Verbal Communication in a Mathematics Classroom

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Though we all know that proper use of mathematical language is an important aspect in teaching mathematics, this did not assume priority for me until face to face classroom interaction became impossible during the pandemic. Because of the lockdown, our school (Azim Premji School, Dhamtari, Chhattisgarh) reached out to students using different modes such as sharing hard copies of reading materials, telephonic conference calls with groups of students and even video conferences. However, since the majority of our students do not have facilities such as smart phones and internet connectivity, we engaged with them mainly through the first two methods. Using these, I continued mathematics classes with students of classes 6, 7 and 8.

It was then that I realised two things. The first was my reliance on old-fashioned 'chalk and talk' -written mathematical language accompanied by logical explanations. The second was my lack of attention to using proper verbal language in my classroom teaching. Both these hampered my 'distance-mode' lessons. I will write about my experience and my learning from it in this article.

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We all know that visualization is an important aspect of teaching mathematics. Here the word visualization means both seeing the object and imagining the object. To visualize the concept, both verbal and written languages play important roles. During my telephonic conference calls, I faced problems in the step-by-step explanation of a procedure as described below.

Step by Step Explanation of a Procedure: We know that explaining a procedure requires a step-by-step process with the use of logic at each step. But, considering the limitation in the mode of interaction, we used examples from the textbook and asked students to open the specific examples or exercises in the textbook. However, what the students saw in the textbook was the final compilation of the procedure. Because they could not see the procedure being carried out as I would have done on the blackboard, it became extremely difficult to explain each step to them.

For example, if we wish to explain the division of one algebraic expression by another, we need to focus on different parts of the expressions in each step, do some procedures and then move to the next step. If the student only sees the image in Figure 1, it is too difficult for them to connect with the step-by-step process.

If the series of steps with appropriate highlighting of the relevant part of the expressions is shown, then students would definitely understand the procedure better.

$$
\begin{array}{r}
2q^2 - 3q + 2 \\
4q + 2 \;\overline{)\; 8q^3 - 8q^2 + 2q - 1} \\
\pm 8q^3 \pm 4q^2 \\
\hline
-12q^2 + 2q - 1 \\
\mp 12q^2 \mp 6q \\
\hline
+8q - 1 \\
\pm 8q \pm 4 \\
\hline
-5
\end{array}
$$

Figure 1

Use of Verbal Language in Mathematics: A second difficulty that I faced was in communication when the only explanation that reached the student was the verbal language I used. I am also not clear whether there is any standard verbal language for communicating mathematical concepts because most of the textbooks have never mentioned the proper use of verbal language. The language I used was the language that my own mathematics teacher had used as it had been sufficient for me to grasp whatever he taught.

During one of the online classes, one of the students asked me to explain a question. He read the question as "two x plus 3 divided by 5 is equal to 3". Since the question was from the textbook, I searched in the book but could not find the expected question $2x + \frac{3}{5} = 3$. Then I asked him to share the question number. When I got it and searched by page and question number, I realised that the question was $\frac{2x + 3}{5} = 3$. It was clear that the student had used "divided by" instead of "whole divided by". Probably, I too would have read out $\frac{2x + 3}{5}$ as "two x plus 3 divided by 5" which is not correct. But in the physical classroom, there would be no confusion because I would have written it out and would also have been able to physically check what the student had taken down. I realised that this was not sufficient; I would always need to communicate in complete mathematical sentences and ensure that my students did too.

Think of reading $2x + \frac{3x - 4}{5} = 3$. It is not an easy task, but it should be necessary to read it with complete understanding (and no visual cues) on the part of the listener.

I am highlighting some more examples of similar challenges experienced in verbal communication -

- $x^m \times x^n = x^{m+n}$: Generally, we read it as "x to the power m times x to the power n which is equal to x to the power m plus n". A student could perceive this as $x^m \times x^n = x^m + n$.
- Communicating the presence of parentheses in a mathematics expression verbally: In most of our verbal communication, we generally fail to mention the parentheses or rather assume it is understood based on our board work. For example: we write $3x\,(2x + 5)$, but we generally say this out loud as $3x$ multiplied by $2x + 5$. Just imagine communicating $5a + \{3b - (2a - 4b)\}$ verbally! It definitely needs thoughtful practice.

- Inadequate use of parenthesis while writing: We read -3 – (-2), as “negative 3 minus negative 2”. We must have observed that students write it as “-3 – -2” and we may have allowed that.

From the above examples, it is clear that we are careless about verbal communication in mathematics. Whether it is because we lack practice or awareness of the correct verbal language, this is a skill that teachers must practise and teach!

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