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Science Misconception Among In-Service Teachers Of Chhattisgarh State

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Abstract:

Misconception is the major investigated factor which inhibits the learning of science concepts. Existence of misconception may be due to several reasons. One among them is the faulty instruction given by the teachers in the classroom. In this study the researcher aimed to identify the science misconception among the in-service teachers who are teaching at elementary level and are expected to have pedagogical competency. 43 in-service teachers were selected purposefully as sample for this study. The data obtained were analysed by percentage analysis and it was found that almost all the teachers have misconception about basic science concepts. It was suggested by the study that in-service teacher training programme must be given due consideration and to adapt several innovative models to eradicate misconception.

Keywords: Science misconception, misconception and In-service teachers.

Introduction:

Science misconception

In a science classroom the teaching learning process is never one way process rather it is a two way process in which teacher interacts with the students and students respond to the questions asked by the teacher. But it is seen many times that when teacher asks questions in order to check student's prior understanding s/he gets incorrect answers. The reason behind this may be due to several factors like previous conception related to a particular content (Trowbridge & Mintzes, 1988; Gallegos, L. et.al. 1994), lack of adequate learning, everyday experience, poor quality teaching (Esler & Esler, 2001; Arnaudin & Mintzes, 1986) and misconception, etc. A misconception or more specifically science misconception can be defined asa difference in a concept or idea that is built by students' own way of thinking with the ideas of teachers and scientists working in understanding

scientific concepts. In other words, it can be defined as learning a concept in such a way that does not correspondto currently hold scientific theory (Skelly, 1993). In terms of ensuring subsequent learning, correcting amisconception is usually more difficult than teaching freshknowledge. Before correcting a misconception it needs to be identified.Diagnostic tests and drawings are some important methods toidentify and correct misconceptions (Schmidt, 1997; Ayas, Karamustafaoğlu, Cerrah & Karamustafaoğlu, 2001). These Diagnostics tests can be paper-pencil test or open endedtests or multiple choice tests (Patil, et.al. 2019).

Factors causing misconception

Misconceptions become a barrier in learning scientific conceptions. Reviews indicated some factors which are responsible for misconceptions, predominantly the teachers' instruction, textbook,everyday experiences and language used (Lin & Chiu, 2007; Patil, et.al., 2019 and Widiyatmoko & Shimizu, 2018), students (Erman, 2017; Halim et al. 2019), characteristics of teaching materials, teaching methods (Halim et al. 2019), reference books (Erman, 2017) and social environment, causal effect and intuition (Lin & Chiu, 2007). Other barriers that contributes to the existence of misconceptions are- lack of adequate learning time management and quality of teaching and learning, lack of adequate learning time management occurs due to curriculum demands or planning targets of the teachers themselves (Aykutlu et al., 2015). As a result, students only focus on memorizing without understanding the facts and concepts. Some teachers even lack the insight into the misconceptions of their students and only focus on teaching without trying to apply the conceptual change approach (Gaigher, 2014; Moodley & Gaigher, 2019). The quality of teaching and learning which is dependent on pedagogic competence is also one of the major factors to cause misconception and as teachers are trained so it is desired from them to have professional skills especially pedagogic competence. Pedagogic competence is the ability of a teacher's understanding of the concept i.e. scientific concept, understanding of students, designing and implementing of learning, evaluating learning outcomes and developing students to actualize their various potentials (Wahyuni et.al. 2018).

Review of literature:

Yates and Marek (2014) found in their study that multiple factors contribute in varying degrees to the acquisition and retention of student misconceptions of biological evolution and among them teachers are at the very least, propagators of existing misconceptions. Thompson & Logue (2006) identified in their study that student's intuition and the way their teacher taught them the science concepts play a major role in the development of misconception in basic science concepts.

Sarıoğlan & Küçüközer (2014) studied on in-service teachers to know their misconception about phases of moon and the brightest star and found that very few in-service teachers gave correct response. This indicates that teachers may be the source of misconception which students may have in some cases. Kambouri (2011) revealed the importance of taking into account children's misconception while teaching science. She pointed

out in her research that identifying children's misconception can help teachers to plan their lessons accordingly and clarifying the concepts in a more better way and ultimately in enhancing the learning at children's end. Etobro and Banjoko (2017) found in their study that more than 75% of pre-service teachers have misconception about Genetics and their misconception is due to the textbooks, instructional methods in teaching genetics, lecturers' English language skills, pre-service teachers' cultural beliefs and practices, nature of laboratories and abstractness of genetics.

Rationale of the study: This study throws light on the importance of knowing the level of understanding of basic science concepts among the in-service teachers of Bilaspur district of Chhattisgarh state. As the reviews highlights misconception among teachers of science subjects are responsible for the faulty teaching- learning process so the researcher also wanted to know the level of misconception among the in-service teachers of Chhattisgarh state.

Research Question: Following research question arises from the review of literature-

What is the level of science misconception among in-service teachers regarding-basic Physics concepts, basic Biology concepts, and basic Chemistry concepts?

Statement of Problem: The problem is stated as - Science Misconception among in-service teachers of Chhattisgarh State.

Objectives of the study: The objectives of this study are-

1. To study the science misconception among in-service teachers regarding basic Physics concepts.
2. To study the science misconception among in-service teachers regarding basic Biology concepts.
3. To study the science misconception among in-service teachers regarding basic Chemistry concepts.

Methodology

Population, Sample and Sampling: All the in-service teachers of different private and Government schools in Bilaspur district of Chhattisgarh state were considered as the population for this study. Forty-three (43) in-service teachers were purposively selected as sample for this study.

Method: The researcher implemented survey method for leading this piece of work.

Instrument: Researcher used self-made online tool namely "Questionnaire for Science Misconception" to take the views of in-service teachers regarding some common science misconceptions. This tool contains total 28 items which are categorized into three dimensions. Dimension 1 comprising 8 items related to basic Physics concepts, Dimension 2 comprising 11 items related to basic Biology concepts and Dimension 3 comprising 9 items related to basic Chemistry concepts. This tool is a closed ended tool.

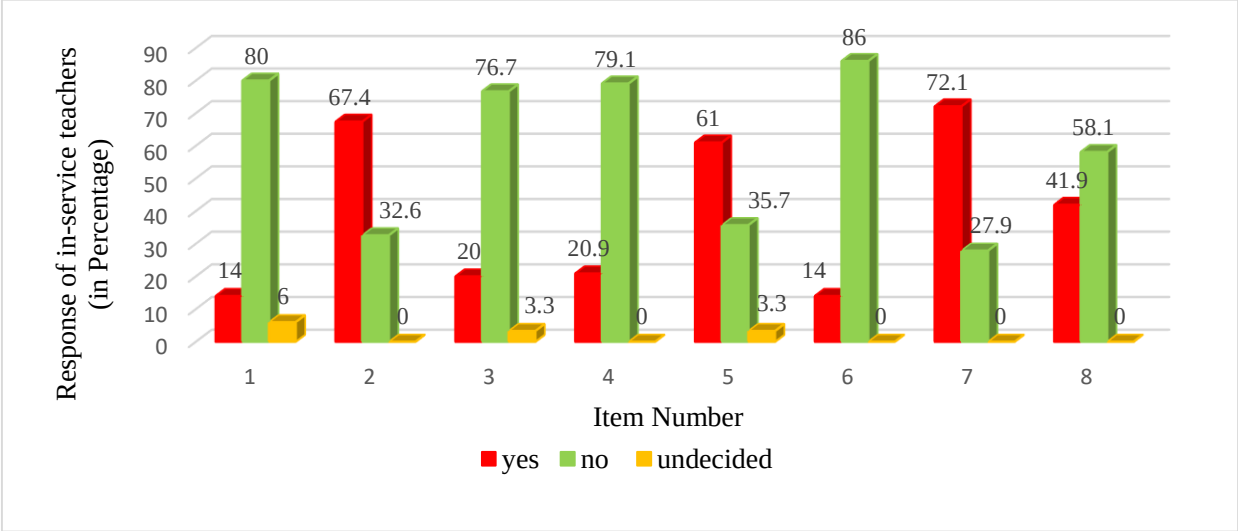
Statistical techniques used: For analyzing the data obtained from in-service teachers, percentage analysis was used by the researcher.

Result and Interpretation

Analysis of Objective 1- To study the science misconception among in-service teachers regarding basic Physics concepts.

Table No.1 Table showing science misconception among in-service teachers regarding basic Physics concepts.

Item No.	Item	Percentage of Response		
		Yes	No	Undecided
1	Two wires conducting current in the same direction pull each other.	14	80	6
2	Two wires conducting current in opposite direction attract each other.	67.4	32.6	0
3	A magnet attracts all metals.	20	76.7	3.3
4	Mass and weight are same?	20.9	79.1	0
5	Heat is measured by thermometer.	61	35.7	3.3
6	Measurement unit of mass is newton.	14	86	0
7	Is polestar the brightest star?	72.1	27.9	0
8	Sound travels faster in AIR	41.9	58.1	0



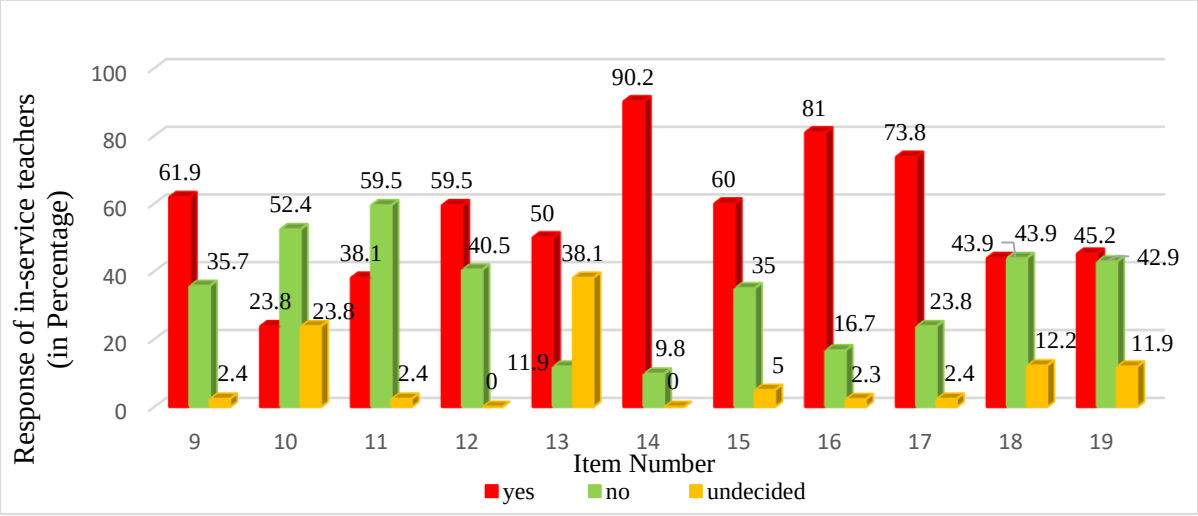
Graph 1- Response of teachers on Dimension 1 (Physics)

Based on the responses of in-service teachers, it can be identified that most of the teachers have misconception about some basic physics concepts (for 4 items) like foritem 2, 5, 7 and 8 about 67.4%, 61%, 72% and 42% of in-service teachers responded 'Yes' that indicates their misunderstanding of actual facts behind the items.However for rest of four items (item 1, 3, 4 and 6) only 14%, 20%, 20.9% and 14% respectively of in-service teachers showed misconception.

Analysis of Objective 2- To study the science misconception among in-service teachers regarding basic Biology concepts.

Table No. 2 Table showing science misconception among in-service teachers regarding basic Biology concepts

Item No.	Item	Percentage of Response		
		Yes	No	Undecided
9	Mushrooms are plants without seeds.	61.9	35.7	2.4
10	Pine is a plant without seed.	23.8	52.4	23.8
11	Corn is a dicotyledon plant.	38.1	59.5	2.4
12	All cells have nuclei.	59.5	40.5	0
13	If all members on both sides of a family is tall, the offspring are going to be tall.	50	11.9	38.1
14	All humans have DNA, as do animals, plants, and most bacteria and fungi.	90.2	9.8	0
15	Diploid (2n) cells are formed as a result of meiosis.	60	35	5
16	The primary purpose of photosynthesis for high structured plants is to produce oxygen and nutrients.	81	16.7	2.3
17	Plants cannot perform photosynthesis in the dark	73.8	23.8	2.4
18	Photosynthesis reactions occur faster under green light.	43.9	43.9	12.2
19	Cell numbers of large living species (elephant) is more than a small one (worm)	45.2	42.9	11.9



Graph 2- Response of teachers on Dimension 2 (Biology)

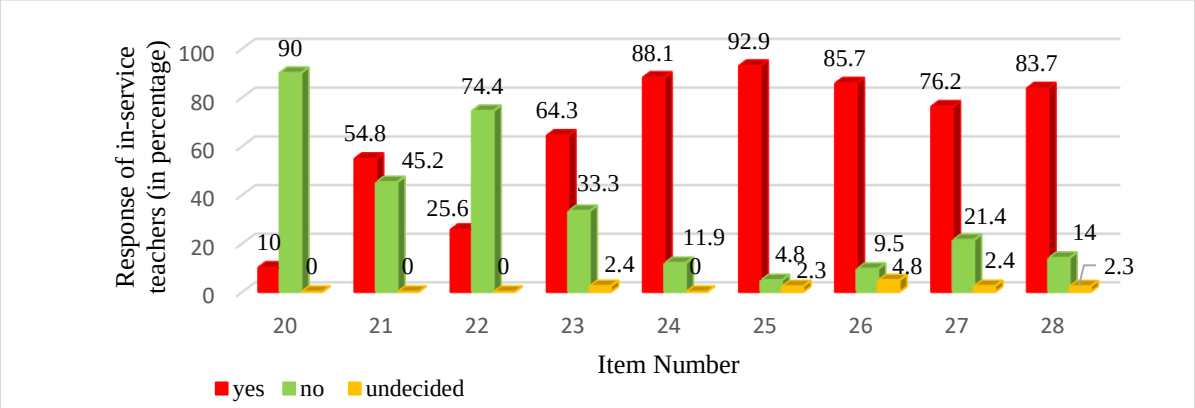
Based on the responses of in-service teachers, it can be recognized that students tend to experience more misconceptions on topics related to biology concepts. For only two items (item no. 10 i.e.Pine is a plant without seed and item no. 11 i.e. Corn is a dicotyledon plant) majority of teachers responded 'No' (i.e. 52.4% and 59.5%

of in-service teachers) which shows that they were aware about the facts behind the items but for rest of nine statements (9, 12, 13, 14, 15, 16, 17, 18 and 19) about 50% or more than 50% of in-service teachers responded 'Yes' which means they are either not clear about the facts or may have insufficient knowledge about the items. Similarly as compared to the dimension 1 i.e. physics related items, notable proportion of in- service teachers were undecided about the given items.

Analysis of Objective 3- To study the science misconception among in-service teachers regarding basic Chemistry concepts.

Table No.3 Table showing science misconception among in-service teachers regarding basic Chemistry concepts

Item No.	Item	Percentage of Response		
		Yes	No	Undecided
20	Melting and dissolution are the same.	10	90	0
21	Dissolution of sugar in water is a chemical change.	54.8	45.2	0
22	Rusting of iron is a physical change.	25.6	74.4	0
23	Rust is caused by the decay of the iron atom	64.3	33.3	2.4
24	Woolen materials do not allow to enter cool from them.	88.1	11.9	0
25	Heat is related with temperature of material rather than mass of material	92.9	4.8	2.3
26	Metal can absorb more heat and cool than other materials	85.7	9.5	4.8
27	Conduction is both for heat and Temperature	76.2	21.4	2.4
28	Temperature can be transferred from high temperature to low temperature.	83.7	14	2.3



Graph 3- Response of teachers on Dimension 3 (Chemistry)

By observing the responses of in-service teachers, it can be identified that students tend to experience misconceptions on topics related to chemistry concepts. For only two items (item no. 20 and 22) majority of teachers (i.e.90% and 74.4% respectively) responded 'No' which indicates that they were aware about the facts behind the items but for rest of sevenitems (21, 23, 24, 25, 26, 27 and28) about 55% or more than 55% of in-service teachers responded 'Yes' which means they have misconception on the given items related to chemistry topics.

Conclusion: From present study it can be concluded that the in-service teachers have poor understanding about the basic science concepts and this is very critical situation for the students taught by them. As the teachers are already working so it is necessary for them to be pedagogically competent. If they are having misconception then how they will teach the correct science concepts. So to escape from this problem it is essential to organize in-service training activities (Etobro and Banjoko, 2017) at the district level as well as at the state level. Adaptation of 5-E model has been proved to be helpful in removing misconception (Sarıoğlan, and Küçüközer, 2014) and enhancing the learning of students. So it is suggested by this study that the in-service teachers must adapt 5-E model in their daily lesson plans and improving their students understanding.

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