

A CRITICAL APPRAISAL OF STATE LEVEL SCIENCE EXHIBITION

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Abstract

Science exhibitions are really great opportunities to students as well as teachers to disseminate knowledge that they have, and to experience a variety of new inventions and innovations that also need wide dissemination. The great significance of exhibition is that it fosters acquisition of different process skills leading to the development of multiple faculties of intelligence in a social context. In such a point of view, it shares very strong theoretical bases of Scientific Attitude, Multiple intelligence, and Social Constructivism. The main theme for the State Level & National Science Exhibitions for 2007 – 2008 in India was ‘Science & Technology and Planet Earth’. Thorough analysis of the state level science exhibition of Puducherry state of India was conducted, so as to realize its’ prospects and problems. The Exhibits include Still models, Working models and Investigatory Projects. Among the projects, assessed, scientific procedure is correctly followed in very few studies; in others, assumptions and beliefs were generalized. Student involvement in projects is comparatively higher than that of models. High school section performed far better than higher secondary section in number variety and in comprehensiveness in all categories, though higher secondary also was included in the competition.

Introduction

Science education should be more experiential than mere conventional talk and chalk. There are different strategies to change the teaching learning approach into an experiential one. Science exhibitions can be effectively utilized in this direction. Both participants and non-participants get benefited by the programme. The position paper on science education National Curriculum Framework (NCF 2005) remarked, “Clearly for experiment based science learning to be effective there must be space and time for teachers and students to plan Experiments, discuss ideas, and critically record analyses observations”. NCF also encourage implementation of co-curricular and extra-curricular components (even if these are not part of the examination) through a massive expansion of non-formal channels such as organization of science exhibition at the national level for school students. (NCERT, NCF 2005)

Science exhibitions are really great opportunities to students as well as teachers to disseminate knowledge that they have, and to experience a variety of new inventions and innovations that also need wide dissemination. “The teaching of science must enable children to examine and analyze their everyday experiences.” as envisaged in the guidelines for State level Science exhibitions 2007 -08 developed by National Council for Educational Research and Training (NCERT) in 2007.

The great significance of exhibition is that it fosters acquisition of different process skills leading to the development of multiple faculties of intelligence in a social context. In such a point of view, it shares very strong theoretical bases of Scientific Attitude, Multiple intelligence, and Social Constructivism. Since science education is aimed to acquire process skills, a study of this kind would throw light on

various aspects of the exhibition such as student involvement, quality analysis of the exhibits, etc. so as to provide necessary guidelines for better organization of exhibits.

The main theme for the State Level & National Science Exhibitions for 2007 – 2008 was **‘Science & Technology and Planet Earth’**. The main objectives of the exhibition according to the guidelines of NCERT 2007 were:

- _ “to highlight the role of science and technology in the exploration of the new incognito of the mind and consequent changes taking place in the mind of the learners;
- _ to develop awareness about the importance of science and technology in effectively managing the resources of the planet earth leading to national development vis-à-vis the global changes;
- _ to lay emphasis on the development of science and technology as a major instrument for achieving goals of self-reliance and socioeconomic development;
- _ to emphasize the role of science and technology for producing good quality materials for the use of society;
- _ to learn managing agriculture, food, water, health, energy, and natural resources; etc.”

Another important objective mentioned in the guideline is that the “organization of science exhibitions at different levels is also to identify and nurture inventive/creative talent among students. Children must be encouraged to explore every resource to enable them to express and to handle objects. They must be given all freedom to express their own creativity and imagination. The role of parents, teachers, and peer groups may be in the form of financial support and discussions.”(ibid p16)

Methodology

The proposed study conducted a thorough analysis of the state level science exhibition, so as to realise its' strong aspects and weak aspects.

Objectives: The objectives of the study are as follows

- 1 To analyse the quality of different types of exhibits
- 2 Suggest necessary steps for improvement of quality of the exhibits

Tools:

Present study followed mainly the tools such as participant observation supplemented by a set of evaluation criteria, discussion with participants, discussion with escorting teachers, and discussion with experts to gather first time data regarding the exhibits.

Separate set of criteria are developed for evaluating each category of exhibit such as project, working model, and still model. Participant observation technique was adopted to get the first hand information of the exhibits. Participant observation is an effective tool for collecting data in a natural setting, Best (1989).

Criteria for evaluation of projects, working models and still models were prepared as per the guidelines of national level exhibition, supplemented by experts in the fields of science exhibition. Document analysis technique was used to analyse various documents on exhibition.

Sample:

The sample of the study comprised of regional level exhibits of Mahe, and state level exhibits of Puducherry state of India. The detail of participation in the exhibition is as given below.

Category	Project	Working Model	Still Model	Specimen	Total
HS Regional	11	12	5		28
HSS Regional	3	3	5		11
HS State	5	18	5	2	30

Teacher's exhibits were also observed and evaluated on the basis of a separate set of criteria.

Students' exhibits at regional level and state level were observed, analysed and evaluated. In the regional level, exhibits from Primary, Secondary and Higher Secondary levels were present. Analyses of the exhibits in Secondary and Higher secondary level only were done. Among the 28 entries at HS level 11 projects, 12 Working models, and 5 Still models are included. Among 11 entries at HSS level 3 projects, 3 Working models, and 5 Still models. In state level Competition out of thirty entries, 5 projects, 18 working models, 5 still models, and 2 specimens were included.

The exhibits were analysed using the set of criteria prepared for evaluation.

Students Exhibits:

Students exhibits are mainly belong to three categories such as Projects, Working Model, and Still Model.

Projects

There is a systematic procedure for conducting a project. The projects in the exhibition include How to deal with Plastic menace, Diabetes – Causes and prevention , Rebirth to banana plant , Biodiversity of Medicinal Plants in Kavu , Phyto extract effect on Mosquito larvae , Energy crisis – Whom to blame, Fruit adulteration ,

Giant African Snail Management , Rhizobium as bio-fertilizer ,and Occurrence of Petrol in the surface water and its impact ..

There were two projects that dealing with the occurrence of Petrol in the surface water at Mahe region. From this, one studied the impact petrol on Humans and the other studied about the impact on Biodiversity of fishes. The selection of the topic, problem identification, and statement of objectives are of current relevance and socially significant. The procedure followed for both the studies concentrated on documentation rather than scientific approach. The variables involved were not fully understood that is why the momentum of the projects fail to achieve its' objectives in real terms.

One more project is on Biodiversity, which signified the importance of Kavau , the holy forest area traditionally seen attached with temples in Kerala . A specific kavau was observed by the participants to identify the occurrence of medicinal plants there. Though they were able to collect specimens of many medicinal plants, the importance of Kavau in biodiversity conservation could not be established using the procedure that they followed. A good aspect that they have included in their work was the preparation of a rainfall chart for the past ten years of that region, which also could not be directly linked with the study

The projects, Rhizobium as bio-fertilizer, and Diabetes-Causes and prevention, followed the essential steps in a project, but limited in contributions from the participants. Ample reference materials are available in these areas and a mere survey could not be sufficient enough to establish the scientific basis.

Plastic menace – how to deal with, was a project on a variety of ways in which plastic can be reused. The existing practices of reuse and recycling of plastic are properly arranged. A school level assessment of plastic sources was made by the participants,

which was a good attempt But it was not comprehensive as only two sources such as milk covers and biscuit covers were only included in the list of sources .Any new innovation or practice was not addressed through the project .

Energy crisis whom to blame was a project explored mainly the wastage of electrical energy in selected families. The project came out with certain novel suggestions such as necessity of proper planning to allow maximum entry of natural light into houses, fitting of fan at those spots so that it could cover maximum area, etc. A survey form, and visit to KSEB office to gather the cost effectiveness of public supply of electricity were the measured adopted for collection of data. The study, instead of concentrating on a particular issue, consider many aspects at a time, thus became vast and unable to reach fruitful conclusions.

Fruit Adulteration is a serious issue of the present time, which is raised in one project. The problem identification, objective statement, etc. were clear. The study concluded that people using adulterated fruits are suffering from diseases such as loose motion, vomiting, diarrhea, head ache, etc. The methodology of the project did not fit to prove the objectives.

Management of Giant African Snail is a serious issue having much social impact in some part of the state of Kerala. A project on this issue was able to identify different eco-friendly materials to destroy the menace. The substances like, common salt, ash, and kerosene were tried. All these are effective, but the best eco friendly one is ash. That aspect was not taken care of in the study. The study also revealed that about 300 eggs were laid by a single snail, whether it is in one year or one season also didn't mention. Another important finding of the study is that, the snails mostly attack papaya plants

which cause a mass destruction of the papaya plants in a particular locality. Though the study has some suggestions, most of them are still in practice by the common people. The project is unable to put forth a comprehensive management plan for total elimination giant snail from the locality

Banana plants are commonly affected by bunchy top disease. An attempt to disseminate a local remedy to the masses was attempted. One day old sediment Starch water after filtration is found to be an effective measure to rejuvenate the plants suffering from bunchy top. Effect of a mixture of turmeric and starch water was also studied, which is said as better than using starch water alone. The exact proportion for best result was not attempted. The sample size is comparatively small to generalize; even then, the study threw light into a traditional eco-friendly approach to disease control.

Mosquitoes became the most dreaded insect with respect to mankind. Mosquito eradication programmes drain lakhs of rupees from our revenue, still then mosquitoes survive greatly. An attempt to kill mosquitoes at larval stage using Phyto-extract of selected plants became so significant in such a situation. In the study, mosquitoes of a particular locality were collected identified and reared. Extract of three different plants such as *Gliciridium sepium*, *Leucas aspera*, and *Ocimum sanctum* were prepared and administered in different concentration and combination to the water in which larvae reared. The best effective one in isolation is *Leucas aspera* and the most effective extract is a combination of 1:1:1 mixture of the three extract. There are a variety of other plants having glandular hair cells also may be included to identify any weed plant as an effective measure to destroy mosquito larvae . The experimental procedure followed for the study is scientific, but the report needs more detailing of methodology.

Working Models

Among the working models exhibited the important ones are Low cost energy water stove , Water harvesting and Purification System, Accident preventing system in hairpin curves , Non-stinking urinals, and Bridge alert .

The low cost energy stove having two cylinders at either ends one filled with kerosene and the other with water. The claim is that use of kerosene can be reduced by half than normal stove. The stove got started using kerosene and gradually the water valve got open slowly and said that by the temperature of about 147 °C at the burner ,water get dissociated into hydrogen and oxygen which will help the working of the stove there after along with small quantity of kerosene . Though the stove is working, energy efficiency testing of the apparatus was not done to prove the claim.

A similar type of stove but with an alternative fuel also was attempted, in which the second tank was connected to a biogas chamber. The biogas is to be formed from the domestic household wastes put in the chamber. This device is more promising as it has an additional value of waste management. One more additional aspect of the stove is that a narrow metal pipe fitted close the burner supplied to a water container. When the stove is working tap of the container can be opened and while passing through the metal pipe it became hot. This is an additional advantage of the stove which can be propagated for energy conservation even in gas stove also, where large amount of heat getting waste around the burner

Water harvesting & Purification system of public toilets for villages and town separately is a useful model with a dual purpose. This is a system with a rain water

harvesting tank having two tiers. When rain water consisting dust particles reaches to the tank for the first time after an interval flows down to the lower tank along with dust. When an amount of water got filled in the lower tank lowered down as it is fitted on spring. Then the water free of dust got filled in the upper tank which then flows to a storage tank through a filter as seen in the common rainwater harvesting systems. The water in the lower tank may be fitted with public toilet, with step in pressure system help the flow of some water to the toilet when people step on the specific part of the floor fitted with pressure lever, thus functions as an automatic flush out system. Such system can be utilized for individual as well as for public toilets.

Accident preventing system is a simple device with sensors at either side of hairpin curves. When a vehicle crosses a particular point near the hairpin curve, an indicator light will start working on the other side of the hairpin and vice versa. So drivers can easily understand the presence of a vehicle in two sides of the curve. A pressure based sensor was attempted in the model, which could not be useful for actual road conditions, but the idea is good for road safety.

Non-stinking urinals is a public utility model in which the U tube of each urinal be more lengthy and a layer of black oil added to the top of water layer in each . The water level of each is maintained the same always. The quantity of water poured into the system, the same quantity will flow out from the system. Since oil remains as the top layer, bacteria could not come out from the lower level and keep the system non-stinky.

Weakening of bridges occurs due to various reasons. Running of vehicles with higher capacity to permitted level is one major cause. The bridge alert system is suggested as a solution to this problem. In the system, an alarm worked automatically

with a pressure sensor, and then the gate keeper can close the gate to prevent passage of heavy vehicles. The question is with the required strength of vibration that the sensor could sense and that vehicle could be stopped only in the middle or at the other end of the bridge is the main demerit of the system.

Multi-purpose sanitation vehicle is a vehicle which can clean the road and same time fitted with water tank and system for road marking. Such multi purpose vehicles will be cost effective with the only pre condition that the roads should be level and clear.

Plastic bricks are an effective plastic recycling technique. Plastic got heated with sand in an earthen pot and as melting proceeds, it mixed thoroughly with the sand. This paste like material can be molded into different size and shape, the strength of which can be tested in different concentrations, and if tested positive can be used for construction purposes. The only problem is that the sand is the necessary raw material. Alternatives can be used with plastic instead of sand for a better eco-friendly plastic management technique. Experiments using waste of coconut fiber can also be conducted.

Still Model

Among still models, a novel idea for making cooking gas has some significance. though greatly theoretical, practicability can be tested. The proposed raw material is sea water and the energy source proposed is sunlight using solar panels and concave mirrors. The products of the system are common salt and water. The water get dissociated into hydrogen and oxygen in a high temperature and pressure chamber. The hydrogen itself if available an effective remedy for our energy crisis.

Diesel from plastic is another promising still model in which a theory is being put forth for the production of diesel from plastic. The explained theory should be tested for its efficiency and cost effectiveness.

Specimen

Specimen plays an important role in science education. Two participants presented specimen, one is biological control and the other vermi composting (using earthworms). Different harmful and useful insects, and other measures for biological control also presented in a meaningful and comprehensive manner. How to prepare vermicompost and its merits were presented using specimen. But it is only an exhibit of an existing practice

Teacher Exhibits:

In the case of teachers, only five turned out as competitors. It is a great idea that participation will be mandatory for each school, and then teachers would have produce something beneficial for students.

Only one among the participants use IT tools effectively to collect, record and exhibit the item meaningfully. The innovative approach that the teacher attempted is the use of a digital video camera to shoot directly from a microscope eyepiece. The subject brilliance of the exhibit is the real video of microorganisms. The only demerit of the item is that a proper documentation of work done is not presented in a written form, though the teacher explained everything verbally.

Another important exhibit is on the theme Global warming, in which the participant presents a variety of items to provide a holistic idea of the concept. Exhibit includes a still representation of events due to the impact of global warming, charts, research study

abstracts, collections, and posters. The exhibit is succeeded in providing a holistic view of the issue. The main demerit of the exhibit is that it require so much time to prepare and arrange the materials and the project done in relation is confined to a very small area. Other wise it is a good attempt for a comprehensive approach.

One among the competitors exhibited an electronic device, the similar variants of which are already available. The other two participants done a good job in compiling the information obtained from various sources which are meant for creating awareness, one about a Drug resistant microbe and the other on Plastic. Such attempts can be positively utilized in daily teaching.

Results & Discussion

High school section performed far better than higher secondary section in number variety and in comprehensiveness in all categories, the reason for which should be identified and rectified. The number of teachers participated in the competition is very low with regard to the population size of teaching community. From the observation of the exhibits and discussion with students, teachers and experts, it is clear that a comparative evaluation of the three categories of the exhibits such as Project, Working Model, and still model is very difficult.

Among the projects, assessed, scientific procedure is correctly followed in very few studies; in others, assumptions and beliefs are generalized. Student involvement in projects is comparatively higher than that of models.

The projects will have high student involvement, but in working model and still model, craftsmanship of an expert is being explained by students and the scope for collective thought is minimal.

The spirit of such exhibitions is to create an enquiry attitude in students and a facilitator attitude in teachers as mentioned in the guidelines. It can be infer from the observations, that student involvement became minimal in many of the exhibits, where teachers involvement is greater. Teachers must be involved in developing teacher exhibits and only provide necessary guidance to students since from problem identification. Well documented reports for projects; report, diagrams and theory in the case of working model and still model must be submitted for evaluation to prove the quality, novelty and genuineness of the item . Systematic documentation also is an important skill that students should acquire through these exercises.

Suggestions

Separate evaluation should be conducted for projects, Working model and still model Specific criteria should be developed for evaluation of each of the category Projects should be given more importance as it invites more student involvement Teacher exhibits may became mandatory for each teacher at least once in a period of five years.

The details of exhibits of each year should be compiled and published for better dissemination of new ideas as well as the rarely known traditional ideas.

The theme of the exhibition for 2007 08 is **Science, Technology and Planet Earth**. The theme should be more specific so that it is possible to explore pros and cons of a particular issue which is the actual purpose of such exhibitions.

Reference

- 1 National Curriculum Framework 2005 , New Delhi: NCERT
- 2 State level Science Exhibition 2007 -08 – Guidelines , NCERT 2007
- 3 Best, J.W. & Kahn .J.V., (1989) Research in Education (6th edn.). Prentice Hall India Ltd.
- 4 Position paper on Science Education (2005), New Delhi : NCERT