United Nations
Educational, Scientific and
Cultural Organization

UNESCO, Bangkok Project

Experiential Science
&
Task Based Learning in English

(ESTABLISH)

Activity Booklet

India, Nepal, Indonesia, and Srilanka

INDEX

Android app e-book development Expert: Mr. Chetan Akarte

ICT Activity Card for Tele-collaboration

Prof. Dipak Tatpuje

Note: You need **Gmail account** to join the "Google community named "ESTABLISH" for tele-collaboration in this project.

Please follow the steps.

1. Click on the link of the

   https://plus.google.com/communities/105632083122771655112

2. On the page click Red button: **Join Google plus**

3. Enter your Gmail ID and password.

4. Click Red Button: **Ask to Join**

5. Activities in PDF & videos are available on the community.

6. Also put your comments, remarks, observations, opinion on the Discussion page.

7. **Visit for details & also to download the resources as if required**:

   http://www.newsite.vidyadeep.org/unesco_project.html &

8. http://www.newsite.vidyadeep.org/unesco_project_1.html

9. All the best and wait for the further participation in the UNESCO's ESTABLISH project.

10. **UNESCO Web URL: http://goo.gl/XfKeX**

Prof. Dipak Tatpuje
UNESCO, Bangkok Project Coordinator: ESTABLISH
& Secretary, VidyaDeep Foundation, Satara
Cell: 9422038403, 9890960816

Make the coin disappeared

Hemant Lagvankar
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E-mail : hemantlagvankar@gmail.com

Illustrative Experiment Based on the concept : Total Internal Reflection (Secondary Level)

1. Title of the experiment : Make the coin disappeared
2. Objective : To study total internal reflection of light.
3. Material Required : A transparent glass bottle with a lid, coin and water
4. Concepts covered through the experiment : i. Denser and rarer medium
   ii. Total internal reflection
5. Time required to show the experiment in the classroom : 3 to 5 minutes. Teacher can show this experiment easily by going at students' place.
6. Procedure :

   (A) Place a coin on the table. Keep transparent glass bottle on it. Close the bottle with its lid.
   (B) Ask students to see the coin.
   (C) Now open the lid of bottle and fill the bottle with water. Close the lid.
   (D) Ask students to locate the coin which is still placed below the bottle.
7. Photograph :

Coin kept below the bottle Coin disappeared

8. Observation : When the coin is kept below bottle, it can be seen as the glass bottle is transparent. However, when the bottle is filled with water, even if the glass bottle and water both are transparent, coin kept below the bottle cannot be seen.
9. Theory : When rays of light get reflected from any object and enter in our eyes, image of that object is formed on the retina and we can perceive that object.
   Total internal reflection of light is also an important property of light like that of reflection. Total internal reflection occurs at the interface of two transparent media of different densities.
   When light goes from a denser medium to a rarer medium, and the angle of incidence is larger than a critical value, called critical angle, then entire light gets internally reflected at the surface. (In particular, if we consider air and glass as two transparent media then critical angle for these media for total internal reflection to take place is 48.5^{o}).
   If the angle of incidence is smaller than the critical angle, part of the light is reflected and part of it is refracted.
   In the above experiment, light reflected from the coin gets reflected internally and therefore can not come out of the bottle. So we can not see the coin.
10. Learning outcome : (1) Explain total internal reflection of light.
    (2) Reason out the events observed in day to day life like fiber optics, rainbow.

Science Activity: Feeling 3-D Magnetic Field

Name of the Expert: Prof Babasaheb D Sutar

Name of the Activity: Feeling Magnetic field in three dimensions

Material, Tools required:

1) Coconut hair oil filled bottle
2) Iron fillings
3) Different types of magnets

Activity Steps:

1) Fill the iron fillings in the oil bottle and shake the bottle.
2) Bring slowly the horse shoe magnet near the bottle and place it on the surface of the bottle. Observe the pattern formed by the iron fillings inside the bottle.
3) Replace the magnet and again observe the pattern.
4) Sketch the pattern on paper.

Learning Outcome:

The magnetic field of a magnet is present in three dimensions.

Name of the Expert:

Prof Babasaheb D Sutar
Department of Physics,
Goagte Jogalekar College, Ratnagiri 415 612
Maharashtra, India
babasutar at gmail dot com

Explanation:

In school books the magnetic field is always shown in two dimensions around a magnet by means of flux lines originating from North Pole and ending in South Pole. This is the limitation of drawing in two dimensions. However, in real case the magnetic field is present in three dimensions. For example the earth is a big magnet having the field everywhere. It is popular misconception in students that the magnetic or electric filed exists in two dimensions only. The figures are drawn accordingly. Further much attention is not given to draw the flux lines. The density of the flux-lines at the poles is more. It goes on decreasing away from the poles.

This activity tries to put a light on the fundamental facts about the magnetic field lines, how they are originated and how they can be observed using basic laboratory magnets.

We collected the iron fillings from a hardware workshop and sieved them using usual tea-sieve from kitchen to get fine particles. The clear coconut oil is filled in a bottle (a readymade coconut hair oil bottle can also be useful) and the iron fillings were immersed in it. The cover of the bottle is carefully tightened. The bottle shook vigorously and held vertically. A bar magnet is put slowly on the transparent side of the bottle. The particles are gathered near the poles and it is also observed that they are arranged themselves along a certain pattern near the magnet inside the bottle. The density of the particles is more at the two ends of the bar magnet and along the body of the magnet it is less and almost parallel to it. The iron fillings also shoot off away from the poles inside the oil making hair-strand like structure. These observations clearly show the magnetic field represented by flux lines is present in all directions for a magnet that is in three dimensions.

If we use a horseshoe magnet the similar pattern is observed as shown in above graphics.

Paste this sheet on a black card board. Write your name.
Cut along the dotted line and fold along the solid lines as as shown here.
Remember you have cut two windows - at 'eye' and 'Towards light'
Up here means towards printed side and
down means towards back or black paper side
(case of doubt please check our web or send email
http://www.iucaa.ernet.in/~scipop or scipop@iucaa.ernet.in)

Fold this side up along x - x' by 90 degrees
this is to be glued to the spectroscope base

X'

IUCAA
CD/DVD Spectroscope

Inter-University Centre for Astronomy and Astrophysics
P.O.Bag #4, Ganeshkhind Pune 411007, India
http://www.iucaa.ernet.in/~scipop ::: Email scipop@iucaa.ernet.in

Design: Arvind Paranjpye
Public Outreach Programme

sides A and B are aligned to
line A' and B' and glued

A

Fold here - down (inside)

spectroscope base

X

Fold this side down (in side) by 90 degrees

A'

Do not fold

X'

Eye

Spectrum of a fluorescent lamp

Colour	wl	Element
Faint purple	405	Mercury
Bright blue	436	Mercury
Very faint blue	486	Hydrogen (one may not see)
Faint green	542	(triphosphor)
Green	546	Mercury
Green yellow	577	Mercury
Orange red	611	(triphosphor)

wl = wavelenght in nm

Towards light

Spectroscope made by

Name _____

Do not fold

Y'

Y

B'

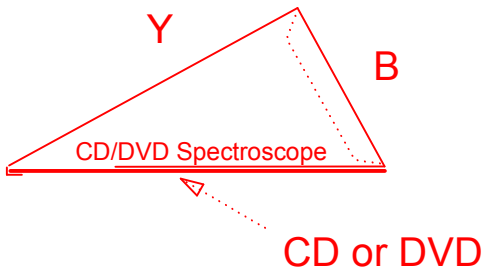
Fold this side down (in side) by 90 degrees

B

IUCAA
CD/DVD Spectroscope

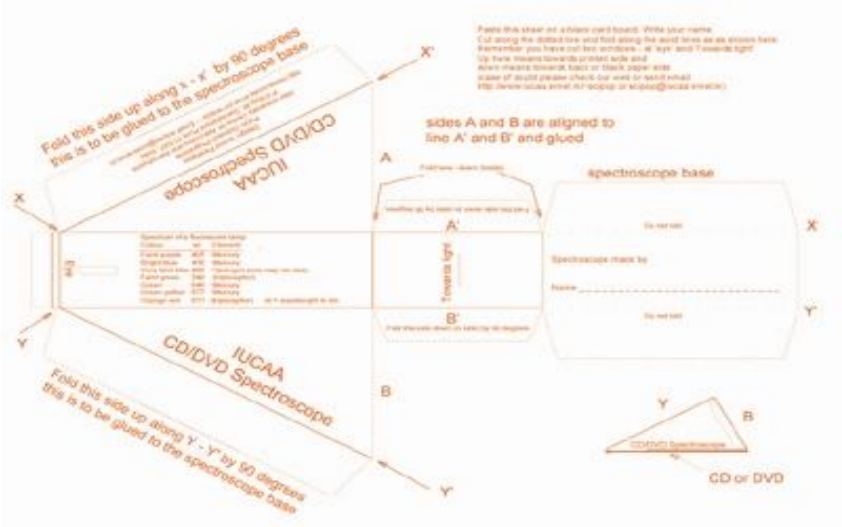
Fold this side up along Y - Y' by 90 degrees
this is to be glued to the spectroscope base

Y'



CD/DVD spectroscope

Arvind Paranjpye

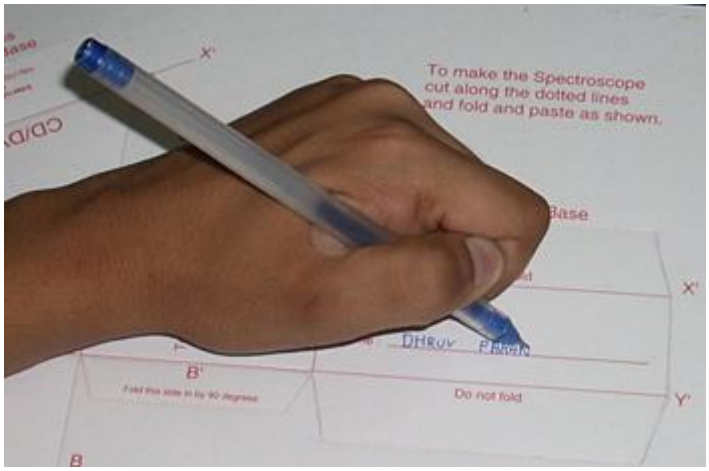


On of the major source of junk from the digital technology are the CD (*Compact Disks*) and DVD (*Digital Versatile Disc*) though these might soon meet the same fate that of computer cards or mag tapes.

Well soon after the first CD hit the market it was quite clear to the science educators experimenters that these could be used as diffraction gratings. Many versions of spectroscopes using CD/DVDs are available on the web. We at the Muktangan Science Exploratorium experimented with discarded CDs. Here we are presenting our 'best model' so far.

The first design of this kind was made in Sept/Oct 2008 for the Festical della Scienza (science festival) at Genova, Italy, that I as invited to participate from 23rd Oct 4th Nov 08. During this period about 200 spectroscopes were made everyday mostly by school children and by parents and teachers.

Follow the instructions given here. Your sheet may look some thing like this. We might add or change it a bit but the basic design is not likely to change.We begin with writing name for identification. Write your name at the space provided



... and carefully detach the 'spectroscope' from the main sheet.

One must be very careful in doing so. There might just be a bad piece that may not come out easily. So be careful.

if you have downloaded the sheet then cut along the dotted line.

Now you have to open the windows. Use thumb to push the slot open……..

If you are using the downloaded sheet, pasted on cardboard then use a good sharp knife. Be very careful - take help of an elder. You may take help of a scale of some straight edge for sharp clean cut.

.. sometimes the window might not come out clean .. you may use some pointed tool such as tip of a ball point pen or even knife

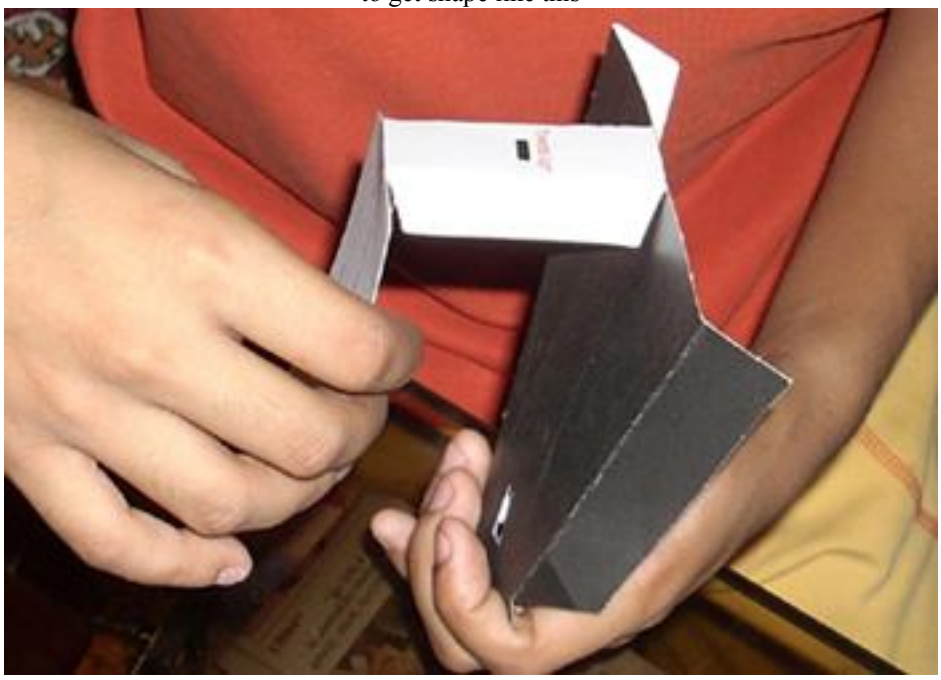
Next fold the side wings up as shown here

again you can take help of straight edge for folding

now bend A' and B' sections the as shown

..... now two more bends

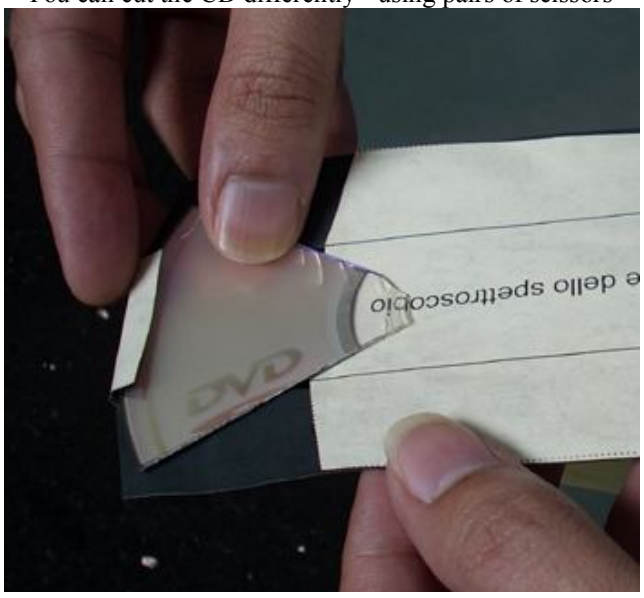
to get shape like this



.Now apply glue to side A' - B' and on the base

first glue the sides A' and B' and then glue the base

We actually do not need one full CD/DVC - a small sector is good enough.
You can cut the CD differently - using pairs of scissors

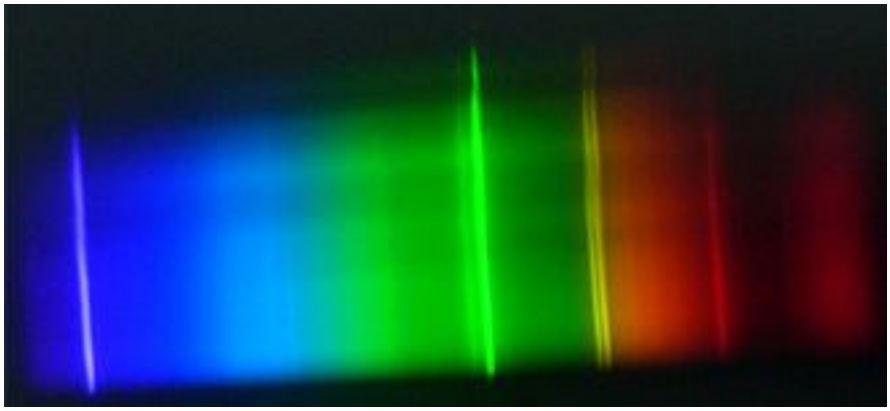


That is it - your spectroscope is ready. Point the window marked 'Towards light' to some source of light and place your eye at 'Eye' window.

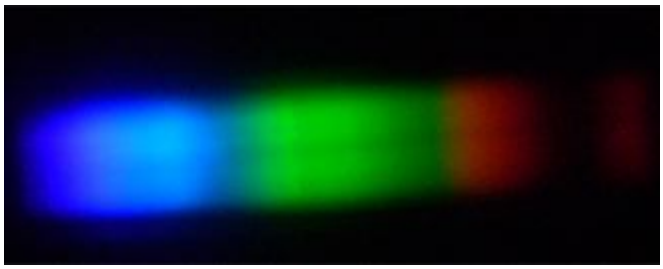
Point your spectroscope to different light sources and check out their spectra.

Try interchanging between DVD and CD - you will find that that spectra using CD are bright but short and with DVD it is more spread out but a bit dim.

Check out **why** from the links given below. The spectra will look vertical.
This is how the spectrum of the sun would like. For the Sun try making width of the 'Towards light' window smaller - you will see many more lines. Check out **why** ?



The above one is that of CFL source and the one below is that of white LED



More information:
CD (*Compact Disks*) and DVD (*Digital Versatile Disc*)
Check out 'how stuff works' and Wikipedia, the free encyclopedia for CD and DVD
Whey we can see rainbow colours using CD/DVD check out diffraction grating Wikipedia, the free encyclopedia one of best source of information is
from http://physicsworld.com/cws/home check out Diffractions Grating.

Name of the Expert: Dr Arvind C Ranade
Name of the Activity: Understanding the Probability
Material, Tools required: Card Board Box, 100 blue and 25 red beads

Activity Steps:

1. We will try to find out - without looking in the box and counting - whether there are more blue or more red beads in the box.
2. Have four students draw five beads each from the box. (Make sure that the beads are put back into the box after each draw.)
3. Have every student record the numbers and colours of beads for each of the four draws.

Learning Outcome:
Questions to Ask and Answer:

1. On the basis of the first four draws how many beads of each colour are there in the box? Let each student in the rest of the class draw five beads each from the box. (Be sure to put the beads back in the box after each drawing.)
2. What are the totals for each colour of beads?
3. Do you think there were more beads of one colour than the other? Why?
4. If so, what do you think the ratio of one colour to the other might be? Open the box and count the number of beads of each colour.
5. What is the ratio of one colour to the other colour?

Conclusion:
The probability of drawing a blue beads is four times greater than drawing a red one.
Video of the activity (If available): Not Now

Name of the Expert: Dr Arvind C Ranade
Name of the Activity: Calculating the value of Pi
Material, Tools required: Meter scale, string, bangle, ring, dish, CD

Activity Steps:

1. On a sheet of paper make 4 columns labelled: object, diameter, circumference, and ratio. (See example below.)
2. Wrap the string around a CD. This measures the circumference of the object.
3. Measure the string using the meter scale. Write the value in the column labelled circumference.
4. Next, measure the distance straight across the CD. Put this value in the column labelled diameter.
5. Now take the circumference divided by the diameter. Put this in the column labeled ratio.
6. Is this close to pi? Make sure you take the ratio out to three or four decimal places.

Learning Outcome:
Measuring the value of Pi

Conclusion:
Every time the value of Pi for any circle comes around the same.
Video of the activity (If available): Not Now

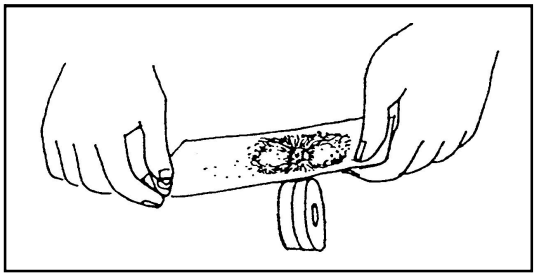
Name of the Expert: Dinesh S Nisang, Sunday Science School

Name of the activity: **Understand electromagnetism and make Simple DC motor**

Experiment 1: Explore Lines of Magnetic Force using iron filings

Iron filings form some specific patterns when you sprinkle them around a magnet. Let us try this out with our ring magnets.

1. Take two magnets together. Keep them on their edge.
2. Hold a card sheet just above these rings. The card sheet should touch these magnets gently.
3. Sprinkle iron filings on the card sheet gently and shake your hand which is holding the card sheet very slowly.
4. You will find that the filings get a specific pattern. This is due to magnetic field of the magnets.



Experiment 2: Make an Electro magnet

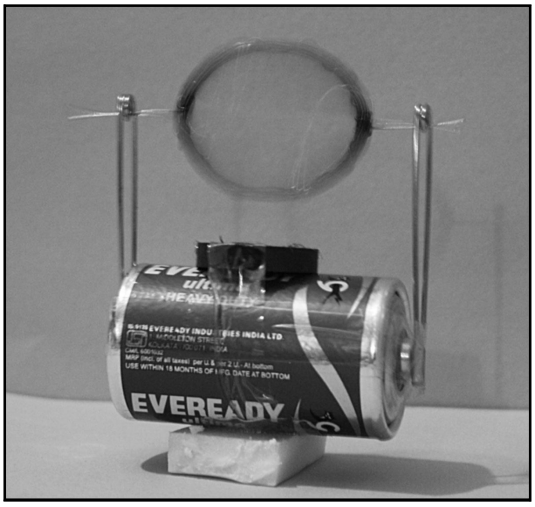
Use copper wire from the kit.
remove enamel coating of its ends using cutter or blade.
Give several turns of this wire around safety pin from the kit.
Join two ends of this wire to 1.5 V cell given in the kit.
This becomes electromagnet. You can test is using pins and other magnetic material.

Expt No.3: Simple DC motor

Objective of the activity: To make a simple electric motor using household material & demonstrate conversion of electrical energy to mechanical energy.

Material required: Battery (1), Ring magnet (1), Safety pin (2), Cello tape, Insulated copper wire

Procedure:



1. Take insulated copper wire, to make armature round, wind copper wire around the battery 12 times.
2. Gently take it out & twist both free ends & wrap them around the coil exactly 180 degree apart.
3. Remove the enamel of the one end of the copper wire with sharp cutter fully & 75% (3 sides of the wire) of the second end.
4. Stick 2 safety pins to the both terminals (positive & negative) of the battery with the help of cello tape.
5. Fix ring magnet on to the centre of the battery in between 2 safety pins.
6. Put round armature in to the holes of the safety pins; make sure it doesn't touch the magnet. Two ends of armature, from where the enamel coating is removed, must rest in the holes of safety pins.
7. If your motor doesn't start immediately, try giving it a start by spinning the coil.

Learning outcome: **Students understands laws and properties of magnets. Concept of working of motor.**

Name of the Expert: Dinesh S Nisang, Sunday Science School

Name of the activity: **Measure your Lung's capacity and make Working lung model**

Prepare working lung model:

1. Attach balloons to each of the tube-end as show in the figure.
2. Insert "Y" shaped tube from bottom of the plastic box. You may apply m-seal to make the assembly air-tight.
3. Fix rubber sheet on open side of the box in order to make it air-tight.
4. Now your working lung model is ready. On stretching the rubber sheet at the bottom, the small balloons will begin to inflate.

   It shows compression and decompression of the lungs.

Effects of Smoking

Smoking damages your lungs' natural cleaning and repair system and traps cancer-causing chemicals in your lungs.

Smoking destroys the tiny hairs (cilia), which line the upper airways and protect against infection. Normally, there is a thin layer of mucous and thousands of these cilia lining the insides of your breathing tubes. The mucous traps the little bits of dirt and pollution you breathe in, and the cilia move together like a wave to push the dirt-filled mucous out of your lungs. Then you cough, swallow, or spit up the mucous, and the dirt is out of your lungs.

Smoking permanently damages the alveoli (air sacs) in the lungs, making it hard to breathe.

The alveoli, little air sacs at the tips of your lungs, are built like tiny, stretchy balloons. As you breathe in, your alveoli help you absorb oxygen into your body, and as you breathe out, alveoli help get rid of the waste gas carbon dioxide. (Carbon dioxide is a harmful gas that's also found in car exhaust fumes.) Smoke damages your lungs so much that your alveoli become less stretchy. This means it's harder for your lungs to take in the oxygen you need and harder to get rid of carbon dioxide. When the alveoli are damaged like this, you can feel short of breath and tired. Your heart has to pump much harder to give your body the oxygen it needs. Over time, this damage can lead to COPD and heart disease.

Regular exercise and out door gaming improves lung capacity and provides you a healthy life.

Measure your Lung's capacity

Blow in to the plastic bag till you can empty your lungs. See how much length of plastic bag you could fill in one breath. Measure its volume and you would know your lung capacity. Repeat it to get more accurate estimation.

Learning outcome: They will come to know their lung's capacity. Some mathematics is involved in finding volume of the cylinder. Children enjoy doing this activity.

Activity & References for Task Based Learning in English

Name of the Expert:	Prof. Nisar C. Shaikh. Director, Satara Education Society's, Language Institute & Research Centre, Satara.
Area of Research:	Designing and conducting Task-Based Language Learning Courses in English and Teachers Training Programmes, Doing Assessment and Evaluation of Task-Based Language Learning and Teaching Courses.
Name of Activity:	Assessing the subjects'(students') proficiency in English during activities conducted for Experimental Science Teaching. (This is the task assigned and undertaken for the ESTABLISH project)
Knowledge Recall:	Students' background knowledge of the forms of language required to understand and express their knowledge of the Science subjects.
Material & Tools:	Standard tests available for assessing English for Science, Question and answer sheets, Questionnaire, Observation Table for recording use of English by the learners in classroom.
Activity Steps:	Classroom observation and recording, Assessing and analyzing the learners' subject specific proficiency in English.
Learning outcome:	Proficiency in English for Science.
Reading References:	English for Science and Technology (Books), English for Specific Purposes (2007), Keith Harding, Oxford University Press, New York.
On line References:	Link for Google Books on line: http://goo.gl/E9sG5
	A practical Guide to a task based curriculum: Planning, Grammar Teaching, & Assessment. On line link for PDF is: http://goo.gl/08Z38