

INNOVATIVE SCIENCE EDUCATION

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Darshan Lal Baweja, a science teacher at Government Model Sanskruti Senior Secondary School at Camp Yamunanagar, has been serving in the department as a Science teacher, and as well as a Science communicator for several years. Since 1994, he has been developing low-cost learning aids to teach science. His students not only make these TLMs independently but also help him in making them.

Baweja makes concerted efforts to propagate science by participating in various events of the teacher-training Institute of Tejali in Yamunanagar, SCERT Gurugram, and in several fairs (science, religious and social), degree and B.Ed. colleges, and science activity stalls. He also holds workshops in various schools.

Baweja believes that a teacher should never wait for the ideal resources to teach his lesson, but rather should use the locally available resources to make learning aids on the spot. He believes “do it and also save it for the future”. Baweja has used several items considered to be junk such as discarded empty bottles, balls, glasses, empty pans, tin cans, discarded injection bottles, syringes,



A teacher who teaches children to do scientific experiments

glucose bottles, matches, funnel, strainer, paper, PVC pipes, discarded fused electric bulbs, sketch pens, marbles, pencils, thermocol beads, useless speaker magnets, handkerchiefs, pieces of wires, plates, lemon, shampoo, soda, vinegar, discarded rose petals, polythene, nails, safety pins, push pins, all pins, discarded CD players, DC motors, candles, pieces of various metals, etc. to create several experiments and tools aimed at making science interesting for teachers and children of Haryana and other states too. He also trains the students to make several of these tools on their own.

According to Baweja, these simple science experiments he creates motivate students to perform science activities and are helpful in making learning simple. These science activities include various curriculum-based rules, principles and provide practical knowledge to children of class 6 to 10.

Apart from syllabus-related activities, Baweja has prepared several low or zero cost tools to perform other activities such as fun with science, hands-on activities, science activities that can be conducted in classroom, “Come and know nature”, “My science box”, science toys, measuring the circumference of earth and Sun dial.

Baweja provides demonstration and training for several syllabus-related science experiments, and explains various concepts using materials that are easily available at home or around the house. These activities include experiments like reflection and shadow formation, electric current and its effects, force and pressure, formation of vortex, electrical decomposition of water, Finding PM time, making clock based on sunlight, density of water, rate of breathing, polar nature of water, solubility of water, checking conductors and non-conducting materials, electric circuits, electric torches, dry cells, electromagnets, determination



Children doing scientific experiments

of sex in human embryo, force and type of force, Pascal's law, air pressure, hydraulic brake, friction force, suppressive force, electromagnetic induction, convection currents, thermal diffusion of air, Bernoulli's law, Archimedes' principle, Boyle's law, Ohm's principle, Refraction of light, Reflection of light, Deflection of light, primary and secondary colours, conductivity/non-conductivity of electricity/heat, Chromatography, vortex current, electric motor, electric generator, resistance, fibres, Sand dials/clock, inertia, action-reaction, centrifugal force, rotational force, air flow, air expansion, boiling point, heat absorption by substances, combustion and flame, types of fire extinguishers, layers of soil, air circulation in the soil, food chain, food network, circulation system, candle flame, vein configuration in leaves, heat conduction in metals, dissection of bisexual flowers, production, transmission and expansion of sound, ores and mineral collection, creating hydrogen, oxygen, carbon dioxide gas at low cost, litmus sheet from flora, making an universal indicator, hydro-currency, full internal reflection, reddish hue of sun during sunrise and sunset etc.

Objectives behind conducting low/zero cost science activities

The aim of teaching and carrying out low/zero cost science activities is that children are able to do these activities from materials easily available at their home or from their surroundings without having to spend anything. Students should be able to conduct experiments on their own and do science activities so that they can develop an interest in self-learning.

Children can easily understand the complex rules/principles related to science lessons when they conduct experiments on their own.

While conducting activities, they can develop an efficiency in creative and constructive skills which helps to prepare them for innovation in

the future. Students should have the opportunity to assimilate the science subject.

Also, they may develop collaborative relationships with their classmates and teachers while doing these activities.

Opinions of various officials and academicians regarding innovative activities conducted

by Baweja

"The Science teacher Darshan Lal presents science to children in unique and interesting ways through innovative teaching methods and also supports the department in training programs. His cooperation is commendable."

Mr. Anand Chaudhary
District Education Officer Yamunanagar

"I have known about these efforts of Shri Darshan Lal for the last 16 years. Low-cost science experiments have great importance in making science teaching interesting and efforts to achieve this by Baweja ji are commendable. He also helps SCRT in teacher training from time to time."

Mr. Manoj Kaushik
Spokesperson Physics and Training coordinator,
SCERT Gurugram

"For the last 4 years Shri Darshan Lal Baweja ji has been putting in commendable efforts for Teachers Training Institute, Tejaji, in science-related training programs for science training, learning promotion program, science popularization program, science kit training, science training for primary teachers and DIET trainee teachers."

Mr. Dushyant Chahal
Acting Principal, DIET, Tejaji



Children explaining scientific tools

List of 100 science activities developed, innovated, and adopted by Darshan Lal Baweja

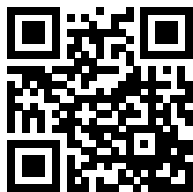
(sent to Shiksha Sarathi magazine started from October 18)

1. My pump.
2. Magic of stopping water through card/napkin/strainer.
3. My own rain.
4. My convex and concave lens (making water lens).
5. My spray pump.
6. There is a hole in my palm.
7. Hot air pushing the water.
8. How did one become two and two become four.
9. Make your own sand timer.
10. Identifying root and vein configuration.
11. Transpiration activity.
12. Germination and necessary conditions for germination.
13. My own water cycle
14. Study the different parts of the flower.
15. Dancing all pins.
16. Magnetic levitation.
17. Electrical decomposition of water.
18. How did iron become copper?
19. What is the distance of the object from its image?
20. Low cost my own electroscope.
21. Floating lemon.
22. Needles and paper clips floating on water.
23. Electric circuit.
24. Fan run car.
25. Make an herbarium and scrapbook.
26. Know the poles.
27. Siphon.
28. Dancing ball.
29. My obedient ball.
30. Toy telephone.
31. How clear the voice of sir.
32. Let me see if you can blow a balloon.
33. Paper whistle.
34. Dissection of Aak fruit.
35. Some boxes swim and others drown.
36. Drawing and observation of stomata.
37. Magnet hanging in the air.
38. Finding Solar noon.
39. Detection of somatic amplification from Bryophyllum plant.
40. How do balloons stick to the wall?
41. Electric conduction in graphite.
42. Physical and chemical changes.
43. To know and observe the microscope.
44. High glass observation and micro-photography.
45. Standardized rain gauge and measurement of rainfall.
46. Why do leaves fall? How do new leaves come?
47. Heat water in balloons and paper cups.
48. Putting soil mould in water.
49. Putting the pencil on the finger.
50. Take out the coin from the matchbox.
51. To know the properties of acid and alkali using litmus test and turmeric as an indicator.
52. Standing on paper cups without breaking.
53. Checking the purity of petrol.
54. To see the difference in densities of different liquids.
55. Dancing naphthalene tablets.
56. Find the rate of water inhalation.
57. How did potato go up.
58. Spinning thread.
59. Come, let's see the Spectrum.
60. Come and observe with binoculars.
61. Identify and observe combustion by heating magnesium metal.
62. Heat absorption, black white bottle.
63. Kaleidoscope.
64. Periscope.
65. Finding pupa.
66. Drip irrigation bottle.
67. Know your teeth.
68. Balloon screams.
69. Why do letters reverse from lateral reflection?
70. Thermal effect of electric current.
71. Concentration gauge.
72. Know metals, non-metals and alloys from samples.
73. How different are leaves?
74. Light travels in a straight line.
75. My friend Prism who gives me rainbow.
76. Teaspoons teach light reflection.
77. Fetoscope – Running Horse.
78. Magnet – Design of coins.
79. Why did the water flow faster from the lower hole?
80. Safe solar observation.
81. Get to know the parasite Amarabel.
82. The ball comes closer and closer.
83. See silkworm cocoon.
84. Let's make Tiktiki.
85. Finding directions.
86. Find the temperature difference between sunlight and shade.
87. Why is the candle extinguished?
88. Magnetizing needles.
89. Curiosity of tiny red seeds.
90. Innovative circuits that indicate saline water are conductors of electricity.

Activities during lockdown:

91. Bubble within a bubble and make one more bubble in it.
92. Big bubbles in the bucket.
93. How did the coin disappear?
94. Bees are our best friends.
95. Message related to prevention of mosquitoes circulated.
96. Getting water from leaves by solar heat.
97. Finding your own height and making a graphical representation.
98. Patterning of parts of a candle flame.
99. Spiral rotating by hot air.
100. Take out one glass from another.

Special recognition as a science blogger for Science club activities

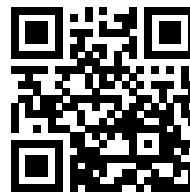


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The above link is the blog of Vipnet Science Club which is maintained by Baweja.

It started when Facebook's group and pages were not very popular. Baweja documents club activities on this blog.

His work has often received departmental accolades. He also made a live presentation of this method of documenting (blogging) at the Regional Science Club Meet in Dehradun Central University on 15-17 October 2012, and now the feed of this blog is part of many newspapers and social media links. These efforts have brought the blog international recognition.



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Blog on why and how of science. This science blog by Baweja is for children and teachers to find answers to many such questions which arise in the curious minds.



QUESTIONS FOR TEACHERS

1. Which teaching activity will be effective in explaining science experiments?
2. How will you explain to children the things to keep in mind while experimenting?
3. What are the benefits of integrating a science subject into everyday processes?

QUESTIONS FOR TRAINEES

1. How should various digital media be used in educational work?
2. What purpose of education is achieved by the activity of cutting from newspapers?
3. What activities can be done to develop comparative skills in children?