

Science for school children*

Let us for one instant imagine a world where people do not have sufficient understanding of basic science and technology to relate to important issues like water shortage, pollution, health, forests or climate change. Who can take decisions that are needed on these issues? Who will influence the decision-makers? With just a little stretch of imagination, this world may not be so far away in the future. Studies are constantly reminding us that young people today are less interested in studying science and technology subjects than before. They are opting for fields that pay better salaries and require less hard work. As the dossier in this issue points out, at a time when the demand for scientific advances and innovation is needed, the number of graduates in science and technology is falling. However, the response of the student scientists attending the recently concluded Science Congress was a bit different. 'It was an eventful and enriched five days that we experienced in our school time so far...', was the response of many students attending the session on 'Science for School Children'.

The session, popularly known as 'Children Science Congress' was held at Gujarat Science City. About 350 selected students and their teachers attended the session and enjoyed the activity. To make this interaction more creative and meaningful, the 32nd State Science and Mathematics Exhibition was also organized at Science City by the Gujarat Council of Educational Research and Training during this period. About 800 students along with 1500 guide teachers from primary, secondary and higher secondary schools from different districts of Gujarat displayed their exhibits on the theme 'Recent trends in science and technology'. The event provided a good platform for students and teachers of the state to interact with national-level students as well as other scientists and professionals.

In his inaugural keynote address, Yashpal said that it was sad that education imparted in our schools and colleges and

our experiences in life do not match. He said that education, that needs coaching classes, is reduced to cramming information without knowledge and understanding. Once we develop the habit of understanding things, we would not blindly accept facts and information and would thus develop a scientific attitude, he said. In his inaugural address, Narendra Modi (Chief Minister of Gujarat) stressed on the need for developing a scientific temper and also an atmosphere where science and scientists become a source of inspiration for people to take up science as a profession. In his opinion, people can recognize artists but not scientists, who have dedicated their lives in search of new innovations for societal development. It is the endeavour of organizations like Science City to popularize science.

On the second day, Ravindra Keshkar and Jayant Dharmsey gave a lesson in mathematics that showed science and mathematics also can be learnt by origami, a game involving folding of a paper. Ashutosh Rawal explained that Vedic mathematics could be a handy tool for those who need to solve mathematical problems faster by the day, especially in a system where the emphasis is on examinations. There was a two-hour session, when students interacted with Yashpal on various subjects. This was followed by an interactive workshop on model rocketry, coordinated by the Vikram Sarabhai Community Science Centre. It gave immense thrill to the children, who rarely get opportunities to scientifically experiment with rockets.

The third day was a memorable one for all the student delegates as well as their teachers. The day was reserved for close interaction with the President of India, A. P. J. Abdul Kalam. The curiosity of the children knew no bounds when the President declared the question-answer session open. This resulted in a flood of questions from mundane to serious ones. And, Kalam answered them all with patience and ease.

Some of the questions asked were: Why didn't America warn Indonesia about the tsunami threat when they knew about it several hours ago? What is the difference between the air-to-air and surface-to-air missiles? Why has an Indian

not landed on the moon yet? Why does the reservation quota exist?

Kalam told students about the importance of being properly educated, about natural disasters and measures to be taken when they strike.

When asked why America did not warn Indonesia of tsunami, Kalam said, 'they detected the danger about six hours in advance. I saw it on a website. If they had alerted Indonesia, the loss of lives may not have been so great. Maybe their system of warning covers the Pacific states, while the incident occurred in Sumatra'. He added, 'an earthquake is difficult to predict, but tsunami can be detected as they travel at a speed of 800–1000 km per hour'. He also backed the idea of setting up a tsunami-warning system, which can be connected to the database in the Pacific region, so that data exchange can be fast and easy. Kalam also emphasized on including a chapter on tsunami in school textbooks, so that children can learn how these waves are generated and what is the reason behind the phenomenon.

Telling children that everything is possible, Kalam gave the example of a bumble-bee. 'Technically, if you look at the bumble-bee, it is not built for flying. It does not possess the kind of wings that will help it to fly. Yet, it manages to fly'. The President asked the students to have a goal, and then work hard towards achieving it. He told them to keep experimenting, and also to respect their teachers.

The fourth day was reserved for trekking. The delegates visited the Vikram Sarabhai Community Science Centre. Activities depicting basic principles of physics, chemistry, mathematics and biology awaited them, followed by a couple of interactive games like web of life, who am I, etc. Students and their guide teachers then visited the Space Exhibition Hall at Space Application Centre (ISRO), Ahmedabad. The afternoon session once again gave them an opportunity to meet and interact with several eminent scientists.

On the fifth day, the delegates were taken for another field trip to Bhaskaracharya Institute for Space Applications and Geo-informatics, Gandhinagar where they could explore application of remote sensing satellites and Geographic Information System for developmental and

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planning activities in agriculture, land and water resource management, watershed development, forestry, disaster management, infrastructure and educational activities.

The students then visited Indroda Nature Park, being developed by Gujarat Ecological Education and Research Foundation. During the nature walk, they visited the Dinosaur park, aviary, crocodile park, deer park, botanical garden, etc. and also interacted with the scientists at these centres. In the afternoon, the students were back at the venue of Science Congress for the valedictory function. Prior to that they attended the Vigyan Jatha activities conducted by Regional Community Science Centre, Rajkot.

The entire event in the sprawling, undulating landscape of the Science City offered these budding scientists a rare opportunity of exploring the wonder world of science and technology. Along with showcasing their exhibits, the student delegates interacted with other students, experienced the thrill of watching 'T-

Rex: Back to Cretaceous', an IMAX 3D movie and walked through different theme pavilions of the Gujarat Science City. 'It was a wonderful experience and a dream place', many of them quoted while leaving the Science City campus.

'The entire process is to enthral the young mind for the basic curiosity, which is the driving spirit for the growth of science. I have a strong belief that scientific knowledge and scientific temper, both form a right combination and are the key for development', remarked J. N. Singh (Secretary, DST, Govt. of Gujarat).

The programme aimed to create excitement and enlightenment about science and provide opportunities for young children to explore challenging areas of study in science and technology. The Children Science Congress is also an occasion for budding scientists to learn about new discoveries and recognize that a career in science is rewarding.

The activities during the Children Science Congress were also witnessed by thou-

sands of other students who were visitors to the Gujarat Science City. The Science City had also arranged for the live telecast of specific events on its newly installed large LED screen for mass-viewing.

'Man's journey of life in this world is wonderful. Science is a journey toward the truth and we know that truth will make everybody fresh and free. The study of nature, through multiple disciplines of science, makes it all the more exciting and fascinating. Every student of science can experience this excitement if he or she asks the right questions and seeks a logical answer to each of the questions', said S. D. Vora (Executive Director, Gujarat Science City).

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Aerosols, clouds and monsoon

The International Symposium on Aerosols, Clouds and Monsoon was attended by about 120 delegates from various parts of India and also ten foreign scientists from USA, Japan, Germany, Taiwan and Greece. Nearly 120 extended abstracts were made available at the time of registration.

The fact that over the last ten years, significant changes in climatic and weather conditions have taken place over the Indo-Gangetic basin, was the reason behind organization of this symposium. P. C. S. Devara, Vice-President, Indian Aerosol Science and Technology Association (IASTA) briefed about the objectives, activities and future plans of IASTA and welcomed the delegates.

Sanjay Dhande, Director, IIT Kanpur, in his Presidential address, invited scientists to solve problems of dense fog and haze over the Ganga basin, which are common

during December and January. V. Ramanathan, Victor C. Alderson, Professor of Ocean Sciences, USA gave the inaugural lecture on 'Air pollution, atmospheric brown clouds and the Indian monsoon'. He highlighted the findings of the INDOEX experiment and also provided details of the Asian brown cloud (ABC). Ramanathan stressed the need for atmospheric observations. He emphasized the influence of greenhouse gases (GHGs) on climate through the solar incident energy, solar reflected energy and earth's emitted energy. The GHGs have increased significantly after 1950s, leading to significant influence on: dimming of the planet, sea surface temperature, and cloud formation and rainfall.

It is estimated that India is about 6–7% darker now than in 1950 due to the influence of GHGs. Ramanathan gave details of ABC, which was discovered during the INDOEX experiment and noted that India should be concerned with ABC.

In the first technical session on 'Aerosol research: Global perspective' five papers were presented. Brent Holben (NASA, USA) reviewed the global Aeronet network of NASA and several research accomplishments by various groups in integrating

the research data and derived products. C. B. S. Dutt, Coordinator, ISRO–GBP programme gave details about the IGBP programme of ISRO that has laid emphasis on aerosol studies for over a decade. He referred to the field campaigns over marine and land regions of India and to the commitment of ISRO to promote aerosol studies in an integrated manner among Indian research institutes.

Sanjeeva Rao, Department of Science and Technology (DST), New Delhi summarized the efforts made by DST in promoting atmospheric research through project mode funding and organization of several field programmes such as MONTBLEX (1990), CASPEX (1995–96), BOBMEX (1999) and ARMEX (2002–03) and the climate programme. K. Krishnamoorthi (VSSC, Thiruvananthapuram) reviewed the work carried out at the Space Physics Laboratory at VSSC on aerosol in the last 15–20 years. He also gave an account of the contributions made by the Indian scientists under the INDOEX programme. He illustrated the nature of radiative forcing over India in different seasons. Krishnamoorthi presented plans by ISRO in extending the sun photometer network at 22 locations

*A report on the International Symposium on Aerosols, Clouds and Monsoon organized by the Indian Aerosol Science and Technology Association and the Indian Institute of Technology, Kanpur and held at the Indian Institute of Technology Kanpur, during 15–17 November 2004.