Children's Science Training Programme

October 3- Nov 17, 2007

And

Bal Vigyan Mela

November 18, 2007

Conducted by

Department of Physics, IIT Kanpur

Vigyan Prasar, Delhi

Shiksha Sopan, IIT Kanpur

Opportunity School, IIT Kanpur

Anveshika, Indira Nagar, Kanpur

Report

1. Introduction

Science has become one of the most important ingradients in the development of a society. It is a well known fact that Science education in our country has not been able to enthuse the young minds towards Science. Further in majority of the schools including government schools, there are no laboratory facilities at middle school level. Bare theoretical teaching of science cannot inculcate the qualities needed for one to learn scientific methods and attitudes. The situation is even worse in the schools situated in rural areas and low-fee schools.

Shiksha Sopan is a voluntary organization run by some IIT Kanpur faculty members and students with the help of enthusiastic local youths, working in the villages near the IITK campus. During interaction in the rural areas around IITK Campus we saw that there are more than a dozen schools within say 2 km from the Campus where there is extremely poor infrastructure and where the students get absolutely no exposure for Science or Science experiments. In most of the cases, the children go to the school only for namesake and the only job in the school is to cram material given in their textbook without getting any feel of it.

To give these children a real essence of Science, Shiksha Sopan conceived the idea of conducting an extended 6-week Science Training Programme where children from all these schools could be collected for 2 hours in the afternoons and exposed to Science experiments with their most familiar commodities. The Children's Science Training programme and Bal Vigyan Mela came out of this seed idea.

2. To Get People Around

The plan was extensive. There are about 15 schools in the immediate vicinity of IITK Campus. Focussing at middle-school level, class 6-8, there would be around 700-800 children in this group. We estimated that about 300 of them could be motivated to join the training if the message can be effectively conveyed to them and the school administration. Opening it for the other schools in Kanpur, the total number of children was to reach 400. To make arrangements of experiments, trainers, class-space etc was a huge task.

Shiksha Sopan discussed the plan with Opportunity School in IITK which readily appreciated the idea and became a co-host. Opportunity school is a school inside the IITK campus which caters the needs of hundreds of families who help IITK by providing domestic assistance or construction labour and so on. We found yet another partner in Anveshika which is an open Laboratory set up in an Inter college in Kanpur where training is imparted to students and teachers of Uttar Pradesh and Uttaranchal. Anveshika agreed to provide their expertise in Physics education at school level.

We then approached Department of Physics, IIT Kanpur to be a part of this unique experiment in Science education and the Head of the department readily agreed. A proposal was then written to Vigyan Prasar, Delhi to join in this adventure and they too found the proposal very attractive. Vigyan Prasar also took the responsibility of providing necessary funds.

3. The Methodology: PAHALE DIKHAO PHIR SIKHAO

In this programme we wished to try out a totally different methodology of Science training. The central idea was to perform few experiments related to a particular science topic and from the observations, make the children think and come out with the possible rules guiding the phenomena. What we wanted was that they feel Science as enjoying, exciting and fun to learn and teach. The sense of logically deriving conclusions from the observations and making more observations to confirm or reject ideas were to be developed. The use of mathematical equations and formulas was almost absent. No complicated definitions in terms of unfamiliar words to be given and no topic to be started as a known law. Use of blackboard too was to be very minimal and all the training was thought to go through interesting experiments followed by discussion.

4. Programme Structure

The programme was planned essentially to be in three Phases. In Phase-1, the training was to be in the form of observing the experiments and discussing in a group of say 100 children. In Phase-2, it was to be in smaller groups where each child could be given individual attention. In the third phase children were to demonstrate before selected people from Science background and learn from interaction with them. Finally Children would do Bal Vigyan Mela to demonstrate and explain the science to thousands of visitors from all kinds of background.

5. Preparation on Science Themes

A total of 36 themes were identified for the training programme. These may be grouped as Air Pressure, Water Pressure, Equilibrium and center of gravity, Floating and Buyoancy, heat conduction and convection, Rectilinear motion of light, mirrors and lenses, Attraction repulsion between charged objects, Magnets and magnetic attraction repulsion, Electric current and its relations with magnetism, Acid base detection, Ignition temperatures, Mechanism of vision, Science Games in Magic mode.

6. Collection/Selection/Designing of Experiments and Assembling

For each of the 36 themes we wanted to have 3-4 experiments. A total of 100-150 experiments were needed. We looked into different books on Science experiments, different websites on Science education and conceived ourselves new experiments. The ideas generated or collected was tried out in Type-1 Quarter No. 13A, Science Lab of NSS IIT Kanpur, where we had set up all our activities. We made sure that we will mostly use only those materials which can be easily found in houses or which can be easily purchased from normal market. Purchase from scientific stores was very limited and no vendor selling readymade experiments was involved. The team members worked day and night to actually translate an idea to the doable experiment. Quite often it was not possible and we had to rethink on the implementation of the idea. A short write up of each experiment was written in Hindi.

7. Contacts in Schools and the Overwhelming Response

To convince school administration in rural areas to send their children for six weeks for science training was a difficult task. We send our team workers with letters and drafts of expected output at their school to personally discuss the issue. A meeting of Principals of such schools was convened in the Opportunity School where a detailed discussion took place and they understood the importance of such a training programme.

A letter in the name of Principal, explaining the whole concept and plan of the Science Training Programme, was sent by post to 196 schools of Kanpur, these were other than those targeted from around the campus. These schools were given the option to send selected students of class 6-8 in the training programme.

All this campaign was responded by the society very positively, much more than what he had expected. Instead of the expected 300-400 we got registration requests from more than 900 children from different schools. Finally we had to admit 675 children for the programme.

8. The I-cards

The 675 children had to come from 20 schools. The team decided to issue Identity Cards to all the children. Two of our team workers were given the responsibility to take digital photographs of all these children. They visited the schools with pre appointment and snapped photographs of the participating children. The I-cards were then prepared digitally for all children. Separate I-cards were prepared for trainers and other team mates.

9. The Team of Trainers, from Faculty to School Students

The original plan was to work with nine trainers from the Shiksha Sopan and Anveshika team. But with 675 registrations, we needed many more trainers. We appealed to IITK faculty, IITK Students and College students from the village Nankari (adjacent to IITK Campus). With proper negotiations, 32 trainers offered their valuable time. These included 5 faculty members, 8 M. Tech. students, 1 Ph. D. student, 5 B. Tech. students, all from IITK, 3 Physics teachers and 8 B. Sc. students from different colleges of Kanpur, and 2 brilliant School students from Kendriya Vidyalaya IITK. All the trainers were shown the experiments and the mode in which the training to be imparted was discussed.

10. Inauguration Programme, the Beginning of a YAGYA

The day for which 40-odd team from Shiksha Sopan, Opportunity School, Anveshika was preparing for about two months finally arrived. It was 3rd of October 2007. All participating children were sitting in the SAC ground in regular formation, the whole ground was packed. Each one was having I-card hanging from the neck.

The Deputy Director Prof Kripa Shankar, The Registrar Mr Kashalkar, Head of the Department of Physics Prof Y N Mohapatra, President of Shiksha Sopan Dr Sameer Khandekar, Principal of Opportunity School Mr R S Srivastav, and the Programme coordinator Prof H C Verma inaugurated the event by lighting the lamp. A team from Saraswati Gyan Mandir Inter college performed Saraswati Vandana with music. All speakers praised the effort by the team to take up such a massive Science training for children. The Deputy Director told that it is the first time that IIT has such a large scale programme for children. The Registrar said that he would have loved to participate in such a Science programme. The head of the department Physics was amazed by the enthusiasm of the children and said that it showed a great potential for science career in the younger generation and congratulated the organizers to tap this potential.

During the inauguration programme, several science experiments were demonstrated at the dais. All children and others enjoyed the experiments very much. The experiments were just to give a glimps of what was in store for the next 6 weeks. The programme was concluded with Vandemataram song.

At the end more than 500 balloons were released in the air to go up signifying the high morale and ambitions of the children and the organizers.

After the conclusion of the inaugural programme the 675 children were divided in six groups and each group was led by an Instructor to the respective Hall and general instructions were given.

11. Phase-I

In the first phase, which was conducted from 4th October to 18th October, the training was in Lecture mode but still very interactive. All the 110-120 students in a group used to sit on the floor and the Instructor addressed them collectively. Each Hall had three instructors, one doing the main instruction and the other two helping

him/her and going into the children areas and monitoring their participation. The mode of teaching was completely through the Experiments as described above and the blackboard was used negligibly. Most of the apparatus for these experiments were from household items like Wiper, Spoons, forks, balls, bottles, cans, balloons, balls etc. All students were excited seeing the experiments and tried them on their own. Many of the parents gave the feedback that children after going from here were totally involved in trying to duplicate the experiments at their house and to show them to other family members.

Though we had prepared about 150 experiments, each group was shown about 60 experiments. In a day we used to do on the average four experiments on a single theme. Each experiment was repeated several times, sometime even eight or ten times, calling different students to participate and closely observe. Lots of discussion too took place. But we never indulged the children into taking long notes or writing in very specific language a finding. For the entire two hours the children and the teachers used to be deeply involved in the theme of the day.

12. Phase-II

The Second phase of this program started on 23rd October after the Dushahara break. A total of 475 children were admitted for the second phase. In this phase of the training, students were divided in groups of 16 and the training was given in Tutorial mode where each instructor trained one group. There were 32 groups in all and 32 instructors were employed in this phase. Each group was trained intensively in 4-5 experiments with different themes and all aspects of science, from assembling the apparatus to explaining its science was discussed in great detail with each child individually. The groups were formed in such a way that children of one school got spread over maximum

number of groups. This ensured that in each school a larger number of themes can reach so that they can follow up the science activity in their school easily.

All children were very excited and enjoyed to learn and play with science. Just to give an idea of the fun content, about 550 balloons were ruptured during the 2nd phase of training itself to get them trained on various aspects of Air Pressure. Children made dozens of water pumps using empty toothpaste tubes. Producing a variety of musical sounds using drinking straws and water containing plastic tubes were other great games.

This phase was completed on 5th November 2007.

13. Third Phase

The most efficient way to deeply understand a scientific idea is to teach someone that idea. In the third phase, which started after Deepawali break from 12th October to 14th October, children practiced explaining to newcomer visitors what they have learnt. We specifically arranged 4-5 visitors on each day with science background. It was done in a collective mode where students were ready with their apparatus, the visitors went to them and children explained the experiments and the science behind. Different visitors raised different questions and this way the children got a chance to learn more. The trainers used to closely watch the children performing the experiments and reacting to questions, and later interacted with them to give them more training on the science involved. Each day about 175 children were called in this phase.

This phase was also very enjoying as the children found it very pleasant to explain something to newcomers. The visitors too enjoyed listening to the kids, counter questioning them and finally giving good encouraging remarks and suggestions.

14. Bal Vigyan Mela Preparation and Management

The grand finale of the Children's Science Training Programme was held as Bal Vigyan Mela on 18th October. It was to be a huge affair and lots of preparations were done for it. We had 480 children divided into 120 groups and each group was assigned 4 experiments on a particular theme. Thus a total of 480 experimental sets were needed. Essentially 120 different experiments were repeated four times. A

group of our workers took charge of setting up these 480 experiments. Another group was doing the publicity. We printed 10,000 pamphlets and these were distributed in general masses, especially in villages around the IIT campus. Several school principals were contacted and we requested them to arrange for vehicles for their students. Information was also broadcasted through Big FM Radio and Print media.

Yet another group was busy in supervising the Tent structure being erected. The whole Mela was to be composed of 4 LANES and each LANE was to have 30 enclosures or stalls, each stall measuring 9 ft x 12 ft covered from three sides. Two tables, 2.5 ft x 5 ft, joined together to make a working space of 2.5 ft x 10 ft, were given in each stall. Then there was a Control room and 18 ft x 54 ft tent for stalls of Shiksha Sopan, Vigyan Prasar, Opportunity School and Noble Book Store. The tent erection work continued for the whole night of 17th October and about 6 Mela workers continuously supervised the activity. Once the stalls were ready, equipment needed in each stall were put in all the 120 stalls.

Each LANE was to have a TEA and water stall. The tea was complimentary from our side. Besides this, there was a stall where variety of eatables were made available on payment.

Special care was given for security from fire. A dozen fire extinguishers were arranged with trained personnel to operate them in case need arises. A First Aid Box was also arranged and two Doctors were present during the Mela.

15. Bal Vigyan Mela

Finally the day arrived. The Mela timings were 10.00 AM to 3.30 PM. Though the children were asked to come at 9 AM, they started arriving at 8 AM itself. Full of excitement and enthusiasm, dressed in their best, they were the real hero icons of the day. They were guided to their respective stalls. Many of them had brought Chart Papers with some diagrams and descriptions of their experiments. These were fixed up on the walls of the stalls. All children and the Mela workers were then given a breakfast packet to have something before they start the show.

The district Manager of Kanpur, Mr Alok Kumar was the Chief Guest. On 19th of Nov that is the day following Mela, Chief Minister Ms Mayavati was to visit Kanpur. All were suspicious whether the DM would be able to come to Mela. But Mr Alok Kumar was very much there to inaugurate it in time. Together with him were the prominent dignitaries like the Deputy Director Prof Kripa Shankar, Dean of Students Affairs Prof Prawal Sinha, Director of Institute for Engineering Technoloy Prof Dayal Saran, Eminent Nuclear Scientist and Ex Director Nuclear Science Center Prof G K Mehta and others.

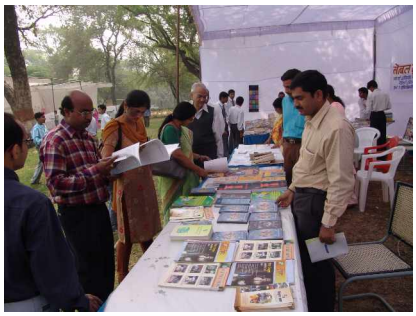
The inauguration function was very brief. The Lamp of knowledge was lighted by the Guests and very brief expression of feelings was given by the Guests. The DM Mr Alok Kumar, who is also an alumnus of IIT Kanpur, expressed great satisfaction on seeing that IITK is caring for the society outside the campus and is helping in having good education in schools. He wished Government schools participated in the Prpgramme. All speakers expressed their well wishes and blessings to the children. The DM then cut the Ribbon at the entry of the Mela Venue marking the opening of the Mela.

From 10.30 AM to 3.30 PM it was a real treat to watch the visitors going from stall to stall and our children showing them the experiments and explaining the science. The visitors were given Tea Coupons at the entry gate that had colour codes for the LANE in which they were supposed to go. Though all lanes had similar experiments, the colour code was made to distribute the inflow of visitors in different lanes so that they can see the experiments with ease. The visitors were in all age groups, a large number of school students from different schools, Faculty members and employees of IIT Kanpur together with their family members, local people from nearby villages, and general public, all were deeply involved in looking at the experiments the children were showing. About 6-7 thousand people, as estimated from the tea coupons received, visited the Mela.

The highlight of the Mela which impressed all, was the confidence with which the children were showing the experiments, explaining the science and answering the questions. All faculty members of IITK and others with science background later gave their feedback that the children were understanding the science very clearly. It was not just cramming few lines given to them but they were really acting like competent teachers. They pro-actively involved the visitors in their experiments by either asking them to participate in the experiment or by asking them to explain the science of the experiment performed in front of them. Children of class 6-8 inviting such an interaction from the grown up visitors was something that impressed all the visitors.

For the whole 5 hours there was no drop on the excitement of the children. We had to remind them around 1-1.30 PM that they had lunch with them and they have to take it turn by turn. At the tender age of 11-12 years boys and girls were as active and as involved in entertaining the visitors even in the final hours as it was in the morning.

The four stalls of Shiksha Sopan, Vigyan Prsasar, Opportunity School and Noble Book Stall were very well attended. People kept on visiting these stalls and gathered the kind of work these organizations were doing. Vigyan Prasar had put up many of their publications and CDs for sale and everything was taken up by the visitors almost in the first hours. Similarly people were greatly impressed by the Social activities through Shiksha Sopan and Opportunity School.



At 3.30 PM we stopped further entry and all children were asked to pack up whatever they were given for the experiments. Barring few items that we had borrowed from somewhere, all the items were given to children to take home or to give in their schools with the consent of their teachers. At the end all children were given another snack packets to make up for the day long energy dissipation.

The Bal Vigyan Mela was concluded and with this concluded the 6-week Children's Science Training Programme at IITK.

16. Media Coverage

Since the inception of the Children's Science Training Programme, Media gave it prominent coverage. Almost all newspapers gave detailed report of the inauguration programme on 3rd October and also during the training programme several times the reports were published. On the Vigyan Mela day, reporters from all leading newspapers, Anchor from Big FM radio, TV reporetes from Sahara Samay, E-TV, MH-1 and others were present and they reported the event as they saw it. Live broadcast was made at 92.7 FM from several stalls where the children were explaining the experiments to visitors.


आईआईटी के विज्ञान मेले में नन्हें वैज्ञानिकों ने संभाली लैब

120 विद्यार्थियों को प्रशिक्षित किया गया

प्रयोग करके छोटों को समझाए फार्मूले

राष्ट्रीय सहारा 19.11.2007

17. The outcomes

The Children's Science Training Programme had a great impact on the society. We can enumerate some the positive outcomes already achieved.

(a) Hundreds of children had a taste of how interesting Science is. Now they are no more afraid of Science. Science is now their best companion.

(b) The children got a training of how to think with originality, to derive conclusions logically from the observations and to plan experiments to test some ideas. Thus they practiced Scientific Methods which will help them in all walks of life.

(c) The school teachers who accompanied the children were also exposed to the Experiment-based Science teaching Methodology. They realized that "PAHLE DIKHAAO TAB SIKHAAO" method is so effective and children learn the things so fast. Hopefully the teaching methods in these schools will have a change for better science education.

(d) Some equipment for science experiments has reached the participating 20 schools. The schools are advised to set up an informal laboratory where children can do science with their hands and enjoy. Hopefully at least in some of the schools such a lab will come up.

(e) A team of 32 trainers also learnt a lot. Though many of them were students at B Sc, B Tech level, and others were at still higher level of education, facing science in action without equations and formulae was not simple. Through tuning themselves to science fundamentals to train the kids, these trainers also developed a new perception of science and that will help them in their scientific career.

18. Acknowledgement

Children's Science Training Programme was a large scale operation and we received full cooperation from all sections wherever we made an approach. The Deputy Director and the Dean of Students Affairs were always ready to give sanction to use Institute infrastructure, be it use of Outreach Building or SAC premises or Auditorium complex. Security Department extended full cooperation in allowing and monitoring inflow of more than seven hundred outsider children, their teachers and their school buses during the 6-week programme and thousands of visitors on the Bal Vigyan Mela Day. Kendriya Vidyalaya, IIT Kanpur too gave full support to this activity by providing five classrooms for the training. A number of faculty members and students of IITK and other residents directly involved themselves into the training programme and management. We gratefully acknowledge their contribution.

Finally, it was Department of Physics which provided the platform and Vigyan Prasar which jointly hosted the programme and provided necessary funds. The Director Vigyan Prasar himself came down all the way from Delhi to visit the programme and encourage the children.