic approach to solve a problem.**

The Scientific Method is a logical and rational order of steps by which experimenters come to conclusions about a problem. The Scientific Method helps to organize thoughts and procedures.

**The basic steps in the scientific method are**

i) **State the problem :** It is the first stage in understanding the problem you have chosen.

ii) **Gather information :** After you state the problem, you will need to research everything that you can find about the problem. You can collect information from your our experiences, books, the internet, or even smaller "unofficial" experiments.

iii) **Form an Hypothesis :** Hypothesis means "a possible solution to a problem, based on knowledge and research." The hypothesis is a simple statement that defines what you think the outcome of our experiment will be.

iv) **Experiment:** This is the part of the scientific method that tests your hypothesis. An experiment is a tool that you design to find out if your ideas about the problem are right or wrong. It is absolutely necessary to design an experiment that will accurately test your hypothesis.

v) **Record and analyze data:** Note down the results of your experiment in a data recording sheet. Create columns to record the results from multiple trials and variables. Note your thoughts on the experiment. Include the time and date of the experiment. Analyze the data with respect to hypothesis.

vi) **State the conclusion :** The final step in the scientific method is the conclusion. This is a summary of the experiment's results, and how those results match up to your hypothesis. You have two options for your conclusions: based on your results, either (a) you CAN REJECT the hypothesis, or (b) you CAN NOT REJECT the hypothesis.

**2) Things to remember in applying Scientific Method**

i) Differentiate between activity and experiment.

ii) Not to prefer one out come or another by using common sense and logic.

iii) Not to ignore or rule out the data which differs hypothesis.

iv) Hypothesis cannot become an explanation.

v) To avoid Internal and external pressure to get a desired result.

vi) Estimate systematic errors quantitatively.

**3) Common Mistakes or Unsafe Practice Made by Students in the Science Experiments**

- Using excess chemicals
- Heating a liquid in a test-tube unevenly
- Pointing the mouth of the test tube towards others during heating
- Not viewing reaction mixture in a test tube from the side, but directly above
- Heating a closed
- Not labeling containers of chemicals
- Not observing warning labels on containers of chemicals
- Not replacing stopper of bottle immediately after use
- Picking up broken glass with bare hands
- Using glassware without checking for cracks
- Placing reagent bottle near the edge of a bench
- Leaving experiments unattended
- Placing flammable liquids near a naked flame
- Lighting a Bunsen burner with the air hole of the burner open
- Washing hot glassware in cold water
- Adding water to concentrated sulphuric acid
- Taking away laboratory chemicals without notifying the teacher
- Throwing a burning splint / burning object into a waste bin.

If one is aware of the scientific method, things to remember while applying scientific method, possible unsafe practices and their correction during an experiment, the experimentation in science becomes more meaningful and significant at school level itself.

# CLASSROOM MANAGEMENT.... AN EXPERIMENT WITH IDEAS

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***Abstract*** *: Thinking deeply about what we are doing leads us to ask better questions,break out of fruit less routines,make unexpected connections and experiment with fresh ideas...* ***Ron Bandt***

It is a widely accepted fact that the behaviour of the children is influenced by the environment in which they are brought up.This is true especially in the phase of life when one is a student.Almost all children are known to spend atleast six hours in school and their personality gets shaped as per the lessons learnt in school.So, it becomes necessary for us to develop some skills in order to execute our lessons effectively.Classroom management has always been a tricky subject.A number of teachers are constantly in search of effective classroom management techniques in order to control the chaos and instill discipline in the classroom.My essay is an effort towards the same goal.

**Body of the text**

Some of the techniques for classroom management can be as follows.

Making concrete rules: For controlling a classroom of unruly students,some basic rules can be made and the expectations can be explained to the students.The teacher should be consistent in following those rules.

Positive reinforcement in the classroom:By the effective use of positive reinforcement in the classroom, student can be made aware of their strengths and they can use their strength to the fullest to succeed in the tasks alloted to them. The positive reinforcement should be given on time. The psychological impact of immediate appreciation is more than delayed appretiation.

Handling indicipline: a stern glance at a misbeaving students or talking to the student about the expected behaviour after the class is over can help in handling indiscipline.

Elicit participation: All the students may be given an equal opportunity to opine, participate or contribute in the teaching topic. This makes them feel counted and valued.

Fun quotient: The average attention span of children is twenty minutes and a class generally lasts for forty minutes. So, it is advisable to make the lesson more interesting by turning it into a fun activity whereever it is possible.

Seating arrangement: The back benchers generally have their own private and parallel life going on, as the front benchers seem to be very busy learning from the teachers. Students in the middle are generally engaged in some silent unknown endeavors. The amount of communication that occurs in the classroom between teachers and students has been thougt to be partially a function of the seating arrangement of the students. While they are probably is an infinite ways of arranging a classroom, three are most common –Traditional, Horse shoe and modular.

Eeducationists argue that each of the three arrangements has one element depending on the desire type of communication in the classroom. It is suggested that if the purpose of the class is primarily one of information related presentation, the traditional arrangement is probably best because it minimizes student student interaction.

Horse shoe arrangement – this arrangement would be the best if both student student and student teacher interaction are important.

Modular arrangement is recommended for classes which require the teacher to work closely with individuals or small groups rather than primarily with the class as a whole. This arrangement is also advocated for the classes in which student student interaction is most important.

In short I would like to conclude with the view that effective communication in the classroom is essential for the success of both the student and the teacher. In addition to this a positive and inspiring atmosphere should be provided for learning.

# CLASSROOM EXPERIMENTS

**Alka Dureja**
**TGT Science Atomic Energy Central School No-2**
**Anushaktinagar, Mumbai**

Classroom teaching remains incomplete if theory is not supplemented with the demonstration of the concepts. As the curiosity level is more with smaller children, they need the answer for some common questions which have logic and science hidden within it. Some common and interesting experiments can be demonstrated in the classroom.

### Baby Diaper Secret

**If you've changed a diaper, you've uncovered polymers.**

If you've ever changed a diaper and noticed what looked like tiny crystals on the baby's skin, you've uncovered the secret of superabsorbent, disposable diapers. Those tiny crystals actually come from the lining of the diaper and are made out of a safe, non-toxic polymer that absorbs moisture away from the baby's skin.

### Materials and method

a) Disposable diapers (several brands) b) Zipper-lock bag c) Scissors d) 8-ounce plastic cup e) Water f) Newspaper g) Salt h) Spoon

1. Place a new (unused is your first choice) diaper on the piece of newspaper. Carefully cut through the inside lining and remove all the cotton-like material. Put all the stuffing material into a clean, zipper-lock bag.
2. Polymer that may have spilled onto the paper and pour it into the bag with the stuffing. Blow a little air into the bag to make it puff up like a pillow, then seal the bag.
3. Shake the bag for a few minutes to remove the powdery polymer from the stuffing. Notice how much (or how little) powder falls to the bottom of the bag.
4. Carefully remove the stuffing from the bag and check out the dry polymer you just extracted from the diaper.
5. Pour the polymer into a plastic cup and fill the cup with water. Mix it with your finger until the mixture begins to thicken.
6. Observe the gel that the polymer and water create. Turn the cup upside-down and see how it has solidified. Take it out and play with it. Amazing stuff
7. Put the pieces of gel back into the cup and smoosh them down with your fingers. Add a teaspoon of salt, stir it with a spoon and watch what happens. Salt messes up the gel's water-holding abilities. When you're finished, pour the salt water goo down the drain.
8. Grab a new diaper and slowly pour about 1/4 cup of warm tap water into the center of the diaper. Hold the diaper over a large pan or sink and continue to add water, a little at a time, until it will hold no more. Keep track of how much water the diaper can absorb before it begins to leak.

**How does it work?**

The secret water-absorbing chemical in a diaper is a superabsorbent polymer called sodium polyacrylate. A *polymer* is simply a long chain of repeating molecules. If the prefix "poly" means many, then a polymer is a large molecule made up of many smaller units, called *monomers*, which are joined together. Some polymers are made up of millions of monomers.

Superabsorbent polymers expand tremendously when they come in contact with water because water is drawn into and held by the molecules of the polymer. They act like giant sponges. Some can soak up as much as 800 times their weight in water! That would be one wet baby!

The cotton-like fibers you removed from the diaper help to spread out both the polymer and the, uh, "water" so that baby doesn't have to sit on a gooshy lump of water-filled gel. It's easy to see that even a little bit of powder will hold a huge quantity of water, but it does have its limits. At some point, baby will certainly let you know that the gel is full and it's time for new undies!

In spite of their usefulness, these diapers can be a problem. If you've ever observed a baby in diapers splashing in a wading pool, you know that even one diaper can absorb lots and lots of water. Most public pools won't allow them to be worn in the water because huge globs of gooey gel can leak out and make a mess of the filter system. Also, some folks used to throw them away in toilets - not a good idea unless you're a plumber. For the most part, however, these diapers are a great invention and make for dry, happy babies.

**Color Changing Milk**

**It's an explosion of color!**

It's an explosion of color! Some very unusual things happen when you mix a little milk, food coloring, and a drop of liquid soap. Use this experiment to amaze your friends and uncover the scientific secrets of soap.

**Materials and method**

**a)** Milk (whole or 2%) b) Dinner plate c) Food coloring (red, yellow, green, blue) d) Dish-washing soap e) Dawn brand works well) f) Cotton swabs

1. Pour enough milk in the dinner plate to completely cover the bottom to the depth of about 1/4 inch. Allow the milk to settle.
2. Add one drop of each of the four colors of food coloring - red, yellow, blue, and green - to the milk. Keep the drops close together in the center of the plate of milk.
3. Find a clean cotton swab for the next part of the experiment. Predict what will happen when you touch the tip of the cotton swab to the center of the milk. It's important not to stir the mix. Just touch it with the tip of the cotton swab. Go ahead and try it. Did anything happen?
4. Now place a drop of liquid dish soap on the other end of the cotton swab. Place the soapy end of the cotton swab back in the middle of the milk and hold it there for 10 to 15 seconds. Look at that burst of color! It's like the 4th of July in a bowl of milk!
5. Add another drop of soap to the tip of the cotton swab and try it again. Experiment with placing the cotton swab at different places in the milk. Notice that the colors in the milk

continue to move even when the cotton swab is removed. What makes the food coloring in the milk move?

**How does it work?**

Milk is mostly water but it also contains vitamins, minerals, proteins, and tiny droplets of fat suspended in solution. Fats and proteins are sensitive to changes in the surrounding solution (the milk).

The secret of the bursting colors is the chemistry of that tiny drop of soap. Dish soap, because of its bipolar characteristics (nonpolar on one end and polar on the other), weakens the chemical bonds that hold the proteins and fats in solution. The soap's nonpolar, or *hydrophilic* (water-loving), end dissolves in water, and its *hydrophobic* (water-fearing) end attaches to a fat globule in the milk. This is when the fun begins.

The molecules of fat bend, roll, twist, and contort in all directions as the soap molecules race around to join up with the fat molecules. During all of this fat molecule gymnastics, the food coloring molecules are bumped and shoved everywhere, providing an easy way to observe all the invisible activity. As the soap becomes evenly mixed with the milk, the action slows down and eventually stops.

Try adding another drop of soap to see if there's any more movement. If so, you discovered there are still more fat molecules that haven't found a partner at the big color dance. Add another drop of soap to start the process again.

# INEXPENSIVE KITS FOR DEMONSTRATION : BUILDING YOUR OWN WIND TURBINE

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## Introduction

Wind turbine model makes its electricity with a simple generator which produces pulses of current or alternating current. This model of wind turbine is helpful for teachers as well as students for understanding uses of wind energy and for producing electricity with help of wind energy. In class X Science two chapters are included in which students have to study types of energies and uses of the wind energy. At the same time students have to study the alternating current generator. By using this model of wind turbine we can explain the practical as well as theoretical convepts.

## Content

Normally we observe horizontal axis turbines everywhere. Horizontal axis turbines have blades that create lift to spin the rotor, whereas vertical axis design we are using here operates on basis of drag – one side creates more drag in moving air than the other causing the shaft spin. This wind turbine model makes its electricity with a simple generator which produces pulses of current or alternating current. It does so by passing strong magnets over coils of fine wire. Each time a magnet passes over a coil , the coil becomes energized with electricity. With for coils connected in series , the result is quadrupling of the voltage.

This is the simplest and possibly most efficient way to generate electricity and is the same basic principle used in almost all wind turbines, even large sale commercial one. The electricity from a wind turbine varies with the wind the speed so to makes practical use of it, we must able to store it in batteries or change it into a form that gives a stable, constant voltage. Usually electricity from wind turbine is converted from alternating current to direct current which can be used for battery charging.

## Experimentation

**Apparatus** : Plastic water bottle, plywood, particle board, and 28 gage enameled magnet wire, rare earth disc magnet, and galvanometer.

Analysis : We constructed the model of wind turbine and to observe the practical results. We attached the galvanometer to this wind turbine. As soon as the turbine starts rotating the gakvanometer starts showing deflection on the both sides. This indicates there is generation of alternating current.

**Results:** By this simple model constructed with available materials we can demonstrate the concept of wind energy and generator.

# HANDS-ON SCIENCE IN HIGH SCHOOL

**Teena Atul Rokhade**
**Green fingers global School, sector -12, Kharghar**

*"We got tired of it. Lecturing to sleepy students who want to "go over" material that have already highlighted in their text books so that they can remember the "key words" until midterm. We wanted to engage our students in active learning, to exploit their natural curiosity about economic affairs and to get them to ponder the question before we tried to give those answers. We found that conducting experiments in class, with discussion before, during and after the experiments is an effective and enjoyable way of moving from passive to active learning".* **Bergstron and Miller, 1990.**

Classroom discipline and management cases the most fear and consternation in new teachers. However, classroom management is skill that is not learns, but practiced everyday. Teachers should start the year with a discipline plan because students quickly assess the situation; the teacher must start with most the best classroom management and discipline techniques. On the other hand, I consider that is very important to build relationship with the students from the beginning. An idea could be to find out what their interests are. I they are interested in sport it is interesting know what their favorite team is. The students will be pleasantly surprised when teacher take an active interest in their life. The teacher has to set limits, to establish classroom rules and stick to them. The best rule for classroom is " respect". At the beginning of year the class has to discuss what rule means in regards to their work, their peers, teachers and personal and school property. This rule means nothing unless teacher follows it, as well. He has to model expectation that he has set for students at all times, even if student is disrespectful. The teacher has not to respond in kind. He /She must respect them, and act fairly for all students, because they have a distinct sense of what is and what is not fair. Teacher must avoid confrontation in class. Imagine yourself as a teenager in front of 40 peers. How would you respond in conflict if your reputation depends on your response to teacher? Thus it is better to deal with discipline issues privately, speaking to disruptive students for a moment at the back of room or directly outside the door? The teacher should put burden of responsibility on the student, if he/she is not responsive to teacher respectful attempts. He can say something like 'I like your participation in class. I hope that you decide to stay and participate in a positive way. If you choose not to, then you know the consequences".

The teacher should not forget motivation and praise as an important factor in classroom management. He should help students to see reasons behind their work and to make it fun and attractive. In addition to keeping students fully engaged, which cuts down behavioral problem. Teacher should try giving positive feed back to the student's everyday. In other word to catch them doing something right, to praise and encourage them. Doing so, they will also build their self- esteem. The classroom is pace where teacher and students spend their time and implementing these strategies, many discipline problems either don't arise are resolve easily.

Being able to effectively manage a classroom of students is as important a skill as any other teaching. Gaining and holding students' attention is imperative to them to receiving and learning the material you are presenting. With large populations of students in today's classroom, it can be difficult to manage everyone's attention. Each teacher needs to find classroom management strategy that works for her and her students. The teachers can establish techniques like early rules systems, using silent gestures to gain attention, clap patterns, monitoring the class etc.

A combination of all these techniques can be very helpful for better teaching- learning experience if implemented with sincerity.

# DAY TO DAY OBJECTS AS TOOLS OF LEARNING SCIENCE : STATIC ELECTRICITY

**Ms Alka Gadewal & Ms. Anima Sadhu**
**D.A.V. International School, Kharghar**

## Introduction :

The concept of static electricity can be explained effectively by demonstration using commonly available objects. Basic principles of electrostatics are introduced in order to explain how objects.become charged and to describe the effect of those charges on other objects in the neighbouring surroundings. Static electricity refers to the biuld - up of electric charge on the surface of objects. The static charges remain on an object until they either bleed off to ground or are qiuckly neutralised by a discharge. Static electricity can be constracted with current ( or dynamic) electricity, which can be delivered through wire as power source. The effects of static electricity are familiar to most peoples because people can feel, hear and even see the spark as the excess charge neutralised when brought close to a large electrical conducter( foe example, a path to ground), or a region with an excess charge of the opposite polarity( positive or negative). The familar phenomenon of a static " shock' is caused by the neutralisation of charge.

## Content

Everything is made up of atoms, and atoms are made of tiny particles, some of which are electrically charged. Most atoms are electrically neutral; the positive charges( protons in the nucleus or cenre of the atom) cancel out the negative charges( electrons that surround the nucleus in clouds.) Opposite charges attract one another. similar charges repel one another. Sometimes outer layer ( the negative charged- electrons) of atoms are rubbed off, producing atoms that have a slight positive charge as it gets extra electrons. During dry weather, these excess charges do not dissipate vey easily, and you get static electricity.

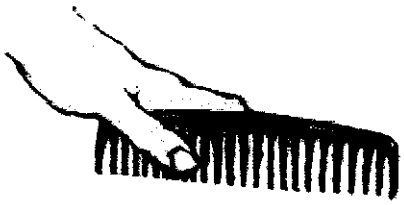
## Experimentation :

### 1) Thread Trick : Comb, thread

Hold one end of a short piece of thred. With your other hand, rub a pocket comb briskly on your clothing, and then bring it near the free end of the thread. You will find you can make the thread stand upright. If you move the comb in small circles, the thread will also move in small circle. Static electricity makes the trick possible. Friction causes free electrons to leave your clothing and attach themselves to the comn, giving it a negative electric charge. Free electrons are repelled from the thread , leaving positively chatged. Since opposite charges attract, it is drawn towards the negatively charged comb.

### 2) Un - pepper the salt :

Shake a pile of salt on the table cloth, flatten it with your finger, then shake some pepper on top of it. The problem is to remove the paper from pepper from salt. Not many people are likely to think of the easy solution. Just put a static charge on a pocket comb by running a few times through your hair. Bring one end of the comb to about an inch above salt. The grains of pepper, which are lighter than salt grains, will jump to the comb.

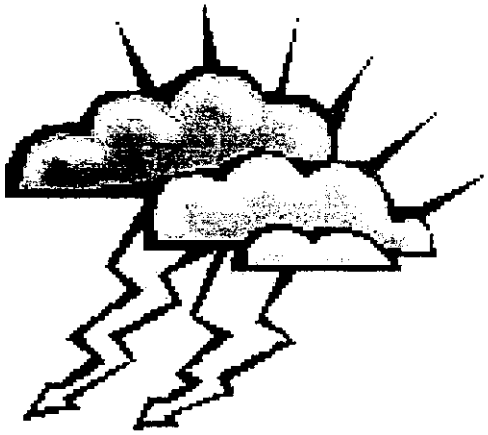



### 3) Static Balloons

Blow up a balloon. Rub it up and down on a shirt. The rubbing makes static charge electricity on plastic skin of the balloon. Hold the valloon against your clothes and let go. the balloon will stick to the clothes. Since the negative charges in the balloon will reorient the atoms of the shirt and a weak electrical force will hold the balloon in place on the shirt.

### 4) Loghting:

Lighting is a form of static electricity. The electricity builds uyp inside storm clouds, and then jump from cloud to cloud or the the ground as brilliant flashes of lighting. The flash makes a booming noise - thunder.



**Result** : the teaching approach helps in building creative and active learning environment.

# HAND-ON SCIENCE IN THE CLASSROOM

**Ms Anika Choudhary**
**Greenfingers Global School, Sec-12, Kharghar**

" ***If I have ever made any valuable discoveries, it has been owing more to patient attention, than to any other talent*" -Sir Issac Newton**

Science is area of currculam that can be utilize hands -on learning perhaps more than any other cases. Science is all about discovery , observation, testing theories to learn more, and experimentation. It is so much more than text books and factual knowledge. It allows children to discover for thenselves answers to questions. It teaches students patience to preserve in the midst of trial and error.

Hands-on science is a valuable tool that can be utilised in the very youngest of classrooms all the way through high school students. There is something instriucally valuable about children learning by discovering the answers for themselves.

Using hands -on approach to teaching and learning enables students to participate fully in a learning community where teacher is not the only source of knowledge and information. It encourages full involvement in a community of learner that includes other students , parents, teachers and outside experts. Science and discovery become a tool, supporting the learning process as students seek new knowledge and understanding. The challenge is not define the new approach to teaching and learning with suffient clarity that it becomes a useful vision for educators as they make decisions about instructional materials, activities and strategies for teaching. This approach is broken down into three components:

**Hands-on** : Students are actually allowed to perform science as they construct meaning and acquire understanding.

**Mind -on** : Activities focus on core concepts, allowing students to develop thinking processes and encouraging them to question and seek answers that enhance their knowledge and therby acquire an understanding of the physical universe in which they live.

**Authentic :** Students are presented with problem solving activities that incoporate authentic, real-life questions and issues in aformat that encourages collaborative effort, dialogue with informed expert sources generalisation to broader ideas and apllication. A curriculum based on constructivitist theory is well - suited to the teaching and learning of science.

Thinking skills, specially higher order skills, must be learned through practice.

A curriculam based on constructivist theory is well- siuted to the teaching and learning science.

Learning assessment must be built into the process of instruction.

all students should have acccess to meaningful, engaged learning in science

In short, using hands-on science activities in the class room is wonderful and effective way to bring the excitement and discovery of science to life for any learner. ( By. Heather Skipworth Craven).

Science experiments give children a chance to explore fascinating topics from world of science using the same methods that professional scientists used to solve problems. Teachers can used

easily available materials to demovstrate certain topics which will be remembered by children always. One such example / experiment is mentioned below.

**Experiment making clouds**

**Materials :** Jar, warm water, funnel, ice cubes

**Method :**

1. Fill the jar with hot water
2. Plasce the funnel in the neck of jar
3. Place the funnel with ice cubes
4. Watch for clouds to form over the funnel.
5. Place a sheet of dark paper behind the jar to make it easier to see the clouds.

**Conclusion**

In this experiment you saw clouds forming above the funnel because of the difference in temperature between the air above the hot water and the air above the ice. as the hot water in the jar evaporated, water vapour formed in the jar. The warm water vapor is less dense than the air around it, so it rose through and the funnel until it encoutered cooler air, it condensed( turned back to a liquid) and formed a cloud.

# STUDENT-CENTRIC APPROACH TO EXPERIMENTS

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**Synopsis** : *Child is born with a natural curiosity. He wants to explore and understand things around him. But he constantly faces instructions from parents and teachers which constraint him. This situation is faced even in different environments like home, school, office etc. Books re-inforce this process of instructions.With time he starts looking for instructions to proceed with an activity. An attempt was made to examine if this natural curiosity can find an expression if students are provided with suitable environment. This paper details such an experiment in actual situation*

## Motivation:

A child is born with natural curiosity. He wants to explore and understand things around him. He wants to play with earth, fire, water, animals and various objects. He wants to understand phenomenon of light and sound around him. But he constantly faces many "Don'ts" from parents who are so concerned about his safety and well-being.

As he moves into outer world where school is his first destination, things remain unchanged. Through books and class-room, he is encouraged to follow the instructions. He is also suitably rewarded if he follows these instructions more and more accurately. His curiosity takes a back seat.

Thus from home to school, he starts looking for verbal/written instructions to proceed with an activity. An attempt was made to examine if this natural curiosity can find an expression if students are provided with suitable environment.

## Background:

Navi Mumbai Science Foundation (NMSF) carries out various programs for promoting science among students. One of the programs is "Science Club' which targets students of 5$^{th}$ to 8$^{th}$ standards. These students have just started on the path to exploring science. Therefore NMSF emphasizes on Hands-on experiments to promote understanding of scientific principles. The exercise was carried in Jan 2012 during one such session in Navi Mumbai.

### Outline of the Exercise

The following basic experiments were selected for trial by the students:

1 Archimedes Principle

2 Galileo's Pendulum Experiment

3 Light Refraction Experiment

4 Light Reflection & Travel in a straight line experiment

5 Strength of an electro-magnet

6 Electricity Series- Parallel connection

Students were grouped to form 6 teams and each team was allotted an experiment. Total 6 tables were arranged and the necessary material required for experiments were placed on the table.

1st step was to select the team leaders and their team.

**Selection of Team**

With a view to select the team leaders, a number quiz was carried out. This is included in Appendix 1. Based on the performance during the quiz, 6 team leaders were identified. The remaining students then wrote down his/her name on a paper. Leaders selected their team by drawing the lots.

Each team was then allotted an experiment to explore

**Guidelines to the teams**

The following guidelines were given:

1 Examine the materials provided

2 Discuss among the group what experiment to carry out and how

3 Discuss and identify the variables to be tested and list the measurements to be taken

4 At the end find '**The Rule**' which is derived from their experiment

Teams were also told that they are required to make a presentation to the class at the end of their experiment. It was also emphasized that **this is NOT a competition** and they should try to explore as many properties as possible.

**Monitoring**

Teachers and guides to monitor to ensure that no unsafe practices are adopted

**Observations:**

As expected, there was an initial hesitation on part of the students to start their activity. Apparently they were waiting some instructions to be given. However, their interaction started when such an instruction was not forthcoming. After initial doubts and uncertainties, students gathered confidence and started exploring the properties

**Archimedes principle:**

The predicted rule by the team was incorrect. This they were able to identify after carrying out the experiment and came up with the correct rule on their own.

Going beyond the rule, one of the students' identified that the loss of the weight of stone was same as the increase in the weight of water recorded by the pan-balance. This finding is far beyond what a normal class-room session will bring out.

**Light – Reflection – Straight line:**

Though both these experiments are simple to look, it became quite a challenge to prove that light travels in a straight line. Finally they succeeded.

Similarly they struggled with light to measure angle of reflection but finally realized that it can be done easily by drawing a line

**Light- Refraction:**

This team really had to struggle with a glass slab and a prism. But their observations were so accurate – 'I see so many rays' also they drew a very unconventional refraction pattern

**Electro-magnet:**

This team also had to struggle a lot to magnetize the nail and to pick up an appreciable quantity of pins. They doubled the number of turns and found out corresponding increase in the number of pins picked up by the magnet. They also found out the time for which the nail remains magnetized even after the current is switched off

**Electricity – Series Parallel connection:**

This team had not learnt about electricity and therefore was not aware about series parallel connection.Once sketch was drawn for these connections without any detailed explanation, they started working with the bulbs provided to explore the phenomenon. One of the bulbs was of higher voltage and this they could find out through difference in brightness. With the bulbs of same type they could correctly identify the Rule.

**Pendulum Experiment:**

I felt that this team knew about the Pendulum experiment and therefore came up with all the predictable results

**Conclusion:**

The exercise emphasized the benefits of a learner-centric approach to science experiments. Such an environment will enable the students to explore and learn and come up with their own conclusions. Such an environment does not depend on tutored knowledge but learning through self-exploration.

**Appendix 1 : Number Game**

**Number Quiz**

Explain to the class, that 3 number will be written on the board. They need to predict the next 3 letters one by one. First they have to write their 1st prediction. Teacher will then write the actual number. Students will compare their prediction with the actual number. Based on this information they need to predict 2nd number Teacher will then write down the actual 2nd number.

Students to check Process to continue Students to find out the Rule

**·Number List**

2 4 6 (4) (2) (0)

3 5 7 (4) (2) (0)

5 8 11 (6) (3) (0)

**Rule = (c-a), (c-b), (c-c)**

**Explanation**

Explain the process of Observation, Prediction, Testing, Modification, Verification, Formation of Rule

**Appendix 2**: Exercise Plan