Preparing TLMs from Waste Material and Using Mathematics-Science Integrated Instructions in Classrooms

Harish Nautiyal

Introduction

In an elementary or a primary school, classes I to 5 are taught Hindi, Mathematics, Science, English and Sanskrit. In most schools only two teachers are available depending on the number of students. Moreover subjects like Mathematics and Science are taught by the same teacher. We can also put it this way that a teacher has to teach ten subjects in a day and this arrangement results in 1) completion of the curriculum without developing an understanding of the concepts and 2) developing an understanding but inability to complete the syllabus.

Both the situations are not good for the students, particularly in remote rural areas where students are the first generation learners. These areas lack basic facilities like electricity, communication, television etc. and the availability of school resources is also not enough. In a situation like this, it is essential to develop the understanding and logical capacity of the students and give them complete knowledge as per their class. In order to do this, it is necessary for a single teacher of mathematics and science to think and develop certain innovative methods by integrating mathematics and science where the concepts of these subjects complement each other in a way that helps save time and maximum number of classes develop an understanding of basic concepts.

In this context, this article talks about concept, efforts and partial results of a method where mathematics and science are taught in an integrated manner. It is being presented with the supposition that it can be effective in the process of teaching-learning at large.

Objectives

1. Creating integrated methods of teaching mathematics-science and to manage time, class and innovations to develop a common understanding for different classes.
2. Creating such TLMs in mathematics-science so that both the subjects can be nurtured and the abstraction in these subjects could be made tangible for the children.
3. Developing integrated thinking in learners so that they are able to imbibe the concepts of mathematics and science simultaneously.

Plan of work

1. Procuring materials such as wood, stones, and cardboards etc. as resources from surrounding environment.
2. Building various shapes with children.
3. Hands-on learning about the structures, similarities, differences and interconnections between the shapes.

4. Use of TLMs of mathematics in science.

Process

My school, Government Primary School Sankari, is located in a hilly and remote region in Mori block of Uttarkashi. At present construction work is in progress there, so we get a lot of waste material in schools such as pieces of wood, cardboards, mud, cement, pipes and wires etc. In the first phase, the students were given the opportunity to gather material for similar shapes in mathematics and science. These matching shapes were then sorted out and the remaining material was kept aside for making TLMs.

Second stage

At this stage, TLMs were made using the collected and other materials with the help of the children. While making them we kept in mind the understanding that these TLMs would bring. Efforts were made to develop an understanding of length, width, weight (light and heavy), geometrical structure, addition, subtraction and the state of matter etc. of materials collected by the children. They made triangles, squares and rectangles using cardboard and wooden pieces and made circles, squares etc. using mud and cement.

Third stage

The shapes that were created collectively to make

TLMs were segregated in this stage. Then they were refined using other resources such as tapes, colours, saw, sandpaper, paint etc. Discussions were held in class regarding their usage and arrangements were made to store them safely.

Fourth stage

The fourth stage of the process is quite a dynamic one. Certain concepts were selected in mathematics and science from the curriculum of elementary classes so that the children could understand both the subjects in an integrated way and develop a common understanding by using these TLMs.

For example, children were helped to develop an understanding of length and width while building shapes, they made circles from clay and cement to develop an understanding of weight (light and heavy); they observed state of matter and tried to understand the concepts of ascending and descending order.

Children's reaction

Since the children were involved in preparing TLMs, they showed a great interest in learning during the process of teaching-learning. They began to understand the general concepts of mathematics and science such as the form of the shapes, measurement and weight, big and small etc. while searching for and building the resources itself. Children were able to get a feel of different types of triangles, rectangles, dividers, scales etc. by touching them. Consequently, children began moving towards understanding the abstract ideas of these two subjects in a concrete way.

Conclusion

There are many issues pertaining to elementary education today: from lack of human resources to paucity of time and teaching materials. In spite of these inadequacies we have to keep one thing in mind and that is the future of our students which should not be made to stop at any cost. It is necessary in today's world that we make the effort to be a better facilitators and TLM makers, understand nature as the source of resources and consider ourselves as a biggest means to facilitate learning. Mathematics and science are complementary to each other and nurture each other. What is necessary is integrating of these subjects based on the level of the class by keeping the concepts and ideas in mind, and displaying it in a concrete form and a simple manner.

Together with the children, I made an attempt to prepare TLMs with waste material available around us and to refine them creatively. In this process, the effort was made to see how science or EVS and mathematics could be taught together using those TLMs. With the help of this type of integrated teaching-learning we will be able to teach different classes together and will be able to establish the concept of previous knowledge, present knowledge and a thought for the future in a multigrade situation. This process will definitely save time in teaching and we will be able to utilise this time and effort in shaping a few new dreams, developing understanding and finding new integrated ways of teaching-learning methods.

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

Harish is the head-teacher of Government Primary School Sankri, Mori, Uttarkashi, Uttarakhand. He may be contacted at dr.harish.uki@gmail.com