



LANGUAGE FOR CONSTRUCTION OF KNOWLEDGE IN SCIENCE CLASS ROOM: A GATEWAY OF LEARNING

Abstract

As we know language plays a vital role as a tool for our communication. And during the teaching – learning process, language generates comprehension. Basically, science is the subject of experiments. When students learn science they do process on theories, concepts and language etc. In teaching science it is necessary that the language used by students to interpret the content must be scientific. When students learn science in their class, their ideas emerge in their own language and teacher has to help them in improving their language for knowledge, i.e. learnt items and concepts. During the practical work and classroom teaching, language is required for the better communication. While in learning of science students interpret theories, phenomena, formulas etc. with the help of language. In teaching science the language must be scientific for construction of knowledge and theories. In school, when students learn science, initially their understanding emerges out in their own language and teacher has to help them in shaping their knowledge, i.e. learnt items and concepts. Generally, science subject considered as a difficult subject because it contains many technical terminologies. Such as in chemistry atoms, intermolecular distance, ions type of words, from which students are unfamiliar. So, instead of these words they used their own words. Because they are not aware that how these type of technical terms are important in learning science. Here, in this research paper researcher had taught a unit of 'Characteristics of Matter' at class IX, through constructivist approach using different types of learning activities. During the experiment, researcher found that how students are using their own local language to describe the scientific processes. The students' comprehension was communicated in their local language. Of course, the science subject is content based subject; it is a 'content-first' subject. But to teach the content effectively scientific and appropriate language, both are equally required. Especially in chemistry subject some topics can be described by using proper scientific language and using technical terms only. In this paper researcher mentioned the words which were used by the students and how researcher correct them for better explanation. This paper focuses on how scientific language played an important role in construction of knowledge.

Keywords: *Characteristics of Matter, Importance of language to construct the knowledge*

Introduction

Language is a tool to express the ideas and actions verbally. Human becomes men because of language. Language made the growth of civilizations. Dean writes, 'Language is a response to experience and rich experience is essential to language development.' But when we come to the teaching language becomes a tool to convert the thinking into the action. Here, researcher shows that the role of language is essential to improve the quality of teaching and learning both. Language is the fundamental tool for the development of thought (Bruner J) and, therefore, for any acquisition of knowledge by human beings for the cognitive process (N.Chomsky).

What is learning of science? For this question we can give answer, it's a process of construction and reconstruction of personal theories previously held. This process includes all the basic science skills like observation, analysis, sorting, ordering, graphing, and calculation etc. following these according to the constructivism, knowledge should be construct by the students by their own. And well-constructed knowledge can be explained using appropriate scientific language.

Theoretical Framework of the Study

One of the important features of science is the richness of the words and terms it uses. We hope to show in this research that learning and teaching in science classrooms is (and always has been) a bit more complex than the delivery model, mainly because students rather than post office sorting machines they are good receivers. The message of the past 20 years of research in science education has been that learners are much more than post boxes. Bullock Report was published, which advocated that all teachers should see themselves as teachers of language. We need to begin by examining the nature of the language experience in the dialogue between teacher and class. Students should be taught to express their own reading with better understanding in all the subjects.

For that given points should be consider: 1) Writing 2) Speaking 3) Listening 4) Reading

1. Writing skill should be improved. For that teachers can give them practice of writing. In this way they can improve their grammatical conventions with the correct spelling and punctuations.
2. Continuously with this, speaking is also a basic competency. For that students should be taught to use language precisely and cogently.
3. They should be good listener, and respond their ideas and views in constructive way.
4. One of the most important constituent is reading. Reading with understanding should be developed in students. So, that they can argue, summarize, synthesize and adapt their reading.

These include the construction of sentences, paragraphs and texts that are often used in a subject. Finally; there is a strong justification for a focus on language if formal science education is to be a major contributor to the public for understanding of science. This means, for instance, that they should be able to distinguish a cause from a claim, an assertion from an argument, a hypothesis from a conclusion and evidence from speculation.

One of the key themes is that science teachers are (among other things) language teachers. This requires a range of strategies and skills, some of which are at a high level. Learning science is, in many ways, like learning a new language. In some ways it presents more difficulty in that many of the hard, conceptual words of science such as energy, work and power have a precise meaning in science and sometimes an exact definition, but a very different meaning in everyday life. Science education thus involves dealing with familiar words, like energy, and giving them new meanings in new contexts.

Communicating Science: More than Just Words

Words are important but in science more than any other subject we rely on a combination and interaction of words, pictures, diagrams, images, animations, graphs, equations, tables and charts (Lemke 1998; Jones 2000). They all convey meaning in different ways. They all have their own importance and their own limitations. For example, the old saying that 'a picture is worth a thousand words' is probably true, but it does not go far enough. In summary, communicating in science teaching presents both a challenge and an opportunity.

Research Questions

1. How does language play an important role in learning science?
2. How do the students comprehend the received knowledge in daily local language?
3. How do students' knowledge could be effective using language of science?

Objectives of the Research

- To teach the students of class IX through Constructivist approach the topic 'Characteristics Of Matter'
- To receive the students' answers responded as a part of constructivist activities in their home language.
- To interpret students' responses given in their home language.
- To facilitate students' for giving shape to their understanding in scientific language for topic "Characteristics Of Matter"

The Experiment

This research was focused on teaching chemistry in standard IX of science and technology book of GSEB. It is a part of teaching through constructivist approach. The mode of communication was Gujarati language. Therefore, how the language plays an important role in teaching science, the researcher had observed learners' responses. The role of researcher was as facilitator in the class. Using different types of activities based on 5E model experiment were carried out. During the experiment the researcher observed that students did not use scientific terminologies nor they were able to give scientific terminology. Whenever discussion and inquiry method was used by the researcher. During the classroom teaching students found active, but they were not aware of scientific terminology. Here, some examples are given how students had responded in their home language. Researcher did experiment in Gujarati medium school; hence here the data is given in Gujarati language.

Data Collection

In this experiment the population was the students of class IX Gujarati medium grant in aid schools in Gujarat. The sample was 50 girls of Kasturba Kanya Vidyalaya, Anand. The researcher is doing research on effectiveness of Constructivist Approach in teaching of chemistry. In the very beginning the topic Characteristics of Matter was taught through 5E model activities. Following the activities some of the questions were discussed and students responded them in their home language. They are shown in the following table in a form of expected answers and the students' answers in home language. The interpretation of data is discussed below the table.

Table: 1

Students' Responses in their Home Language for the Topic Characteristics of Matter

No.	Questions	Expected Answers	Classroom Answers
1	The living and non-living objects around you having volume and mass, what they will be called in scientific language?	They are known as 'matter' .	They are known as 'things and substance' .
2	Which type of particle arrangement is there in matter?	The particles in a substance are arranged at definite distance.	The particles in a substance are very close to each other.
3	Characteristics of solid substance.	Solids are hard and can be easily brittle.	Solids are tough and They break down easily.
4	Smallest unit of matter	Smallest unit of matter is known as an Atom.	Smallest unit of matter is known as particle.
5	N ₂ , O ₂ and H ₂ Which type of molecules they are?	They are made up of a like elements.	They all are made of same elements.

Analysis and Interpretation of Data

The above table shows the qualitative data derived from students' answers. The key words show the comprehension of learners and the expected word show the real scientific language. Here, researcher has given the analysis and interpretation of qualitative data.

1. When the students were asked about the living and non-living objects around them having volume and mass, they responded that they are known as things and substance. Here the word thing and substance is their home language where they were unaware of the word Matter.

2. While discussing about the arrangements of particles in a substance they immediately responded is very close to each other. This again is the response in their home language. The expected answer was that particles in a substance are arranged at definite distance.

3. In the activity of characteristics of solid substance they derived that the solids are hard and they break down. Their interpretation was found with enough of their understanding and experience in day-to-day life, but they were missing the scientific terms.

4. For the smallest unit of matter they gave the word Particle whereas the actual answer is Atom. They didn't know the perfect word atom i.e. scientific term for the smallest unit, but their comprehension was perfect. Which was a sign that the level of learning and understanding was observed high in the classroom?

5. When they were asked about which type of molecules are the N_2 , O_2 and H_2 ? They said they are all made of same elements. The expected answer was they are made up of alike elements.

Thus it could be analysed and interpreted that students comprehension is reflected through their home language which they speak in their daily life. The science they learn emerges through their experiences. The teacher has to introduce the at most new words or Scientific terminology for their home language, which they find easier to receive parallel to their home words or language.

Findings of the Experiment

From the above qualitative experiment some broad findings are derived and discussed as below.

1. Students had enough understanding about Characteristics of Matter. Their comprehension about the topic was up to the mark, which was observed from their responses in home language.
2. Students' learning and comprehension could be observed, understood and measured through the words they speak and through their spoken home/local language.
3. It becomes easier to connect their home language to scientific terminology, which further does not create any missing gap in their comprehension.
4. Teachers should consider the importance of talking, discussion and argument in science classes and practical ways of developing their students.
5. Teachers and facilitators could discuss students' writing in science and how this relates to learning science.
6. Students could look at existing practical teaching ideas, resources and strategies for lowering some of the barriers, e.g. word banks and glossaries, publishers' resources, classroom tactics etc.
7. Teachers and students may discuss how these ideas can contribute to literacy development in general and more specifically to the public understanding of science and scientific literacy.
8. Teachers should present ideas for further reading and teachers' own classroom based research which can be followed up by other teachers and students.

Conclusion

The researchers' experience about this research was thoughtful and reflective at personal level. It definitely has opened up a new gateway for her to understand learners' language and never to underestimate them anyhow Language is a major tool to the most students in learning science. There are many practical strategies which can help to overcome the barriers while learning science in poor or local language. Each science teacher should first be a language teacher and must try to make science interesting with images, diagrams, tables, charts, models and graphs; movement and animation of physical models, using multimedia, gesture or other body language; practical work, with its feel, touch, smell and, of course, sounds; mathematical symbols, either as shorthand or in the form of equations to convey a connection in any of learners' language. Connecting learners' language to scientific language would open up new vista in learning science for future generation.

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