

“And? What have you decided to do now, in college?”

“Chemistry,” I replied without a pause.

“Are you mad?” They were shocked, and descended upon me like a bunch of vultures. Did I even have the faintest idea what I was embarking on? A wasted life? A life without any career prospects?

I was truly without any apprehensions whatsoever, as I calmly countered their attacks by saying: “I love the subject and that is what I wish to do.”

It speaks of the intensity with which I already loved the subject that I felt not a shred of fear. After all, when one is doing what one loves, one doesn't look for any other motive, was my simple logic. Years later, when I completed a Masters' in Chemistry and decided to go in for a Ph.D. in the subject, I wrote a letter to Ms. Gomez and thanked her for sowing the seed of such a long lasting love affair.

It was only when I was later faced with a career choice that I realised she had planted more than one such seed: for, by now, it was patently clear to me that I had to be a teacher. If one teacher could impact me so:

wouldn't it be wonderful if I, too, could impact a student thus?

And so it is that a dedicated teacher turned my life around: in my choice of a course for higher study, my choice of a career and in many ways, the very way I think about Chemistry and Science.

I have often been asked if this teacher impacted all her students thus: and the answer is, no, she did not. While most of her students agreed that she taught well, I was one of the few to come totally under her spell.

But I think my story's import lies in this: the power a teacher can wield, and the timelessness of her influence, even in a career choice, not to speak of the way one views the subject. Today, I can honestly testify that Chemistry is not a subject that needs memorization significantly more than any of the other sciences do. For I was taught so, and have, I hope, managed to teach so. Thank you, Ms. Gomez!

Neeraja Raghavan, Ph.D., is Consultant, Academics and Pedagogy, Azim Premji Foundation, Bangalore. She can be contacted at neeraja@azimpremjifoundation.org

A CASE IN STUDY

Towards a People's Education Movement - Tamil Nadu Science Forum (TNSF) and School Education

T.V. Venkateswaran



This article traces the historical evolution of TNSF's role in education from the mid-1980s to 2008. From organising a few training programmes on low-cost activities for teachers, TNSF today is set on a mission to galvanise the entire Tamil society to focus on school education.

Formative years

Tamil Nadu Science Forum (TNSF) was established in 1980 by a motley group of scientists in IIT Madras, research scholars from universities, and a few school

and college teachers. In the initial years, the activities were more in the nature of expressing concerns over the deteriorating environment, the impasse in science education and concern regarding the use of science and technology for building atom bombs. Slowly and steadily, students, research scholars and teachers were attracted towards TNSF, and it became active since 1986. This group, which started out by organizing 'popular science lectures' in the city, began to take telescopes and slide shows to villages, to show people the stars! Puzzling as it may sound, even hungry and

roofless villagers wanted to hear about the stars. Innate curiosity about the world and thirst for knowledge does move one and all - rich or poor.

A major flip came about in 1987 when TNSF took part in a massive national-level science popularization programme called Bharat Jan Vigyan Jatha that went around the nooks and corners of the country, with the message of 'Science for the People, Science for the Nation and Science for Discovery'. Science was seen neither as just a collection of facts nor as gee-whiz gizmos. Science was seen as a world-view, distinct from non-secular and exclusivist ones.

By then, a number of teachers from middle schools, in various parts of the State, were associated with TNSF, and a lively debate, on what science education is, ensued in TNSF. The traditional wisdom then prevailing, that emphasized on the chalk-and-talk method and advocated various tricks (like mnemonics, to 'memorize the answers efficiently'), was questioned. The question, "Can science be learned in a non-scientific way like memorizing?" and the role of experiments and investigations in learning of science, were hotly debated. Fortuitously, this was the period when, in England, a radically new method of teaching of science, later to be characterized as the 'discovery approach', of the Nuffield science teaching programme, emerged. Whether or not one could really base science teaching on experiments and activities in government schools, which often lacked even basic facilities, was a daunting dilemma. Meanwhile, TNSF was introduced to Eklavya's Hoshangabad Science Teaching Programme (then being shaped in Madhya Pradesh), which laid emphasis on experiments and activities using low-cost techniques. TNSF teachers had an exposure to the Kerala Sastra Sahitya Parishad (KSSP) which emphasized making the learning of science 'joyful'. TNSF activists and teachers were of the opinion that we should learn from both - making science learning joyful and, at the same time, activity-based, using low-cost / no-cost methods.

Around 1988, a series of teacher training camps were arranged all over Tamil Nadu, to orient middle school

teachers towards various low-cost / no-cost methods. The training programmes proved successful, and more teachers were attracted towards TNSF. Though the actual impact in the formal school was limited, TNSF encouraged formation of science clubs - *Thulir Illams* - around the readership of its children's science monthly - *THULIR*. Children's Science Festivals were conducted at many places and the teachers trained in these workshops played the role of resource persons.

Learning beyond school

TNSF firmly holds the opinion that while formal school is given its due importance, one should not lose sight of the informal - out of school - arena. It is in this context that *Thulir Illams* became the main space for such interaction. The least that was taken up in *Thulir Illams* were reading and discussing *Thulir*- the monthly science magazine brought out by TNSF. Slowly, at least some children were keen to try out some of the 'Do - it - yourself' activities. Tree planting, discussion, science tours and many such activities became part of *Thulir Illams*.

Due to its prominence in working with children, TNSF became the state coordinator for the National Children's Science Congress (NCSC) programme in Tamil Nadu. The main objective of the programme was 'to stimulate scientific temperament and to learn the scientific methodology of observation, collection of data, experiment analysis, arriving at conclusions, and presenting the findings.' Groups of three to five children formed teams and undertook small research projects, for example, calculating the amount of water wasted due to leaky taps in a street, number of households that have some form of compost pit in their house, what types of birds are found in their village, what percentage of people in a locality believe in astrology, etc. The teams undertook experiments, made detailed observations, analyzed their findings and made presentations in the 'Children's Science Congresses', held subsequently.

Children's Science Festival as a vehicle for teacher sensitization

Children's Science Festival (CSF) is an out-of-school event organized with children and teachers to learn

science (at times even social sciences) in a radically different mode from the way it was being taught in the school class rooms. The main objective of the CSF was to rebuild the interest of children in schools and to demonstrate, particularly to teachers and parents, that the teaching and learning processes can be made interesting, relevant, joyful and effective as well.

In essence there were two dominant foci on the activities undertaken in the CSF. One set of activities focused on the low-cost / no-cost experiments / games for teaching certain concepts in science. It was possible to prepare hydrogen gas from egg shells and lime juice without looking for costly lab equipment. In the same way, for demonstration of many physics concepts like inertia, Bernoulli's law, generation of spectrum and many more, one needed only a small contraption, easily accessible from the neighbourhood. Traditional folk games like *Pandi* (called *Staapu* in the North) could be re-worked to teach Tamil grammar, and so on. Use of role play, puppets and many other contraptions make the teaching-learning process meaningful and joyful. All these activities were hands-on, practical and simple to do and experiment with.

On the other hand, TNSF also tried to integrate various areas of knowledge/discipline and see the world around us in a scientific perspective, using an integrated approach. Science in the kitchen, for example, looked at the activity of cooking and linked maths (measurements/ratios), hygiene (cleanliness), nutrition, chemistry (cooking), energy (use of different stoves and cooking practices), physics and technology (various gadgets like the knife used in cooking). It did not stop there; science in the kitchen also raised issues such as: Who cooks? Why is it only women who are enslaved in the drudgery of cooking? What is the status of the kitchen space (where women spend most of their day) in comparison to other parts of the house (say drawing room, where we spend very little time)? Other such social dimensions were also integrated.

TNSF considers that it is important to critique the use of science and technology and underscore the need for

social change. This objective was addressed in two ways. Firstly, the very way in which CSF was organised demanded that children from various socio-economic and cultural backgrounds intermingled. Thus they were able to see a new 'social reality' far beyond their daily experience. The Guest-Host system of the CSF played the key role in it. The guest children are hosted by the local students in their respective houses for the period of the festival. It is through this close interaction that both the guest and host children are able to learn about each other. They may belong to two different castes, religions, or socio-economic classes; but as they stay together they develop friendship and learn to respect and care for each other. The guest-host system can be an important tool for forging harmony and opening one's eyes to see the 'other'.

'Science' in the parlance of TNSF includes all areas of enquiry that are scientific. Thus, social sciences too form a part of CSF. In fact, in the recent years, TNSF has been trying to organize special 'social science festivals' which take up themes like caste, religion, money, democracy, food, housing, habits and customs, etc., and explore them in a scientific way. While TNSF has faith in the activity-based pedagogy, it also holds the commitment to social critique as crucial.

TNSF came up with many teacher hand books/teacher manuals that contained activities, games and worksheets. The work also generated pressure on the government. Slowly the material developed by TNSF seeped into the official textbooks and educational system. The quip, 'I hear I forget, I see I remember, I do I understand' epitomized the dominant perspective of TNSF during this period.

Joy of Learning and child-centered pedagogy

With the advent of the mid-day meal scheme, in Tamil Nadu, enrollment in schools started showing a very favourable trend. However, the drop-out rate was indeed alarming! Why does drop-out occur in such a large number? The then prevailing common sense notion was that children of the poor go to work to earn a living - that is child labour.

Indeed child labour is an issue. Yet a study in 1991 conducted by a research team showed that, "In villages where there are no organized avenues of child labour, most of the drop-outs at primary level occur due to a combination of children's disinterest in school, their academic failure and lack of parental monitoring."

'Joy of Learning' therefore meant not only making the classroom lively and making science learning interesting, but also became a tool to retain children in school and prevent drop-out. 'Joy' in learning was therefore understood to be, not merely the 'glee' of making hydrogen gas, nor as the 'fun' one has while doing a role play. It was now seen as something deeper - the joy and exhilaration that one feels 'discovering' for oneself and making sense of the world around. Achievement of skills, of being able to read, write and do arithmetic, is paramount to retain the interest of children. It was clear that one could not delink the universalisation of elementary education from achievement in school and learning levels. Child-centred pedagogy thus became visible in the activities of TNSF.

Rooting the reform

"The important thing in science is not so much to obtain new facts as to discover new ways of thinking about them."

-William Bragg

While the early forays of TNSF into the education sector was limited to sensitizing the teachers in use of low-cost/no-cost experiments, since 1990s, TNSF has been playing a key role in increasing access, improving quality, introducing child-centered and activity-based pedagogy, community mobilization, etc. Teachers, children and school administration are some important players. So are parents, community (civil society), state educational officials, teachers unions, international agencies like UNICEF, educationists, and other NGOs.

It is in this context that TNSF has been organizing educational conventions as a platform for dialogue and debate amongst various actors. It is only by such debates in the public sphere that a fruitful, viable action could emerge. Thus any reform should not be pushed from above, but built by discussion

and debate, with participation of every player involved in education. It is imperative that various actors are given a space in the public sphere and viable action forged.

Miles to go

Despite best efforts, TNSF is still foxed about many things related to education. From the early years, TNSF has been critiquing the examination system that emphasizes memorization and speed. The exams as we know today, are not able to assess the progress of the child in acquiring knowledge nor assess the process of teaching-learning. TNSF is as unsuccessful as many other educational organisations with regard to offering viable and practicable alternative modes for process assessments.

Most of the activities of TNSF are related to pedagogy; development of tools for activity-based, child-centered teaching-learning materials. Efforts towards curriculum development have been very little. There appears to be an assumption that the same, uniform curriculum would fit across the country/state; socio-economic background and cultural specificity do not seem to matter. Curriculum, especially from the viewpoint of a socially and economically disadvantaged child, is yet another area quite unexplored by TNSF.

Like most progressive educationists, TNSF has been advocating education, at least primary education, in the child's mother tongue. English language teaching-learning had always received little or no attention. However, in recent years, various Dalit activists have been demanding quality English language teaching to children of disadvantaged sections, especially as it provides social mobility. The need to re-examine the issue of language still remains to be addressed.

T.V.Venkateswaran is a Scientist with 'Vigyan Prasar', Department of Science and Technology, New Delhi. His research interests include history of science popularization in Tamil Nadu and critically examining the part played by science communication in fabrication of varied worldviews, in particular in the Indian cultural cosmos. He can be contacted at tvv@vigyanprasar.gov.in