

**26**

Let's Experiment

Experience of an Innovative
Science workshop for teachers

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About the workshop

A workshop on science education for high school science teachers was conducted at Center for Learning* (CfL), Varadenahalli, Bangalore, from 1st to 4th Sep, 2012. 30 members participated in the workshop. The theme and modules of the workshop were conceived and developed by the teachers of CfL. The Azim Premji Foundation District Institute members of Yadgir conducted a study on the status of science teaching in the schools of Yadgir District. The analysis of science textbook was done by CfL resource persons as preparation for this workshop.

The objective of the workshop was to generate interest and spirit about science education.

Our Assumptions

As participants, we were not, initially, serious about the workshop, as previous experiences had influenced our thoughts. The only advantage was the location, i.e., Bangalore city. Our presumption about the focus of the workshop, 'science education', was a few presentations followed by some discussions about the nature of science education by resource persons.

Our Surprises

With the above assumptions we landed in Bangalore and the first pleasant surprise was the venue itself, 35 km away from Bangalore, in 22 acres of lush green land. The second was the community-based self-service culture at CfL, though we were treated as guests.

What was in it for us?

As participants and learners we appreciated the very design of the workshop.

The blend of formal and informal spaces in the schedule of the workshop really helped us a lot. The sessions were a good combination of hands-on experience and discussions with experts. We had discussions about science and education. We were divided into groups according to our subject of expertise - physics, chemistry and biology - for the first three days. The fourth day was devoted to feedback and winding up. We also liked the timings of the sessions and the way they were organized to give us ample time for interaction and informal discussion. Old friendships were renewed with these discussions.

The theme of the workshop was Learner- centered i.e., 'Let's Experiment', which enabled us to have a taste of experiential and inquiry-based learning. The contents selected were not new to us. Most of us who participated in the workshop were from North East Karnataka; we either "received" or "transformed" the information in science, we rarely experienced them. This self-experience of basic science concepts was new to us. Inquiry-based learning was a totally new concept for us. Our perception about the complexity and cost of basic science experiments was totally shattered by the simplicity and low cost materials used for the experiments. Our imagination of big sophisticated laboratories at CfL completely changed when we were introduced to labs with a built-up area of 10x10 sq.ft. or 15x15 sq.ft., with requisite low-cost equipment and raw materials. The lab infrastructure was replicable anywhere. For Biology, Nature itself served as a lab for most of the experiments. The resource persons were well qualified and competent. The second session of each day was meant for our expectations and needs - a challenge to any resource person. But the facilitators were so



Nature is our lab

resourceful that they met every demand put forth by us, much to our appreciations.



Resource persons - Yasmin Jayathirtha, Srinivasan K and Thejaswi Shivanand

This session was actually different from what we had previously experienced. The main focus of this session was to quench the learner's quest. This fact actually created interest about science education among us in the workshop.

Some of the experiments we conducted were:

Physics : Ray box, Ray diagrams, lenses image formation, multi-meter handling, bread board usage, different electronic components and basic electronic circuits.

Chemistry: Electrolysis, conductivity meter, Hoffman apparatus, small-scale chemistry - chlorine preparation and volcano – a spectacle of ammonium dichromate crystal's decomposition.

Biology: Photosynthesis, study of ecology - Quadrate method, DNA extraction, observation of stomata-leaf and observation of mitosis.

Each of the above experiments was designed so that they triggered an explosion of questions in our mind. Through these experiments we were exposed to 'experiential learning' and 'inquiry-based learning'

For example, Thejaswi Shivanand facilitated the tour of biology experiments for us. A brief discussion about photosynthesis was held in the beginning to assess the participants. Then he detailed the experiment and the controlling factors in it. Then all of us were supplied with a beaker, water, sodium carbonate, liquid soap and a syringe. All of us prepared a very dilute solution of sodium bicarbonate.

Then we added one to two drops of a liquid soap. After this some leaves of a tree with optimum thickness and age (for the control) were collected.



Photosynthesis

Then again for size control, these leaves were cut into small, round pieces with the help of punching machine. These pieces were put into the syringe by removing the piston. And the piston was placed back. Then the Sodium carbonate solution in the beaker was sucked in to the syringe with the help of piston. Then the contents in the syringe were mixed gently and allowed to settle. Within a minute all the pieces of leaves settled at the bottom. Then some of us kept our syringes in the darkness and others in direct sunlight. While we waited, the following questions came up:

1. Why was sodium carbonate added?
2. What was the function of liquid soap?
3. Why did the leaves sink to the bottom?

All the possible physical causes were discussed and we concluded that:

1. The sodium carbonate facilitated photosynthesis by providing the carbon dioxide essential for the process.
2. Liquid soap reduces the surface tension; hence the air bubbles on the surface of the leaves disappeared.
3. As leaves have higher density, they sink to bottom of the syringe.

Our discussion and the conclusion we arrived at was the essence of the objectives of the very workshop on ‘science education’.

Another interesting incident occurred in the Physics lab. We were involved in the construction of basic electronic circuits using a bread board.

The task was to build a usable electronic circuit to indicate water level in water tanks to avoid overflow. Every one tried their hand and succeeded in constructing the desired circuit. But one of us failed miserably. He tried constructing the circuit several times but the buzzer did not beep. He then dismantled the one constructed by his friend, tried to reconstruct the same and succeeded in it. Then again, he tried with the components supplied to him but again he met with failure. He checked each component for its working and found that the buzzer was not working.

So he used his friend’s circuit for replacing each component in a working circuit to detect the faulty component. Then he replaced the buzzer with a new one but the result was the same - he failed again. He replaced the buzzer twice but got no result. He then came to the conclusion that it was not the buzzer at fault but the circuit itself. Again he constructed the circuit, from scratch, with due care to each connec-



tion; but the end result was the same – failure. Finally, frustrated, he decided to give it a last try by putting in a new buzzer. At last his circuit worked with a beep!

This whole episode is the example for ‘experiential learning’ and ‘inquiry-based learning’. The process enabled him to identify the four faulty buzzer devices, though it was not his objective at all.

Our mind during the Workshop

As a learner when we are subjected to these kinds of learning environment, we find ourselves fully involved in the learning process. Every moment during the workshop, our mind connects and recon-

nects, not so much to the content of the workshop alone, but to the process carried out in the workshop as well, and how we could use it in our own classroom transactions. For example, while Dr.Yasmin was dealing with “Micro Chemistry in classroom”, we were thinking about our apprehensions about using chemicals in the classroom. Then, when we tried Micro Chemistry and became convinced about its safety features, we knew we could use it in our classroom. We were least worried about the content - “Preparation of Chlorine”.



Footnote

*Centre for Learning is a charitable society registered under applicable laws in India. It is a community of around seventy students and twenty adults; they are a semi-residential school outside Bangalore City at Varadenahalli.

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Insights

1. As learners, all of us appreciated the process of ‘experiential learning’ and ‘inquiry-based learning’, which will definitely be effective in our own classroom.
2. Just as we enjoyed the blend of formal and informal spaces here at the workshop, the same is true for our students also.
3. As we appreciated the depth in knowledge of resource persons here, the same is true for us also.
4. Meeting the needs of the students, sufficient time for hands-on and guided inquiry-based teaching and learning are crucial while transacting in the classroom.
5. Integration of lab into the classroom is essential.
6. Inquiry-based and experiential learning coupled with guidance in classroom transaction for science education is the need of the hour.

Conclusions

Surely, science education has no meaning unless it stimulates the spirit of enquiry to understand the world around us. Nature and its subtleties are a challenge for a seeker to understand them. The four-day workshop on science education was an attempt to stimulate interest and spirit about the same. The resource persons and their meticulous planning of the workshop were the key factors in the success of the workshop. The venue, ambience, arrangements and immaculate coordination ensured comfort of all the participants. Let’s also try to, in our classrooms, make the learning from this workshop a grand success!