

MISCONCEPTIONS IN SCIENTIFIC CONCEPTS: AN INVESTIGATION

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ABSTRACT: Students develop their concepts on the basis of their experiences, attitudes and abilities before coming into the classroom. So, as a result sometimes their concepts differ from the actual concepts this is known misconception. In Indian education system, we start to teach Science; as a subject from very early schooling but still it is found that there are so many misconceptions posses by the students though they are studying in higher classes. Previous researches as well as the researcher's observation also found the same. In this regard it will be fruitful to i) find out the misconceptions posses within the students in scientific facts and ii) how can we remove those misconceptions for better understanding of the concepts. So for the first purpose the researcher took one written science test to the students studying in class 9th and for the second one literature reviews were done. The result reveled that students posses so many misconceptions within them. If teachers as well as parents take care about the students learning then it will be very easy to remove the misconceptions and this will be one great step towards the formation of clear concept for our future nation builders.

Keywords: Misconception, Scientific concept

I. INTRODUCTION:

Learning is an active process and the primary purpose of science learning is to inculcate accurate as well as correct scientific concepts among the learners. Now a day learning science is an important activity for every human being for enhancing their life in a better way by knowing and applying the knowledge of science.

Kothari commission (1964) emphasized on science education and also emphasized on experimental and field work. At the same time, it also suggested that science education in all levels should be strongly reinforced through study and its application. National policy of Education (1986) also stressed on science advancement and development of proper scientific temper among the students.

In Webster's Dictionary of English Language, **Science** is defined as systematized knowledge derived from the observation, study and experimentation, carried on in order to determine the nature or principles of what is being studied.

In Indian education system Science is already included from the primary level as general science but in upper classes science is classified into its various branches like: physics, chemistry and biology and each subject is based on concepts.

1.1. Misconception:

Conceptual understanding of scientific facts is the basic thing for learning science. If there is difficulties in understanding, makes misconceptions (**Michael, 2002**). Previous researches revealed that there are some scientific concepts within the students/learners which are often different from those of scientists. These differing ideas or conceptions are known as misconceptions. When the scientific concepts contradict with currently accepted scientific phenomenon or theories, it also called misconceptions. It is also defined as a preconception of phenomena occurring in the real world which is not consisted with the scientific explanation of the phenomena (**Modell et al. 2005, p.20, in Yates & Marek, 2014**) acts as a barrier among the students to acquire accurate scientific explanation. For better teaching and learning of science there is a need to identify the misconceptions (**Yip, 1998**).

There are so many previous researches which tried to find out the misconceptions related to science. **Yip (1998)** revealed that practicing biology teachers show confusion or misunderstanding in respect of a number of basic biological concepts. **Secken (2010)** concluded that students have misconception about 'salt' in basic level. **Chen et al. (2013)** found difficulties in fundamental electronics concepts. **Demirbas & Ertugrul (2014)** found that the students could identify solids among given pictures and provide new examples of solid substances. They also believed that solid substances should be hard; therefore, they did not call soft and flexible objects as a solid. The students did not have as clear an idea about gases.

The students who are studying in class 9th are now in a very vital situation as they have to appear in board exams in next year. So their concepts in science should be clear so that they can do better in their examinations. But from the personal experience of the researcher, it is found that there are so many misconceptions in science among the 9th standard students and previous studies also found various misconceptions in different topics of science. Hence, it is important to identify the misconceptions in science and as

an educator we should try to find out the ways of removing those misconceptions for better learning of the students. For this, the following research questions came in the mind of the researcher.

II. RESEARCH QUESTIONS:

- i) What are the misconceptions possessed within the students in scientific facts, and
- ii) How can we remove those misconceptions for better understanding of the concepts?

III. OBJECTIVES: The objectives of the study are as follows:

- i) To study the misconceptions in scientific facts among the students.
- ii) To find out the ways of removing misconceptions from the students.

IV. METHODOLOGY:

4.1. Sample:

The students studying in class 9th are selected as the samples for this study. Total 20 students were selected by purposive sampling technique.

4.2. Research instrument:

For the first objective, one questionnaire was developed by the researcher and open ended questions were given. Only two chapters were taken from their text book.

And for the second one, review literature was done.

4.3. Method: Qualitative research paradigm is used here.

V. ANALYSIS AND INTERPRETATION OF DATA:

5.1. Analysis of objective 1:

The collected data were analyzed qualitatively.

The questions and erroneous responses are listed here.

Q. What will happen if the nucleus disappears from human cell?

Misconceptions:

- If there is no nucleus in the cell, then we will be unable to do any work.
- We will die.

Q. What will happen if plasma membrane ruptured in a human cell?

Misconceptions:

- If the cell membrane is ruptured then there will be disease in our body.
- Our home will be destroyed.
- If the cellular membrane is ruptured then our body will be burned.
- It is like polythene and found in the polythene.
- We will be in trouble. And we will become ill.
- Our body will start to be rotten.

Here the responses are clearly showing that the students are holding misconceptions in biology.

In the first question they could have thought what does nucleus do and then what disturbance may happen in its absence. Here the students do not have the idea of the function of that particular organelle and its parts.

In the second question, also they are unable to realize the function of plasma membrane. Similarly the concept of diffusion and osmosis is lacking in their responses. Instead of explaining the process of hampering in the exchange of materials from the surrounding of the cell they possess misconceptions that we will fall ill and our body will start to become rotten. They compare cell membrane with their hose and polythene.

These kinds of misconceptions may be the result of lack of proper understanding of the content and less thinking about the concepts.

Q. What are the difference between speed and velocity?

Misconceptions:

- Speed and velocity are same.
- Going from one place to another place is known as velocity.
- From one place to another is called speed.
- Electron, proton and protein are present in the equation of law of motion.
- The first law of motion is known as the law of base.
- First law of motion is written as, $v=ta$ and Second law of motion is written as, $U=tv$

Here also in science in the physical science portion they are very much confused about the scientific terms and as a result they are holding misconceptions that speed and velocity are same. They only memorize the definitions without proper understanding. For this reason their responses are showing misconceptions in the time of define velocity. The students also having misconceptions about the equations and this is due to the memorization of the concepts and lack of practice.

5.2. Analysis of objective 2:

Ways to remove misconceptions.

For analyze this objective a literature review is done.

Yip(1998) found that the source of misconception is **everyday language** and **children's life experiences** and **abstract concepts**. And this can be eliminated by developing the teaching techniques.

Incomplete understanding during classroom instruction is another source of misconception and this can be removed by proper attention of the teacher towards the students and by checking whether the teaching material is understood or not by all the students.

Teachers' less competent in subject matter knowledge, is another source of misconceptions. So the teacher should be competent in the subject matter and deliver the content in such a simple manner which is easy to understand.

Text books sometimes provide inaccurate expression of the topic. It may be in **pictorial** form or may be in **written** form. As a result students feel difficulty to understand the concept properly. So, if teachers explain the pictures properly and ask questions to the students in such a manner, which can test the understanding level of the students can remove the misconceptions coming from this. According to their responses we can teach the content and can help the students to form the right concept.

According to Kwen (2005), Teachers can be the source of misconceptions. Sometimes if in-service teachers who are working in the primary schools may not have science background can be act as a source of misconception. So if such condition appears, they must prepare the content well before entering into the class and they could have to teach very consciously.

Wescott and Cunningham, (n.d.) only the learners have the ability to recognize and modify their misconceptions and as teacher we are responsible for helping and recognizing the misconceptions and give them opportunity to remove or modify them.

Kartal, Ozturk & Yalvac (2011) concluded that the teacher should know the methods and strategies of how conceptions which are used in science teaching and employ them in useful manner.

Secken & Aslam (2011) concluded that the constructivist teaching application is a great way for finding out students' understanding the concepts related to hydrolysis subject.

Aydin & Balim (2009) found technologically-supported concept- mapping is useful for better understanding of the content and there is less chance to produce misconceptions by using it.

Deshmukh & Deshmukh (n.d.) science teacher should be aware of numerous science misconceptions in teaching. If they know these then only they can remove them. There is a need to focus on the knowledge of textbook writers so that they can elaborate the content in proper scientific manner.

5.2.1. Interpretation and discussion:

From the above analysis of previous researches, regarding the ways of removing the misconceptions, it can be said that teachers should try to find out the misconceptions poses among the students because the students are very much dependent upon the science teacher. So if he/she do little hard work to find out as well as removing misconceptions by using teaching techniques,

concentration on students understanding etc. as a result learning will be error free and it will develop clear conceptual understanding of science topics.

VI. CONCLUSION OF THE STUDY:

From the above we come to the conclusion that though our students are studying in higher classes but still they possess so many misconceptions within them in basic concepts. As being teachers and educators, we have to find out those and try to remove or modify their erroneous ideas and provide accurate conceptual understanding of scientific concepts as they are our nation builders. And this work should be started now without any delay otherwise we will be behind the developed countries.

VII. EDUCATIONAL IMPLICATION OF THE STUDY:

Misconception is not a new thing found among the students. It was possessed among the students from many years ago. But now the days are changing. All the countries are developing day by day, similarly science is also developing and it is such a thing, that needs a clear concept. Erroneous or insufficient ideas become dangerous in today's era. So we should try to identify and remove the misconceptions from the students. As a result we will be able to develop the clear understanding, thinking and creative mind for science field which will error free, correct and accurate.

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