

Development of Language in Mathematics

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If we ask our colleagues or friends whether there is any connection between learning mathematics and language, perhaps their answer would be 'no, there is no connection'. This is because the relationship is not evident. Based on my experiences and certain articles that I have read, I would like to share a few things about how language has and can contribute in mathematics. They are as follows:

Usage of common language – While teaching mathematics (concepts, formulas, operations, theorems etc.), if the teacher uses common language then the children grasp it fast. For example: while teaching the concept of number four to a child, we associate it with groups of four concrete things so that they can understand the abstract concept. It is important to use child's first language, or the language that she understands best, while teaching mathematics. Most of the time we do not use a common language while teaching mathematics. That is why children find mathematics difficult.

The language of understanding and solving problems – An important objective of learning mathematics is to make the day-to-day work easier. The children try to achieve it through statement sums (or word problems) in their class.

Language of Mathematics – Mathematics itself is a language in which there are rules of various signs, symbols, its own words and grammar. These are based on some previous relevant preconceptions and are created based on the rules of logic which it is necessary to understand and use for the development of mathematical thinking. This ability depends on the creation of common language. For example, only after obtaining the ability to use conjunctions such as 'and', 'but', 'therefore' and 'or', the children will be able to understand sentences of mathematical reasoning such as: 'Every square is a rectangle, but every rectangle is not a square.' There is another aspect of interaction between two languages where some common words are used in both the languages. For example in mathematics some words of common language -such as operations- are also used but with a specific mathematical meaning.

Role of language in teaching of mathematics –

When we help a child in the classroom to get the concept of a number, say, the number four then we make a group of various things such as four pencils, four books, four children or four trees to make them understand the concept of four. In the same way, we use concrete objects to prepare the child for each abstract concept and the word related with it and then explain the same in common language.

We use child's first language or the language that she can understand to explain concepts of mathematics. Apart from this, the common language should be used at a level which the child can understand.

If we do not take care of these aspects from the beginning, then the forthcoming concepts and procedures will never be clear in child's mind. They will never be comfortable with the language of mathematics. They will be looking for signs and clues at every juncture, so that they may at least remember the definition or the formula. And the moment they face an unknown question, they will start making various kinds of mistakes.

Statement Sums or Word Problems – When the children are introduced to statement sums, we need to tell them about mathematical concepts and processes with the help of right kind of statement sums which provide them with the contexts that encourage them. While asking the children to do the statement sums, we should see that the sums are framed using simple words and are related to their daily life.

While solving statement sums it is necessary to understand what is being said in the question. After that it has to be changed from the real life context to the appropriate mathematical form, then it has to be written in the form of mathematical operations and in the end the answer is to be re-written in the same context of real life from where it started.

So, there can be the following steps to solve a statement sum –

1. Understanding the question in real life context.
2. Changing it to mathematical terms.



3. Constructing questions with the help of operations.
4. Solving mathematical questions.
5. Checking the answer by relating it to real life.

Most children do not come face to face with the statement sums. Many teachers and text books either go straight to abstract number problems or use words without pictures to teach concepts. They introduce statement sums only at the end of the year. Because of this the children face lot of difficulties- they are hesitant, lacking in confidence and so guess at the answers. Some start adding numbers or peering into the notebooks of their classmates to see whether they have done the sums in the same way or not.

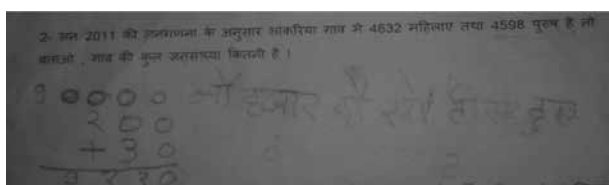
The situation becomes more complex when we start teaching the children varied and effective ways in order to help them know which operation has to be done. We teach them shortcuts and algorithms and though these methods aid them in finding expected answers of familiar sums, they cannot understand what is happening and why. The result is if the language of the same question is altered slightly then the child's difficulty increases.

As mentioned earlier, when children try to do statements sums, they face problems at many levels. The main hurdle is that they cannot express any real-life situation in mathematical form and cannot understand the meaning of any mathematical term in real life. Hence it is necessary that children are able to connect common language with mathematical symbols and operations. Assistance is required to establish this relation. We should explain the questions to the children by linking them with concrete objects and using appropriate gestures so that they can understand them properly.

Example :- I asked the following question :

According to the census of 2011, there are 4632 women and 4598 men in Sankaria village. What is the total population of the village?

Solution -



When the child was asked about how he solved this question, he said that first he tried to understand

what was being asked, compared it to his village in terms of whether it can be done in his village as well. After that he used the mathematical process to solve the question though he wrote 90,000 instead of 9000, but he got the correct solution since he had understood that question.

Learning the language of mathematics – What is the language of mathematics? Like any other language, it is also made up of those concepts, words, symbols, algorithms and grammar that are specifically meant for it. The children can understand this language only when they use it. This means that they should listen to mathematical language, speak it and write it. Talking to children about mathematics, encouraging them to talk about whatever they are doing and discussing mathematics with them will give a shape to their understanding and their mathematical language and thinking will become better, even if their expression is consistent or logical. In order to say these things in a proper way, they should start paying attention to them. In doing so, they will get the opportunity to develop the ability to put together various mathematical processes involved in solving a sum, organise them and express them in words. It has a far-reaching effect in developing their understanding of and fondness for mathematics.

Sometimes children deal with the calculation processes correctly, though they may not be aware of the mathematics involved in it. For example, when we ask the children about five digit numbers, they may not be able to tell correctly even if they can do the operations correctly.

The reason for not understanding the basis of algorithm is often that children do not quite understand why we write numbers only in a certain way. Because of this they make different kind of mistakes. They must have complete understanding of concepts to overcome these mistakes.

So, in short, we should take note of the following points -

1. The use of language can impact the learning of mathematical concepts. It is only with the help of language these concepts can be firmly established their minds.
2. Children have to use mathematical language as well as the language that they speak every day while doing sums, reading books of mathematics or explaining what they have understood.
3. What is the children's attitude towards statement sums and what is the reason for that?

4. How can we help children understand and solve statement sums?
5. Applying an algorithm does not mean that it has been learnt.
6. It may be dangerous to get hold of some useful shortcuts or tricks in a specific context or time period. Because of them, children sometimes make wrong generalisation and get wrong ideas.
7. Children should be introduced to mathematical language gradually, in the right place and with enough practice in such a way that they understand and know it more deeply.

Some suggestions –

1. The same mathematical statement can denote many different situations.
 - The same situation can be presented as different statement sums.
 - Statement sums are not presented in algorithmic manner. So it takes time to understand them.

You may come across many other reasons during your contact with children.
2. We can create questions where we distribute four pebbles between children or do any other activity related to mathematics.
3. $3+5=8$ can be expressed in at least ten different ways as follows:
 - Three and five are eight.
 - Three and five together make eight.
 - The sum of three and five is eight
 - If three is added to five the answer is eight.
 - The aggregate of three and five is eight.
 - Eight is five more than three.

- Three is five less than eight.
 - If we add five to three, we get eight.
 - Three plus five is equal to eight.
 - Three plus five is eight.
4. These examples clearly show that some children, and many adults, who solve the questions quickly and correctly, may not be knowing the mathematics involved. Implementing the method does not mean that we understand the operations meant for these methods. As a teacher we should be aware of this.
 5. How do we present mathematical symbols and statements? While giving a thought to this, we should keep in mind that the children need to understand the meaning of these symbols and their mutual relation.
 6. We should think about ways and means of giving opportunities to children so that they may gain an understanding of symbolic language of mathematics and give a thought to the experiences that will help children understand mathematical equations and expressions, including brackets.



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