

Facilitating Teaching-learning Practices in Science

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The paper discusses the experiences with Class six students about teaching-learning the concept of 'Reversible and non reversible changes'. The discussion depicts the classroom environment and involvement of students during teaching-learning process. The paper also highlights the effectiveness of activity based teaching-learning method for developing concepts in science. Activity based teaching-learning proved to be useful for the students especially at elementary level as it provides space to explore, observe, think, analyse and interpret. Authors have also shared their experiences related to integration of art with teaching-learning of science to make the process interactive, interesting and creative.

KEY WORDS: *National Curriculum Framework -2005, Activity based teaching-learning, Reversible and not reversible changes.*

Introduction

National Curriculum Framework-2005 (NCF-2005) suggests that at the elementary stage, students should connect the knowledge to the life outside the classroom, ensuring that learning shifts away from rote learning methods, going beyond the textbooks, making assessment more flexible and integrate with classroom life, inculcating values among children (NCF, 2005). Research studies have shown that learning through hands-on experiences with peer group participation becomes an effective way to improve learning abilities (Anabelie, 2015). Learner if provided the opportunity to think and solve the problems on their own then the learning becomes long lasting. The importance of activity based teaching is that it is learner centred and it encourages self-learning (Iqbal, 2014). This is effective with students of special needs also (Deepa, 2014).

Authors have observed that students are not given freedom to explore and express due to various reasons such as completion of syllabus within time frame, teacher's engagements in multiple activities, maintaining classroom discipline, etc. As a result the emphasis is mainly laid on mechanical tasks. These tasks are mostly based on recalling the text that does not permit self explanation and questioning by the students. This reflects students as a passive learner, which ultimately leads to lack of interest in the teaching-learning process of science. This process needs a shift.

The question arises: "How to bring this shift?"

The experience shared below may suggest one of the ways to make teaching-learning process interactive and interesting.

Methodology

Science Classroom: An Observation

Authors observed Science Classroom (Class VI) in government schools of Haryana which had the following features—

- Teacher centric
- Instruction loaded
- Learners as passive receptors
- No space for activities
- Learning within the four walls of classroom
- Information loaded teaching, which leads to rote memorisation
- Follows disciplinary approach
- Examination centred teaching

After observing the science classroom processes, authors got an opportunity to interact with the students. Some of the responses given by the students are highlighted here:

- I do not like science. It is difficult to learn.
- I find science confusing.
- It is difficult to memorise activities.
- I cannot remember terminologies of science.

It is a well known fact that conceptual development in science is a continuous process. Students should be actively involved in teaching-learning process by providing opportunities to observe the world around them. This will help them in relating the concepts of science to everyday life (MHRD, 1993; NCERT, 2005).

What kind of strategies need to be followed to make it possible?

To get the answer, let us enter a classroom where the concept of “Reversible and not reversible changes” is being discussed (NCERT, 2013).

“This was the first time when we were engaging students in teaching-learning process of science. They were sitting on *dari* (carpet) separately in groups of boys and girls. They were little hesitant. To make comfortable rapport with them and to break the stereotype sitting arrangement of the class, we asked them to make a large circle. We also sat with them. We started with a round of introduction where we tried to gather information regarding their areas of interests. Within half an hour they were quite comfortable with us.

Authors: “Would you like to play a game?”

They all shouted: YES s sss...! With a smile on their faces.

This was the beginning...

Activity 1

Making Shapes by Using Paper A Group Activity

Students were encouraged to divide themselves into five heterogeneous groups. Here the term heterogeneous has its own significance. This will provide an opportunity to each and every student to feel equal in terms of abilities, appearance, gender, region, etc. Each group was given a used sheet of paper. They were told to make any shape using the paper without tearing it off. They all were engaged with this activity. After few

minutes they were ready with something in their hands.

Group 1: We have made a paper boat.

Group2: We have made a ball.

Group 3: We have come out with a fan.

Group 4: We have made the basket.

Group 5: We could create a game called “Day and Night”...

In this way each group has come out with different shapes.

Authors: Good attempt! Each group has created beautiful items. Can we refold these items and bring back the original shape of the paper? Try it.

They all did it successfully.

Activity 2

In this activity used sheets of paper and a pair of scissors were provided to the students. They were motivated to make some other item of their choice by using paper. This time they were allowed to cut the paper. After 15-20 minutes we got following responses.

Group 1: Look at my purse with handle.

Group 2: We have made a doll. She will carry this purse.

Group 3: Your doll can go to grandma’s place on our aeroplane.

Group 4: Your doll can take this bunch of flowers for grandma.

Group 5: This fan is for your doll. She can use it.

In this way, they all had fun by discussing about the items which they had made. All

groups made different items by cutting the paper.

Authors: You all have made beautiful items. Can you bring the piece of paper back in its original shape and size?

A wave of interaction started among children. They all started trying to get the shape and size of the paper back.

Students: Oh! How can we get it back? We have cut it.

Authors: So, did you observe any difference in Activities 1 and 2?

Students: In Activity 1, we were able to get the paper back in its original shape and size whereas in Activity 2, it was not possible because we have cut the paper.

Many more examples such as knitting of yarn, cutting of vegetable, sharpening of pencil, boiling of an egg, burning of paper, etc. were discussed with students. The observations and discussion helped in concluding various changes as reversible and not reversible.



Figure: Collage of different shapes made by students

Activity 3

Group Discussion

Students were given some situations (S1, S2 ...). Each group was supposed to answer the questions with explanation about the given situation(s).

S 1: Dissolution of salt in water.

S 2: Making of furniture from a log of wood.

S 3: Melting of ice-cubes.

S 4: Mixing of chick peas and flour (atta).

S 5: Heating of a needle.

Students started discussion on each situation.

Each student was involved with the best of his/her potential. Authors observed that it was not so simple for them to categorise these situations into reversible or not reversible.

For example, in Situation 1 (S1) most of them answered "it is not a reversible change".

Authors: Why do you think so?

Students: We cannot see salt any more.

Authors: What happened to the salt?

Students: Of course! It is dissolved.

Authors: Can we get dissolved salt back from water?

Radha: How can it be possible? It has been dissolved into water.

Authors: How do we get salt from sea water?

Ranjan: By evaporating water.

Riya: But how?

Raja: By keeping it under sunlight.

Riya: Can you imagine how much time will it take?

Radha: Ha, ha! Yes, till first term examination!!!

The whole class started laughing. This reflects how students were involved in an interactive and interesting discussion. The discussion continued.

Rajat: Can't we heat it? I think heating will do it fast.

Authors: Very well said. Let us try.

We demonstrated the activity and showed them the process of separation of salt and water by evaporation and condensation.

Students: Wow! We could get both the salt and water back.

Authors: So, is this a reversible or irreversible process?

They all shouted "it's reversible".

Situation 2 was answered as not reversible change. As they all agreed that a log of wood cannot be obtained back after cutting and making furniture from it.

Situation 3 initiated a debate among them. Some of them were saying it is a reversible change but others consider it as a non reversible change. They were arguing that if ice cubes are not taken in the same container for refreezing, the shape of ice cubes may be changed. This was the matter of discussion. Such kind of arguments indicated that students have entered into the process of thinking and analysing.

After discussion it was generalised that if we get everything exactly the same as before, i.e. the original material, shape, size, and

appearance, etc., then it is called a reversible change.

Situation 4 was categorised as reversible change. However, some of them were having an opinion that the mixture of chick peas and flour (atta) can be separated by sieving and others suggested the method of hand picking. This was reflecting how they were applying their previous knowledge with their daily life experiences to solve the problem.

For Situation 5 students asked us to demonstrate the heating of needle because they wanted to observe the changes. Although they tried to give the answer on the basis of their previous experiences but they were not sure about it. We demonstrated the heating of a needle. Again a debate initiated on the changes happening with the needle. Some of them were saying that on heating, the needle becomes red and on cooling it becomes dull in appearance and has lost its original shine. They considered it as a not reversible change. Another group argued that although the colour has slightly changed but the needle remains same. Hence, the process is reversible.

It was discussed that in some cases it is easy to decide which changes are reversible or irreversible, but in some cases it is pretty hard to decide. It is possible that through a prolonged process, we can perhaps get the same material back. Broadly, it can be generalised that the processes in which we can get the material with exactly the same properties as before, we call such changes reversible changes.

Students were encouraged to move out of the classroom and observe any five reversible and non reversible changes in their immediate

environment and note them down in their notebooks.

Discussion and Conclusion

The ongoing discussion itself was an achievement, as students were involved in the process of learning. This provided opportunities to assess students' progress during teaching-learning process. Generally, the issue of continuous assessment is one of the grey areas for teachers. They usually think that some extra time and efforts are required for the same. The sharing of authors' experiences is actually an attempt to break this myth.

The entire process highlighted that when this kind of concept is discussed in the teacher centric classroom where textbooks give some definitions and examples and students simply remember them without thinking, this leads to rote memorisation and ultimately the learner loses interest in the learning process. However, when students are engaged with some interesting activities where students not only learn through their own experiences but also through experiences of other members of the group, teaching-learning becomes more interesting. It also helps students to learn according to their abilities and skills. Students are not stressed with the heavy scientific terms and definitions. Such student centric classroom provides ample opportunities to raise questions and look for their answers.

Sometimes it is difficult to answer all the questions because of the cognitive level of the child, but at least it develops the habit of asking 'HOW and WHY' which ultimately help students to understand the concepts of science.

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