



**ORIGINAL RESEARCH PAPER**

**Mathematics**

**TO STUDY THE AMBIGUITY OF MATHEMATICAL LANGUAGE IN STUDENTS' UNDERSTANDING OF MATHEMATICAL CONCEPTS.**

**KEY WORDS:** Mathematical Language, Role of language, Teaching and Learning of Mathematics

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**ABSTRACT**

Language has always been a vital part to understand and learn new concepts of any field. Every discipline has its own specific language. Scholars, especially mathematics students, get so fascinated by the beauty of language & the symbols used in the mathematics teaching-learning process. In the present study, researchers tried to find relations and facts related to mathematical language. Since there is always a scope to acquire new knowledge in all disciplines, hence they would like to know the reasons for finding the mathematical language as difficult to understand by students and the reason for having confusion between some words used in the English language & mathematical language. In the present research, some students of elementary grades were interviewed by researchers by providing them with some random words and then using those words in sentences to get an insight into students' understanding of the mathematical language & to know the times students ever faced any difficulty or any confusion regarding the same.

**INTRODUCTION:**

Mathematical language is not millennial research but was used before the rinderpest, and since then there has been a lot of research about the language as well as the concepts related to it.

When a child starts speaking, he/she tries to converse in their mother tongue, & has little knowledge about numbers but after getting admission to school, learning a second language becomes the paramount goal, that is, English and Mathematics also become a part of the child's curriculum, henceforth, he/she starts learning new concepts. [Title I Dissemination Project, (2004)].

Moreover, the child learns the mother tongue when he starts to speak but the language used in the mathematical context is introduced formally to him/her in the school with some specific terms that overlap with his/her own language or the second language that he/she learnt in the school, which sometimes become a serious issue because children are not ready to welcome the same word which has different meanings, & they end up getting muddled. [Sweet, L. (2020)].

There may be circumstances when the subjects Mathematics and English may have the same vocabulary but different meanings at the same time. [Helmenstine, A. M. (2019)] For instance, the word 'multiple' has different meanings in mathematics and in English. In English, it means 'involving many people or things' whereas in mathematics it means, a number that can be divided by another number, a certain number of times without a remainder.

If you ask a child to define multiple, he/she may tell the everyday English meaning or may give an example of a number and there is a possibility that the child might get confused because he/she doesn't know the context in which you are asking the meaning. The researcher stated a single example above but after reading it, one may get an idea that the meaning of some words in English (or in any mother tongue) somehow overlaps the mathematical language meaning. So, a few mathematical terms that are ambiguous in meaning can create difficulties for students. [Barwell, R. (2005)]

The objective of the present study entitled "To study the Ambiguity of Mathematical Language in students' learning/ understanding of concepts" is to explore and analyze the extent to which the language of Mathematics is ambiguous.

**Operational Definitions:**

Ambiguity: related to a word or an expression that can be understood in two or more possible ways.

Mathematical Language: language used in mathematics subject area

**Delimitations of the Study:**

The present study is delimited to

- The school of South Delhi, India.
- Students of Seventh and Eighth grades of the selected school.

**Research Design:**

The study follows an exploratory and descriptive research design as it is based on gathering & analyzing the data collected, and it will also help others to better understand the need for research.

**Methodology:**

The purpose of the study was to explore the ambiguity of mathematical language. In order to meet the mentioned objectives & to make the study qualitative in nature, the following tools were used-

1. Group Discussion
2. Observation
3. Desk Study

Nine terms with lexical ambiguity, e.g., face, difference, left, sign, area, square, table, base and leaves (Howang, J. 2021) were selected. Most of the words except 'leaves' were taken after searching about 'words with mathematical ambiguities'. And the sentences using the same words were made by the researcher & some were modified after searching from various studies.

The interview took place in two parts, (i) the researcher asked the meanings of the words and (ii) using the same words in sentences, asked the meaning of the same word in a contextual sense.

Students were encouraged to be vocal about their thoughts. When asked about the meanings, researchers used to write that word & pronounce it as well so that students don't get confused between words.

**Findings:**

The majority of students were sharing more than one meaning of a word, one from the mathematics subject area and another from the English language. When they were not able to give the exact meanings, they used to support their statements with examples.

**Teacher:** F A C E! (*spells the word & also writes it*) What does it mean?

**Student 1:** Ma'am iska do matlab hota hai. (It has two meanings)

**Teacher:** Okay! Kya-kya matlab hota hai? (What all meanings does it have?)

**Student 1:** Ma'am ek to chehra hota hai. (One is face of a person)

**Teacher:** Okay! (*nods head*)

**Student 1:** Or dusra saamna karna. (And second is facing someone)

**Teacher:** Accha! Iske alawa koi or matlab pta hai? (Does anybody know any other meaning of the word?)

**Student 2:** Ma'am flat surface hota hai, solid object ka. (the surface of the solid object)

**Teacher:** Theek hai!

**Teacher:** (*to student 3*) You were also saying something.

**Student 3:** Ma'am cube ke vo six faces hota hai na, to uska hi face bol rha hu me. (Cube has six faces, so I am talking about that face only)

**Teacher:** Okay!

After analyzing the data collected, the researchers realized that there were many instances when the children misunderstood the meanings of words in the sentences.

(I). Less than 30% of students didn't know the meaning of the word so they try to make sense of the sentence so that they can answer the question.

(ii). For more than 95% of students, English is their second language, i.e., they are English Language Learners (ELLs) so there are higher chances that they don't have a vast vocabulary.

(iii). 40% of children may sometimes use their native language to understand English words, which means they have some invisible relationship in their mind between these two languages and understanding the same word in the context of the third subject area causes difficulties in learning mathematical terms with the 'lexical ambiguity'.

(iv). More than 80% of the students were telling the mathematical meaning of the sentences only when asked if this word holds any meaning in the mathematical language context.

(v). Less than 5% of the students were telling the Hindi meaning of the sentence.

On asking to give only one meaning of the word, the students used to come up with the generic/everyday meanings first. When asked about the reason behind giving such meanings, one of the students responded that "because it's our daily language by default and if somebody gives the condition to us to answer by relating it to the mathematical context or we are in mathematics class, only then we are going to tell the mathematical meaning." The meaning of mathematics vanishes in translation, as teachers are always interested in checking the steps & procedures, & in this process, the vocabulary & terminology is ignored. [Kenney, RH & Montan, N (n.d)]

#### CONCLUSION:

Language is an important tool for communication, it is also foremost in learning mathematical concepts so it becomes

unavoidable not to learn terms while learning the mathematical language. So if a child wants to master mathematical skills, he/she somehow has to cope with trying to understand language as well. (IGNOU, AMT Series)

When any confusion arises in learning a mathematical concept, it's not because the child is incapable of learning, the reason is the confusion created by the language used while explaining the concept. (IGNOU, AMT Series)

But most of the students and teachers don't even realize the significance of the importance of the roles of languages in the discipline. The researcher believes that it's important for a teacher to help children to learn the relationship between mathematical language meaning & daily language meanings. A single reading or hearing is not going to guarantee that the child will attribute the same meaning that the question or statement is trying to tell, there can be higher chances that the child may understand the meaning of the word in the daily language sense because he/she uses that language frequently to communicate & has more exposure in that language, it all narrows down to the context in which the meaning of the word is being asked. So it's important for the teacher & student to be on the same page, the teacher can also try to ask them the meanings of the terms given in the questions.

In comparison to daily language & mathematical language, it was found that most of the children were telling the daily language meanings. For them, giving daily language meaning was a more feasible option than thinking about the same word in the mathematical context & then giving out the meanings. This implies that the students might not be able to understand the mathematical purpose of the sentences. Teachers can explicitly teach mathematical meanings by highlighting and emphasizing words that have a distinct mathematical meaning. Scaffolding can be used to help students develop meanings for words in a contextual sense and the teacher needs to be more precise when it comes to using words in explanations and forming questions.

English itself is a language full of ambiguities, and when the same language is used in teaching-learning of another subject, say Mathematics, then the ambiguities also increase. (Howang, J. 2021)

This can be concluded that ambiguities can never be eliminated completely but certain steps can be taken by the teacher to make sure that the child understands the meanings of the word in the correct sense of that specific discipline. The teacher can show children by using the same word but in different subject areas, because mathematics is not devoid of language, language can't be eliminated from Mathematics. The teacher should have clarity of 'where' to use that word & should try to write & pronounce words at the same time so that children don't confuse that word with another word. More attention should be given to the usage of words and vocabulary.

Other than this, word charts can be made where children can write all their thoughts and then the word can be understood in a contextual sense, suggested by Barwell, R (2008). Moreover, the teachers can also make use of tools like Word Walls, Vocabulary Notebook, Graphic Organizer & Mathographs, suggested by Mathcentre (2009).

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