Vigyan Prasar - Anveshika

National Workshop on Inovative Physics Teaching (NWIPT-07)

8th to 13nd June 2007

Report

Department of Physics

IIT Kanpur

The Working Team, NWIPT-07

Coordinators:	Prof. H C Verma
	Mr. Brajesh Pandey
Anveshika Team:	Prof. R N Kapoor
	Dr. D N S Srivastawa
	Mr. Sanjeeva Kumar
	Mr. Amit Kumar Bajpayee
	Mr. Maharaj Singh
Local Team:	Mr. Khalid Massod
	Mr. Somnath Danayak
	Ms. Deepa Danayak
	Mr. Ranjit Kumar
	Mr. Ravi Shukla
Resource Persons:	Mr. A. D. Mahajan, Latur
	Mr. R. K. Awasthi, Agra
	Dr. R. K. Mitra, Lucknow
	Mr. Sanjiv Kumar, Bhagalpur
	Dr. B. C. Rai, Patna
	Mr. Rakesh Kumar Singh, Patna.
	Mr Brajesh Dixit, Auriyya

I. Introduction:

Science and specially Physics is being taught since years and decades only through chalk and talk. Science education has reduced to transferring some formulae, equations and statements from the teacher's lecture notes to the student's note books via the blackboard without affecting either of the brains. This process of teaching and learning of science doesn't fascinate the students and hence learning of science becomes only a tool to get a descent-looking job. To make Physics understandable, perceivable and enjoyable, so that at least some of the students can make it a passion, we are trying to bring in innovations in teaching such as demonstration experiments during the classroom teaching and informal lab activities outside the classroom. This also gives a chance to the teacher to design newer demo experiments even if the syllabus and topics remain the same over years and years.

In association with Anveshika and Vigyan Prasar, we have developed hundreds of short and moderate experiments at IIT Kanpur, which can be used to assist Physics teaching. In order to spread such teaching methodology we are conducting one-day workshops named as "Introductory Interaction Program (IIP)" and five to six days workshop as "National Workshop on Innovative Physics Teaching (NWIPT)". IIP's are the first level workshops which are conducted throughout the year and across the country. NWIPT has become an annual event and is organized for only a selected batch of active teachers. The main aim of NWIPT is to equip the interested and motivated physics teachers with innovative ideas and with innovative demonstration experiments so that each of them becomes focal point in his/her region to spread this teaching methodology. More details about our workshops can be found at http://home.iitk.ac.in/~hcverma/Interactive.htm .

II. Selection of the Participants for NWIPT-07:

During the year 2006-2007 we approached 437 Physics teachers of different states through the Introductory Interaction Programmes. Many of the teachers attending these programmes started including demo experiments in their classroom teaching and narrated their experiences with us through letter, emails and telephones. In the month of Feb-March 2007, we sent letters to all the 437 teachers asking for their follow up activities and their preparedness to attend 6-day workshop at IIT Kanpur in June 07. We received 87 requests for attending the June workshop. The most active 40 teachers were selected and were sent Invitation to attend the "National Workshop on Innovative Physics Teaching NWIPT-07". The details of teachers invited from different places are given in Table 1 below.

Table-1: Number of participants from various cities.

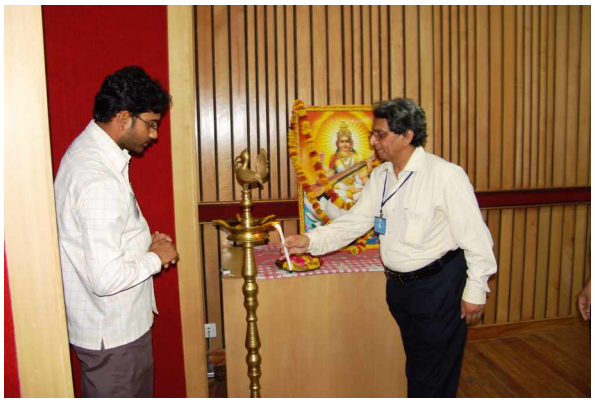
S. N.	Place	No. of participants		S. N.	Place	No. of participants	
		invited	attended			invited	attended
1.	Bhilai	11	10	9.	Kanpur	2	0
2.	Agra	5	4	10.	Bokaro	2	2
3.	Mathura	4	4	11.	Almora	1	1
4.	Delhi	4	3	12.	Cochin	1	1
5.	Nainital	3	1	13.	Indore	1	1
6.	Auriya	3	0	14.	Jamalpur	1	1
7.	Noida	2	2	15.	Patna	1	1
8.	Dhanbad	2	2	16.	Chandigarh	1	1

III. NWIPT-07 Resource persons:

Many of the Physics Teachers who had attended our earlier National Level Workshops have now become competent communicators of Science education methods. They are doing programmes independently in their regions and training more and more Physics teachers in the art of teaching science. We invited 7 such enthusiastic teachers to work as the Resource Persons in NWIPT-07. Thus there was no mental barrier between the participants and the resource persons as the resource persons were also Physics teachers in some school. These were Mr. A. D. Mahajan from Latur, Mr. R. K. Awasthi from Agra, Dr. R. K. Mitra from Lucknow, Mr. Sanjiv Kumar from Bhagalpur, Dr. B. C. Rai from Patna, Mr Brajesh Dixit from Auriyya and Mr. Rakesh Kumar Singh from Patna.

IV. Inauguration:

"National Workshop on Innovative Physics Teaching, NWIPT-07" was inaugurated in the evening of June 8, 2007 at 5:30 PM in the auditorium of the Out-Reach building 69-80, IIT Kanpur. Dr. V. B. Kamble, Director, Vigyan Prasar, New Delhi was the Distinguished Guest, and Prof. S. C. Shrivastava, Dean of Research and Development was the Chief Guest. The



Dr. V B Kamble lighting the lamp

programme started with Lamp lighting followed by Saraswati Vandana by four girls living in the outhouses of faculty quarters. Prof. H C Verma, Coordinator of the workshop welcomed the participants and the Guests and explained the purpose and the background of the workshop. Dr. V B Kamble expressed his appreciation of the efforts made by IIT Kanpur towards Physics Education in Schools and categorically stated that Vigyan Prasar is not only the fund giver but is a Partner in this effort. He assured all possible contribution from VP side. Prof. S C Shrivastava stressed the importance of inspired teaching at school level as the young students choose their path only during this budding stage. The head of the department of Physics, IIT Kanpur highlighted the importance of School Physics teachers as it is only this group which interacts continuously with the young students and no experiment in education can be successful without their wholehearted involvement.

Saraswati Vandana

Mr. Brajesh Pandey, Research Scholar, IITK conducted the programme.

V. Program:

A. Experiments:

1. Physics show experiments:

The experiments in this category have two purposes**.** These are eye catching and entertaining to all sections like Teachers, Students and General people. The participants can use these to conduct their own Physics Shows in Schools, Colleges and other platforms. Besides, these could be used as classroom Demo. **34** Physics experiments were selected and shown in this category. Our Resource persons showed these experiments to the participants and explained the Physics. All these experiments are IIP experiments and are being used as classroom teaching. We have selected various simple experiments from almost all the sections of Physics, namely mechanics, heat and thermodynamics, waves, optics,

Dr. A D Mahajan and Dr. R K Awasthi demonstrating Physics Show experiments

electricity and magnetism. The session was interactive and all aspects of interpretation and the Physics to be learnt were freely discussed.

We have also arranged hands-on session after demonstration session so that they can actually practice the experiments. We have provided one to two page write-ups of all the experiments.

2. Classroom demonstration experiments:

In this category we showed them **35** experiments, which were divided into two parts and demonstrated them on two different days. On the first day 18 experiments from mechanics and heat sections were demonstrated and explained. On the second day we showed them 17 experiments on optics, electricity and magnetism. The sessions were very interactive and almost every participant was involved in the discussion. Again a detailed write-up of all the experiments was given.

Participants at Demo hands on session

We have prepared a work-book for most of the experiments and given to the participants to do the observations, measurements and calculations during the hands-on and submit it to us. After the demo session participants performed the experiments themselves under guidance of the Resource persons.

3. Informal lab activities (ILA):

We have selected **12** experiments in this category. These are somewhat extended experiments to be done outside the classroom. We wish each school has some Informal Lab where students can do whatever experiments they conceive and wish to try out. ILA experiments are sample ideas for some such seed activities. A write-up based on the theory, description and discussion on each experiment was circulated to the participants with a work-book. Participants were asked to complete these experiments, take the appropriate reading and do explicit calculation in about 30 to 40 minutes

Participants at ILA hands on session

time during hands-on session. During the session every body was found working seriously. To assist and guide in case of any difficulty during the hands-on, our seven resource persons were present interacting with the teachers. Each experiment was allotted to a particular resource person to have focused attention on each experiment.

4. Undergraduate lab experiments:

Most of our experiments presented in the workshop are designed in such a way that any teacher can easily assemble the experiment with very low cost and not much sophisticated instrumentation is involved. However, to give them some exposure and experience of sophisticated instrumentations and PC interfaced experiments, we arranged a visit to the Undergraduate Physics Laboratory of IITK. There we showed them **4** experiments, namely Mechanics on Air track, Faraday's law of Induction, Single slit diffraction with He-Ne Laser and Forced, damped torsional pendulum. All participants were given time and guidance to actually perform the experiments on Air Track and EM induction apparatus, the same way our B Tech students do.

Doing experiment on Air Track in UG Lab

5. Eye catching experiments:

In the last session of our workshop we showed them **2** experiments that really thrilled them. All of them were amazed to see with unaided eyes the circular motion of charged particles in a perpendicular magnetic field. This experiment gave them idea that one can easily demonstrate the Lorentz force in classroom teaching. The second experiment was again very much exciting for them, when they saw the phenomenon of beat frequency with the help of a torch bulb and a convex lens.

6. Demonstration by participants:

Many participants after attending our IIP's, have made beautiful experiments. We have explicitly arranged a session to demonstrate these experiments every day from 9:00 PM onwards. A total of **21** experiments were demonstrated during these after-dinner sessions. In summary, throughout NWIPT-07, 34+35+12+4+2+21=**108**, experiments were demonstrated and discussed.

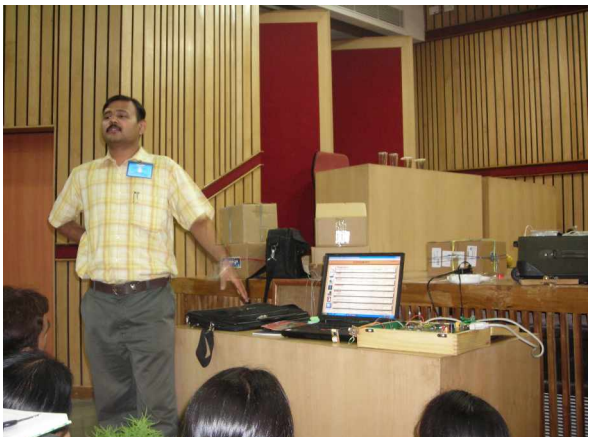
B. Lectures:

1. Invited lectures:

There were three invited lectures in the workshop. Dr. V. B. Kamble, Director, Vigyan Prasar gave a very nice talk on the activities of Vigyan Prasar. With beautiful slides and video clips, he talked about use of EDUSAT, Programmes on Doordarshan like Aisa hi Hota Hai, the Science club scheme Wipnet, Vigyan Rail and so on. He called upon the participants to creatively join the VP Programes.

Prof. Y N Mohapatra, Head, Physics Department, IITK in his invited lecture described the current directions of Physics research. The theme was to tell the Physics teachers that Physics is even today very exciting and lots of new discoveries are being made both on theoretical side as well as experimental side. The various areas touched upon included particle physics, string theory, organic semiconductors and so on.

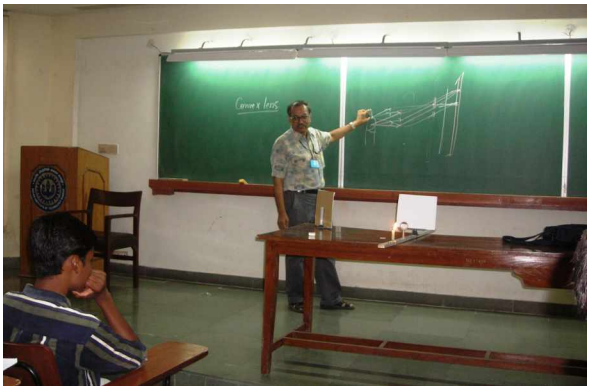
Mr. Rintunath, Senior Scientist, Vigyan Prasar delivered a lecture on Computer-interfaced Physics Experiments. Vigyan Prasar has developed the required hardware and software for these experiments and the whole package is now available on payment. Mr. Rintunath, who is the key person to develop this package, demonstrated several Physics experiments interfaced to his laptop.



Mr. Rintunath delivering Lecture-cum-Demo of computer-interfaced Experiments

2. Model classroom lecture:

We arranged two model class-room lectures (as we perceive it to be), one on “u-v relations with convex lens” delivered by Prof. H. C. Verma and another on “magnetic effect of electric current” by Mr. Sanjeev Kumar of Anveshika. Some students of class 10^{th} and 11^{th} were also invited to make the situation realistic. In each lecture, demo experiments were used to explain the Physics in qualitative fashion and then quantitative derivations were made on the blackboard.

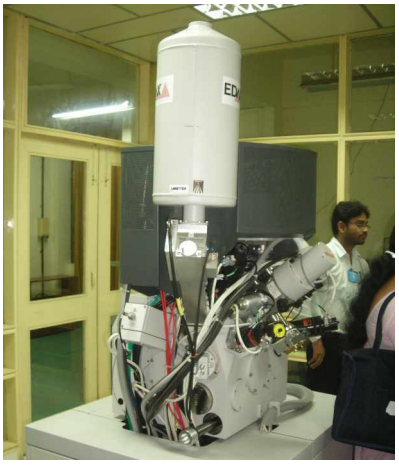


Experiment-based teaching, Prof. H C Verma delivering Model Lecture

C. Visits:

1. Research Laboratory visit:

Nanoscience and nanotechnology forms a major direction of current research. To get a first hand experience of the World-class research going on currently, the participants were taken to Focused Ion Beam facility at IIT Kanpur. They looked at the equipments and the nano structures made with this facility. It was an experience for them to know that in India we are making structures of our own design at the level of 10 nm.



At Focused Ion Beam Lab

Their another research visit was SAMTEL Center of Display Technology, where research is being done to have improved display for equipments ranging from TV to mobile. The participants were shown how carefully the researchers enter the Clean Room where variety of synthesis work goes on. They also looked at the characterization equipments used to monitor the products.

2. Anveshika visit:

Anveshika doesn't need any introduction. It is an open laboratory of Physics where one can go freely any time and do whatever he/she wants. Visitors can learn with the existing experiments, they can modify the existing experiments and they can conceive and implement new ideas. All the NWIPT-07 participants were very enthusiastic to visit the Anveshika, the fountain head of so many Physics activities. The only time slot we could find was morning 6 AM to 8 AM on 13th June. Though the visit was made optional, to our great surprise, 38 (of total 41) participants and Resource persons were at the designated place to catch the bus at 5:55 AM, even though we had finished our last session on the previous day at 11:15 PM.

Participants at Anveshika

At Anveshika the participants looked at all the equipment placed and talked to Dr. R N Kapoor, Mr. Sanjeev Kumar, Mr. Amit Bajpayee and others involved in Anveshika about its functioning.

3. Bithoor and JK temple visit:

After the valedictory function, 15 participants opted to go for the visit. Many of the participants were not able to join due to their departure schedule. We took around 4 hours to visit Bithoor and JK temple.

D. Cultural Program:

Shiksha Sopan IIT Kanpur organized a stunning cultural program on June 12, 2007. It is a social organization run by some IITK faculty members and students for the upliftment of economically weaker section of the society. Mr. Amit Bajpayee coordinated the show and overall management of the cultural program. All the performers of the show were the children coming to Shiksha Sopan centers. The show included dances, songs and comedy. After watching the program almost every one appreciated the natural talent of these children and many expressed the view that the performance was better than most of the shows by professional artists they have seen.

Shiksha Sopan Children presenting a dance

E. Exhibition

An exhibition of the books published and the CDs brought out by Vigyan Prasar was arranged. Participants keenly browsed through the pages of various books and took notes for their procurement. An experimental kit on Modern Physics was also displayed.

VI. Take-home package:

All participants were given the following material to take home to assist them in improving the Physics education scenario:

(a) A portable 30 cm x 40 cm x 7 cm bag which they can use to carry equipments for Physics Experiments together with other material. This bag was complimentary from Shiksha Sopan and was given as the registration bag.

(b) A Physics Show Box, 25 cm x 16 cm x 7 cm plastic box, containing material for several physics show experiments. We expect that the participants will be able to perform at least 25-30

experiments with the material given. The motivation of giving them Physics Show Box was to equip them not only on mental ground but also on physical ground, so that as they return back to their original places they may readily implement the idea of innovative demonstration based classroom teaching.

(c) An interactive CD titled “Innovative Physics Experiments”. It is jointly developed by Vigyan Prasar and IIT Kanpur and contains video and written descriptions of more than 40 Physics experiments, all related to the school physics curriculum. This was complementary from Vigyan Prasar.

(d) A CD containing write ups and workbooks of all the experiments done in the workshop.

VI. Valedictory session:

The valedictory session was conducted on 13th June from 1.30 PM. It was a scene full of emotions. The teachers expressed their extreme satisfaction on what they got academically. Many of them expressed that they have rediscovered themselves. They were going with a sense of pride that they were Physics Teachers. All of them showed determination to work for contacting many more Physics teachers and use various platforms to make Physics education effective and meaningful.

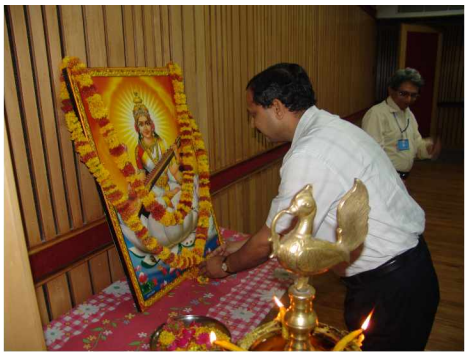
Participants handing over their monetary contribution for Shiksha Sopan to Dr. Sameer Khandekar

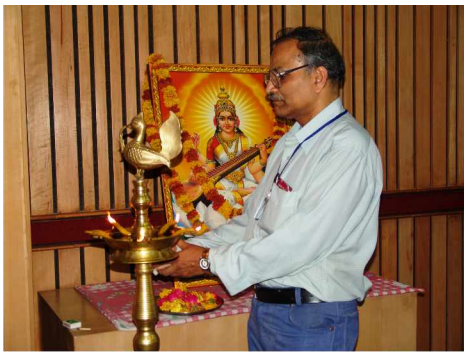
Participants of the workshop appreciated the efforts of Shiksha Sopan in spreading education among the underprivileged society. As a token they handed over some monetary contribution, collected from all the participants, to Dr. Sameer Khandekar, President, Shiksha Sopan.

Prof. G K Mehta, Former Director, Nuclear Science Center and presently Visiting Honorary Distinguished Professor at IIT Kanpur, was the Chief Guest. He also emphasized the important role of teachers in motivating students and expressed satisfaction on the enthusiasm shown by the participants. Certificates of participation were distributed to mark the closing of the workshop.

Prof. G K Mehta giving certificate of participation to participants

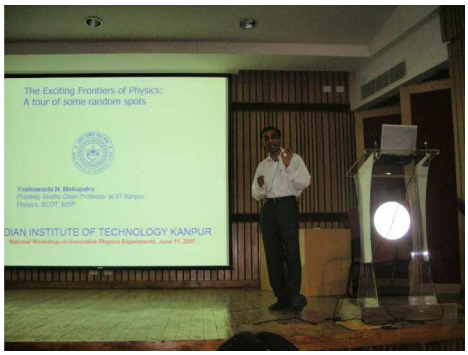
NWIPT-07 in Pictures

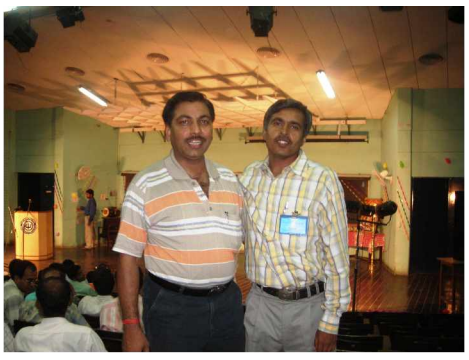






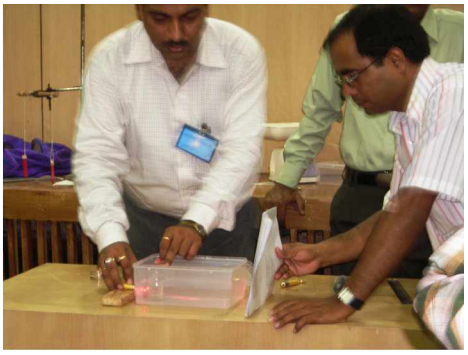


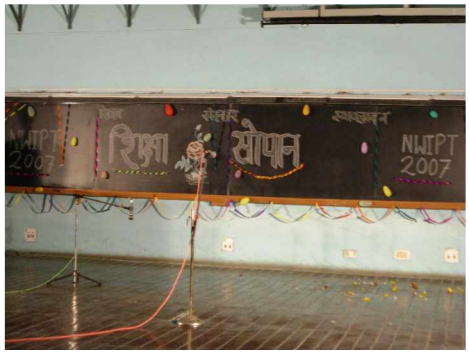


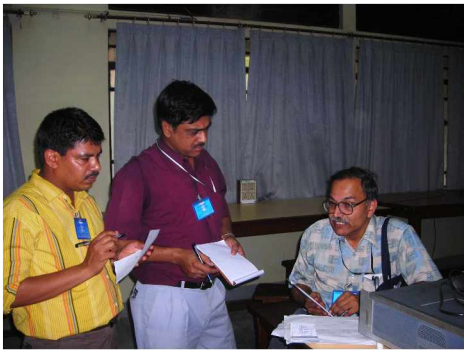



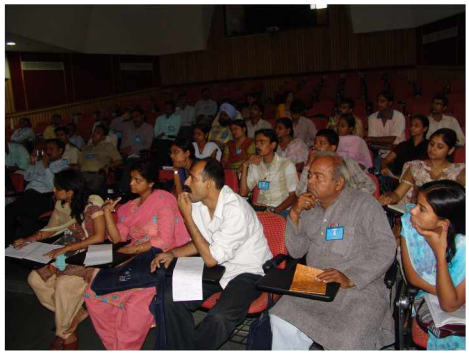

NWIPT-07 in Pictures













NWIPT-07 in Pictures