

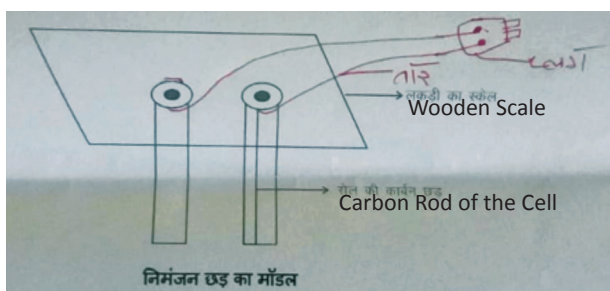
TLMs in Teaching of Science

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Under the present scenario, pedagogy demands our consistent effort to evolve scientific teaching methods. It must involve the use of scientific tools or Teaching Learning Material (TLM) without which neither teaching nor learning is possible. In this article, I will talk about the experiences of my life as a student as well as a teacher and also share my understanding that changed in course of time.

When we were students, the teacher was the most prominent person in the school. Along with a textbook, at times, some additional material was also used during teaching. I remember the day when our science teacher showed us a chart as a TLM while teaching the organ system of human body and how we enjoyed the class and drew pictures looking at that chart! I still remember the model of immersion rods that we had made with materials collected from our surroundings.



Model of immersion rods

The model shown above would heat a mug of water in a few minutes. We remember this model vividly because we had made it ourselves.

There used to be a lot of talk about teaching-learning aids and we used to make them painstakingly but did not know their proper usage. Most of these aids did not have any involvement of learners, they were there only to show and tell. The students did not have any opportunity to have hands-on experience. During my school days, the teachers neither brought TLMs to the class nor did they spend too much time in making them.

In 1997, I started teaching science at a non-government aided secondary school in Udaipur.

I was to teach science to classes VI to X. Initially I started explaining concepts using the blackboard and chalk and felt that teaching with the help of a textbook was a pretty good idea. A workshop for science teachers was held in winter vacation with science teachers from some other schools affiliated to our institution also joining in. In the workshop, we performed many experiments in science and had group discussion on them. We understood things better and that inspired me to use TLMs on a regular basis. It further made me realise that the science I had studied earlier was based on learning by rote without understanding the concepts.

In one of the experiments conducted in the workshop I saw how a coin placed in water appears to be raised and what changes occur when water is poured or removed from the container. Many things got clarified after this observation. This experiment was very much there in the science textbook of class 8, but until then it was not clear to me as to why the coin looks raised in water: when I saw the experiment with others colleagues in the workshop I was thrilled! We had not read this experiment properly till then and that day I saw it happening. After that I started performing experiments given in the book on my own and my confidence increased. We also conducted experiments in our laboratory and the children understood the concepts better. During a science evaluation we observed that the children could answer questions in a better way since they had learnt the concepts by performing experiments. Their performance, drawing (labelling) and expressions were quite explicit.

We also observed something very important while performing experiments (given in the textbook) with the students. Our results of about ten experiments from the science textbook of classes 6-10 of Rajasthan Board did not match with the textbooks results. Now, I do not know whether we did not read the instructions properly or we went wrong in performing those experiments but the fact is that the results did not match though we conducted them many times. Some examples are given here:

1. The cover effect of the magnet – According to the textbook, if iron filings or small pins are kept on small thin sheets along with other small items and a magnet is moved from under the sheet then the iron filings or small pins would also move with wood, plastic fibre, glass etc., along with the magnet. However, they would not move at all when the magnet is moved from under the iron sheet kept on the thin sheet because the magnetic field cannot cross the iron sheet. But when we did the experiment in the classroom using geometry box as an iron sheet, we found that iron filings or pins did move a little.
2. Air applies pressure – The book says - take a tin or a cask half filled with water and heat it. Put out the flame once the boiling starts, close it with a lid and allow it to cool. After a couple of hours, the cask was shown to have dents here and there. But when we actually performed this experiment in the laboratory there were no dents on the cask. We started using transparent plastic water bottles for this experiment. This experiment is now done with plastic water bottles even in the textbook.

I also realised that preparation of kits and TLMs often take a lot of time. Many a time it is argued that since the kit is not available experiments cannot be conducted. I can say with my experience that many experiments can be done with simple materials. There are three categories of materials.

- I. Materials available around us. Some of them can be found in school itself. A lot of experiments, observations and studies can be done with such materials.
- II. Teachers and children can bring certain materials from home.
- III. Materials can be bought for the laboratory or class.

I also feel that the added benefit of such material is that it opens a possibility of some experimentation and discussion at home also.

In 2014, I started teaching in Government High School, Gingla. Gradually I started conducting experiments there also. When I taught separation of substance in class 7, I told the class that in order to separate a mixture of two liquids that do not mix with each other (for example mixture of oil and water) we can use the empty glucose bottle used in the hospitals instead of a separating funnel.

There was a government hospital in front of our school. The very next day children brought an empty glucose bottle from there, cut the top slightly, got some oil from the school kitchen and mixed it with water. It was allowed to stand for some time and then they were separated using a stopper. Whenever this question was asked for evaluation, the children answered it by drawing a clear picture and I concluded that when children collect the material themselves they understand the concept very well. The whole class is full of enthusiasm and energy when such an activity is assigned.

Similarly I took Class 6 students to the school garden to study types of plants and their parts. I wanted to tell them about transpiration which is the process of water movement through a plant and its evaporation from aerial parts, such as leaves, stems and flowers. The students were asked to place a clear plastic bag over the leaves and tie the bag loosely with string around the stem. When they opened it after five hours I could see a miracle happen! The children who never spoke in class were also answering my questions! Here is an example of the dialogue we had that day:

Teacher - What is seen in plastic bag when it is opened?

Children - Water drops. Madam, the leaves are also wet.

Teachers - Where did these water droplets come from?

Children - From the leaves, from the plant.

Teachers - Do these drops come out every day?

Children - Yes.

Teacher - But why do we not see them?

Children - They vaporise due to the sunlight.

Teacher – From where did the water come in the leaves?

Children - from the roots.

Each child also drew a diagram showing transpiration in plant.

My experience tells me that in order to make science simple, interesting and child-friendly, we have to collect materials from around us and give opportunities to the children to do things for themselves to make learning happen.

Most teachers do not use TLMs while teaching science in schools. Only a few use them on certain occasions depending on their interest. The lessons do talk about conducting experiments, but there

is no clear demand anywhere. Some schools have TLMs but the teacher is not interested and in some other schools the teachers are interested but there is lack of TLMs.

One can procure the materials required to do the experiments given in the book and start conducting them. Some are easily available around us, some can be got from children's home and certain other necessary items may be bought from the market. TLMs, according to me, are not about some purchased readymade materials. It is

about a 'science kit' for the students which can be used by groups of students of many classes to do experiments along with reading a textbook.

Therefore, a well-thought-out kit provides a practical form of science teaching. This develops scientific thinking in the students, giving them an opportunity to 'learn by doing'. The students become energetic, understand the concepts and arrive at their own conclusions thus enhancing their confidence.

This article was originally written in Hindi. It was translated to English by Nalini Ravel.

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