Worksheets for Measuring and Building Maths Competencies

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Puducherry is a small town with a 25km radius in all four directions. There are five educational blocks in the district with a total of 269 schools, including primary, higher primary, high schools and higher secondary schools. There are 1038 teachers who work in the primary grades (I - V) in 151 primary schools and 55 upper primary schools. Azim Premji Foundation's work, primarily, lies with these teachers in achieving foundational literacy and numeracy.

Worksheets have become an integral part in teaching-learning process. Many teachers use it regularly as it is an invaluable tool in the students' learning process. Neurological research highlights that retrieval practice is significant in consolidating new learnings so that information gets stored in long-term memory. In maths, after understanding each concept through a hands-on activity, it is crucial to make students practice and worksheets are the simplest way to do that. In Puducherry, we tried to use worksheets in one of the NGO schools to measure and build basic competencies in maths. The process we followed was:

1. Assessment: Using a simple worksheet designed with basic outcomes to measure the learning levels of children
2. Activities: Using contextual activities with appropriate concrete materials to teach concepts
3. Practice: Using worksheets relevant to the activities to further strengthen learning

Measurement of competencies

Here is a look at some worksheets used in classrooms and the competencies measured.

We used worksheets to assess the level of the learners as shown in Table 1. For example, one

Worksheet	Competencies	Observation
Counting and matching numbers *(Refer to Figure 1)*	Is able to count objects up to 10	Student counted and wrote the number and matched it with another box with the same number.
Counting and writing numbers *(Refer to Figure 2)*	Is able to associate quantity with number	Student wrote the symbol and number name as well. We were able to measure that the student knows how to write the name in words and can associate it with quantity.
Comparing - Which is more? *(Refer to Figure 3)*	Is able to compare objects based on quantity	Student counted correctly but wrote thirteen as 31 and nineteen as 91. The student lacks clarity in understanding the place value system.

Table 1. How worksheets are used to assess learning levels.

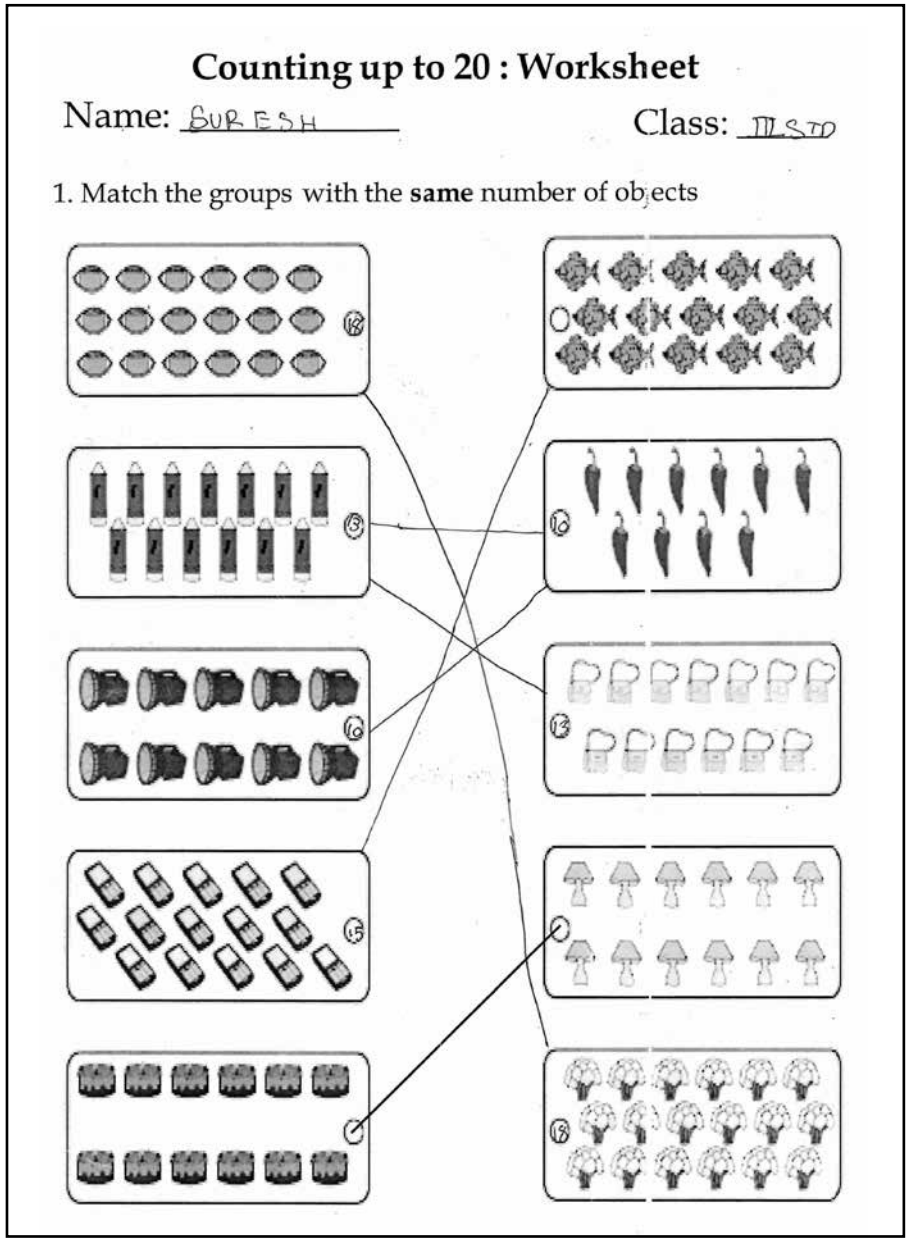


Figure 1. Counting and matching numbers

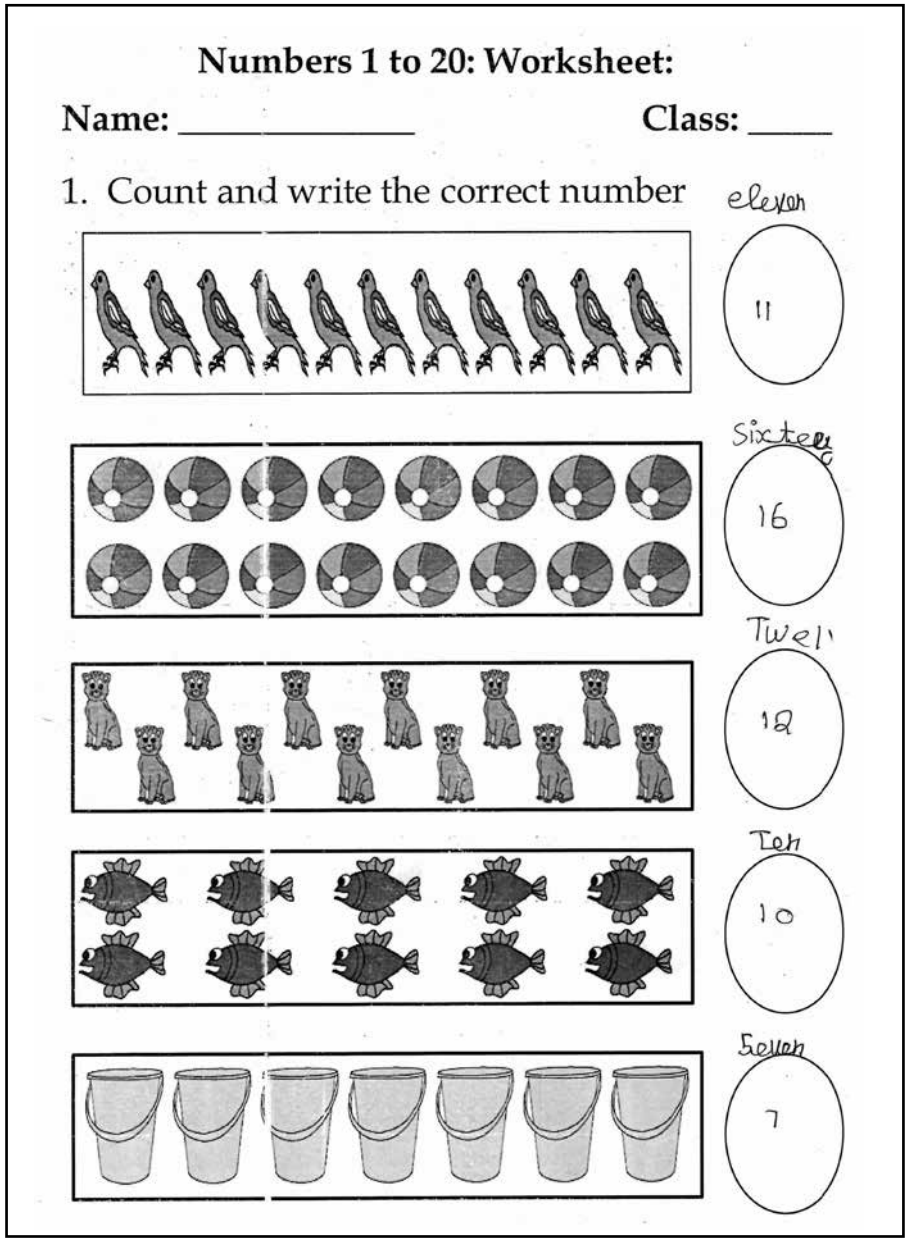


Figure 2. Counting and writing numbers

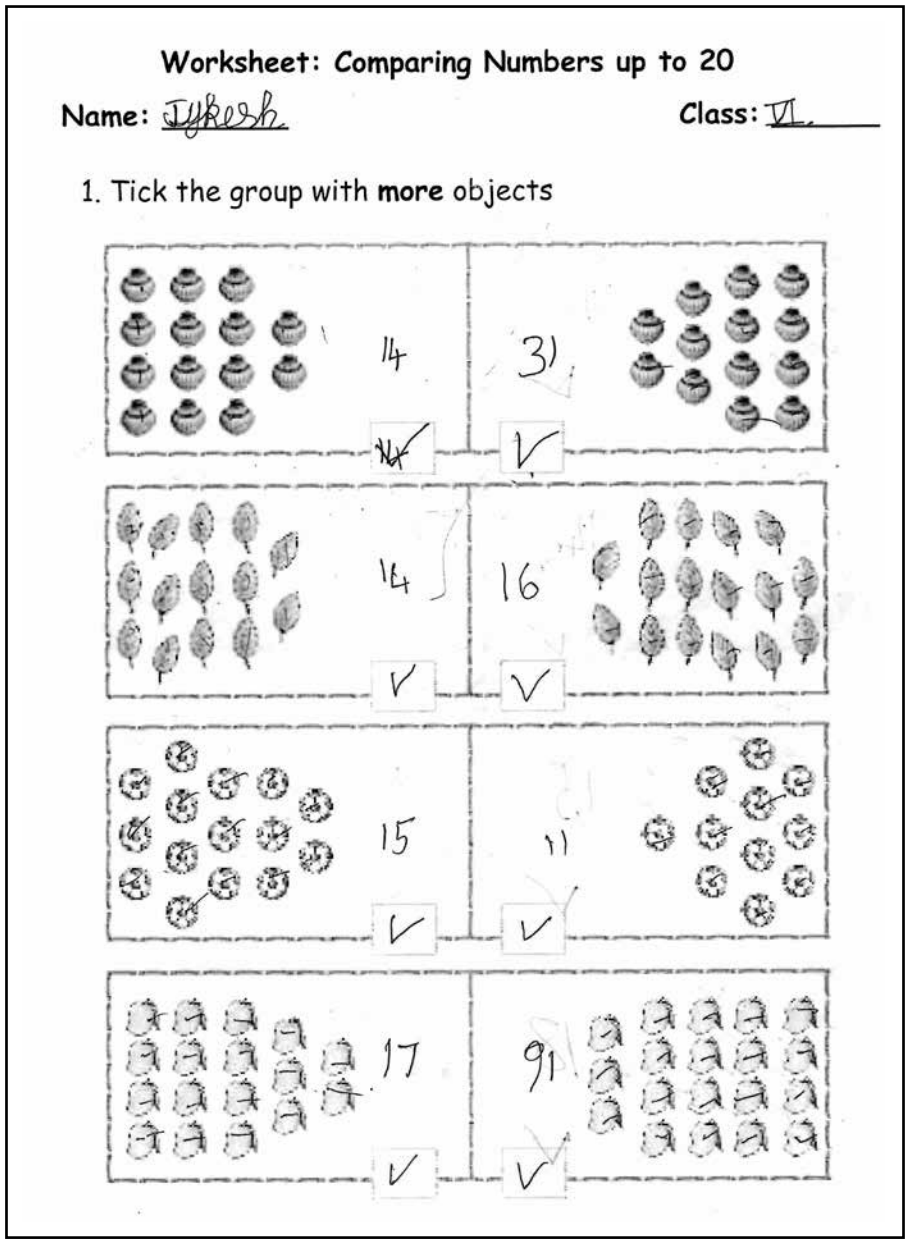


Figure 3. Comparing – which is more?

student was able to count objects but was unable to write numbers using the place value rule. So, we used tamarind seeds and ice-cream sticks to teach counting in tens. This was followed by worksheets (Figure 4). The first one is to count and match with the appropriate name and the second one is related to the place-value rule.

Students were able to do the first one but struggled with the second one. Instead of writing one in the tens place, many wrote ten. We realised that going straightaway to mathematical language, that is, tens-ones, may have confused them. Therefore, we used packets and seeds, bundles and sticks, instead.

To further strengthen their understanding, a story of two mango sellers, Suresh and Ramesh was narrated. Suresh counts mangoes one by one to give to his customers whereas Ramesh packs the mangoes in tens and gives them to his customer. When asked who sells more mangoes and why, students reasoned that Ramesh would sell more because of his counting ability. By the time Suresh counts ten and gives to one customer, Ramesh may have dealt with two or three customers. This is because he has packed and kept the mangoes in tens, which makes it easy for him to count quickly. This was followed by the worksheet shown below.

The real-life example helped students to understand better and we could find minimal errors in the worksheets. Then we used number beads

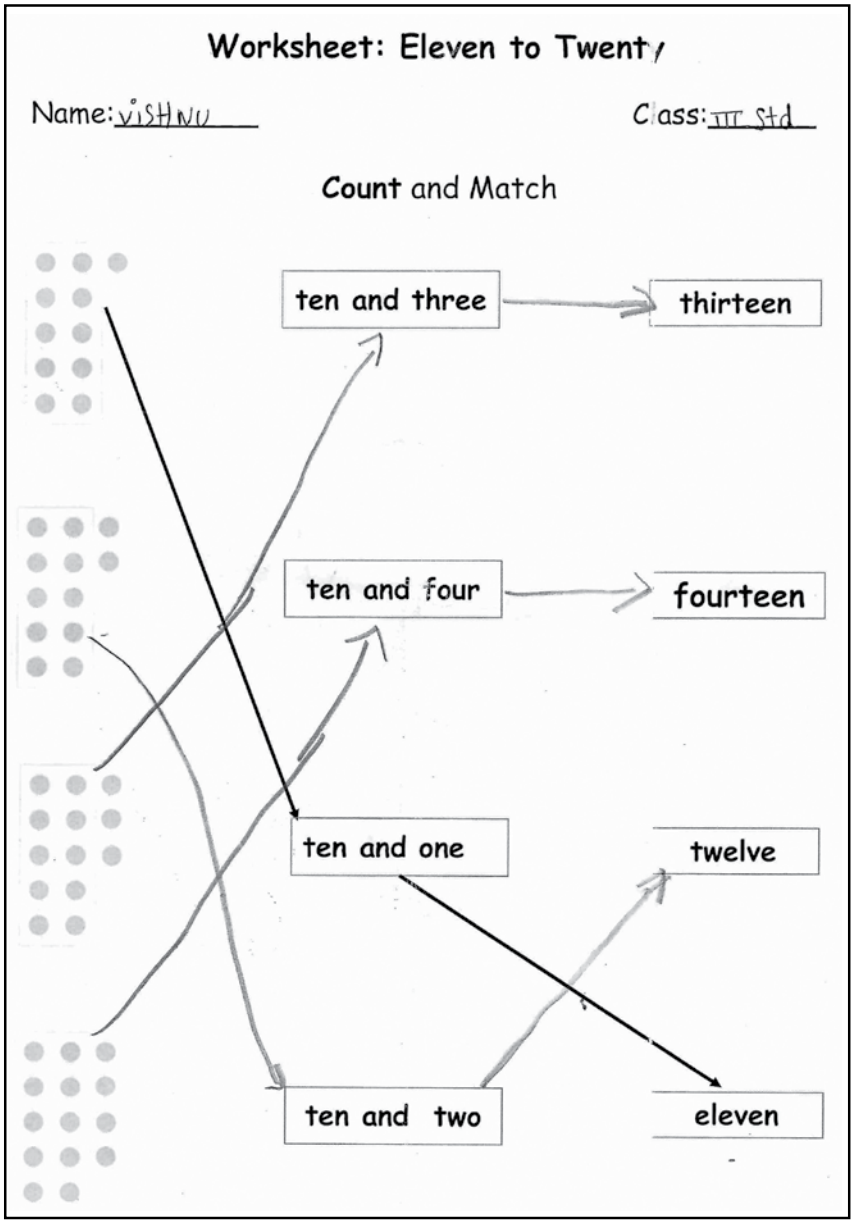
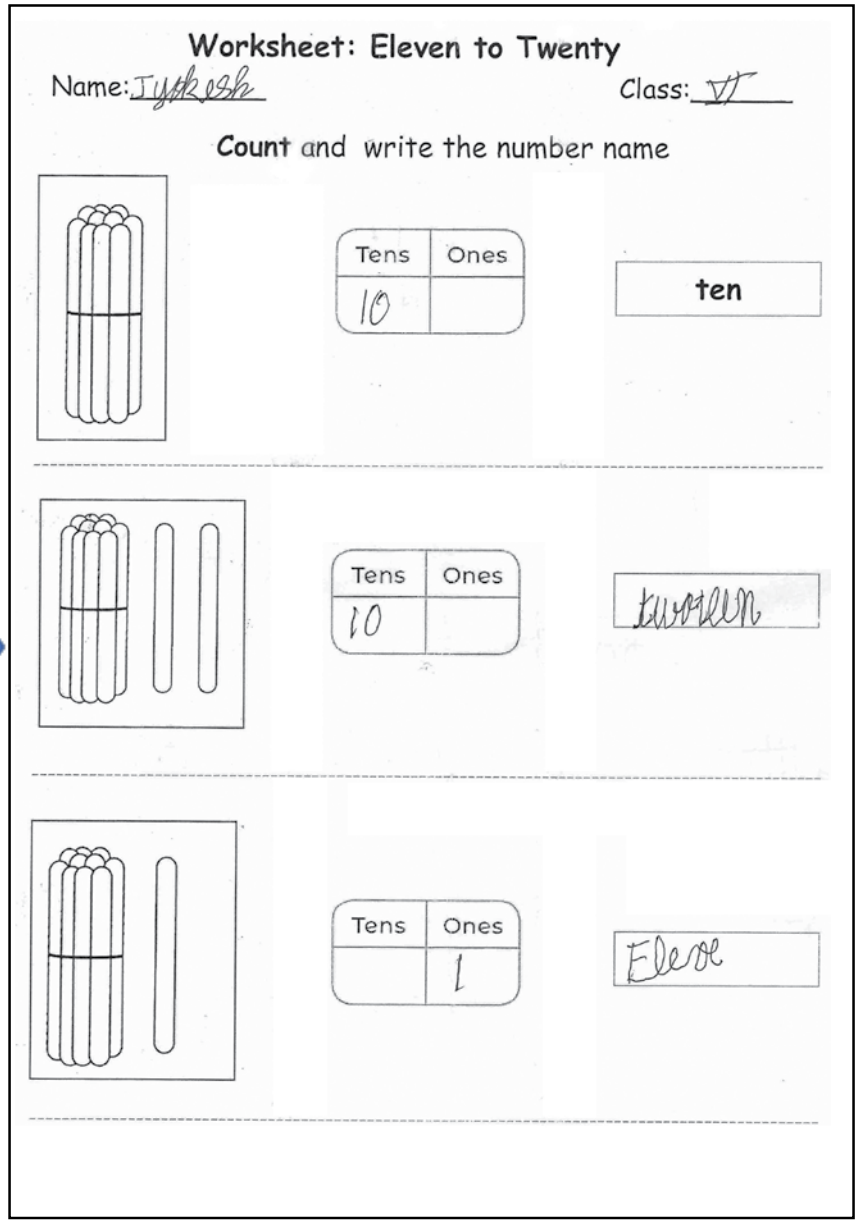


Figure 4. Count and match practice worksheet



Place value practice worksheet

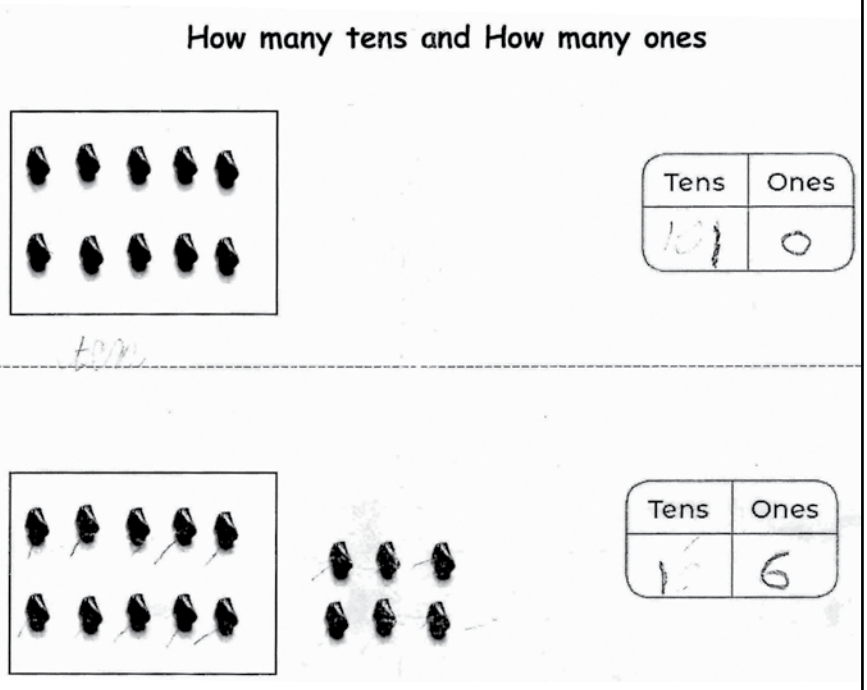
Activity	Practice
Students grouped tamarind seeds -- 10 per packet and remaining left loose. Then, they grouped ice-cream sticks – 10 sticks per bundle and remaining left loose. They worked in groups and practised writing the numbers based on two questions: - How many packets/bundles? - How many loose seeds/sticks? Then they wrote down the same using tens and ones: Packets | seeds | tens | ones 1 | 1 | 1 | 1	Students practised using the worksheet below individually. 

Figure 5. Worksheet used after activity with seeds, bundles and sticks

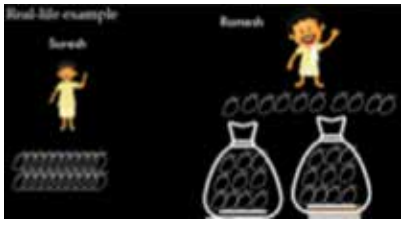
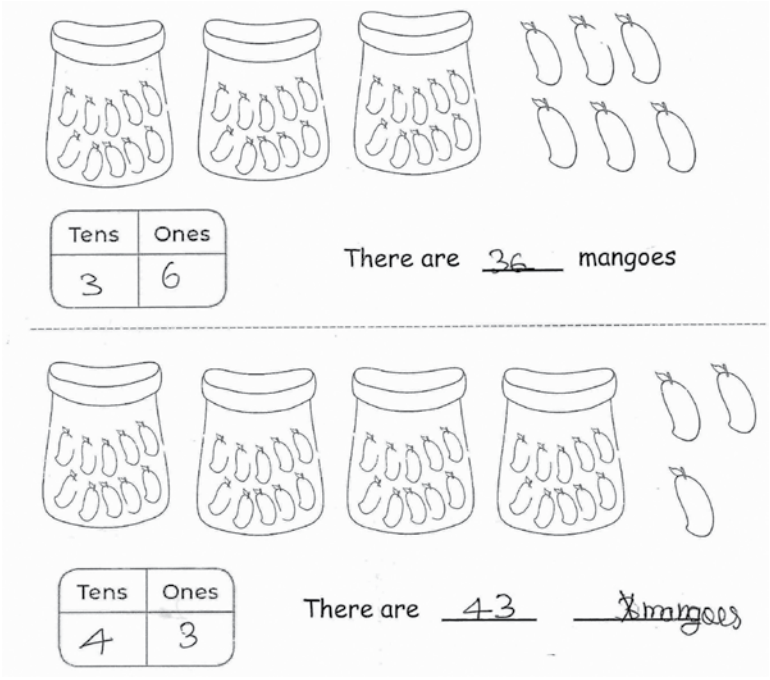
Activity	Practice
Storytelling was followed by roleplaying in which students became shopkeepers and sold mangoes. 	Students practised using the worksheet below, individually. 

Figure 6. Worksheet used after storytelling and role-playing

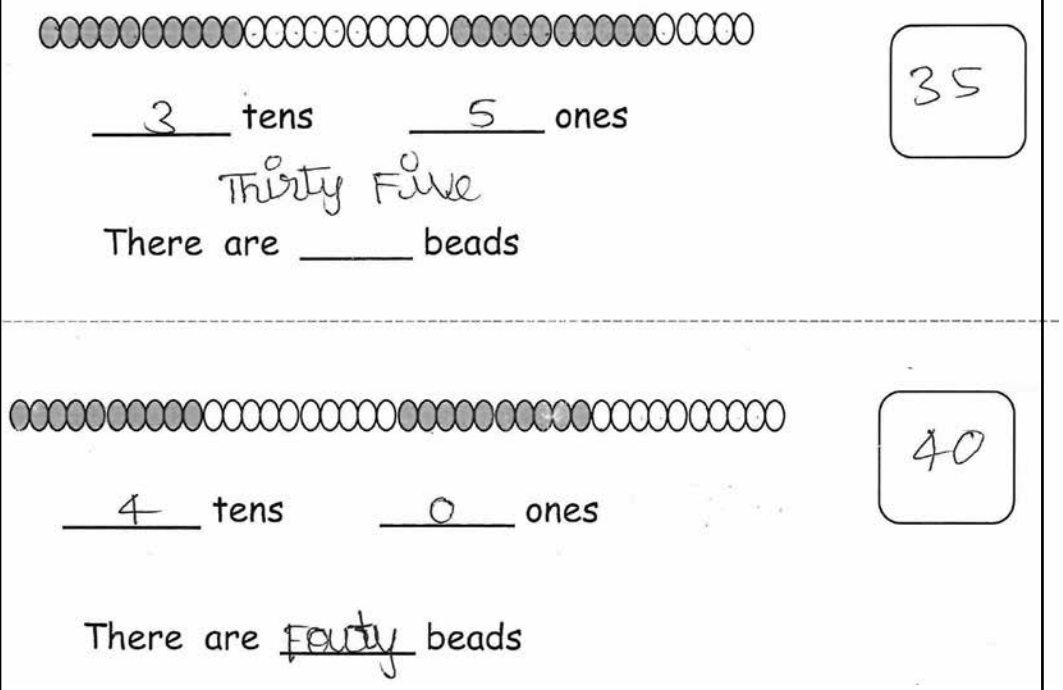
Activity	Practice
Students counting in tens using number beads. 	Students practised using the worksheet below, individually. 

Figure 7. Worksheet used after activity with number beads

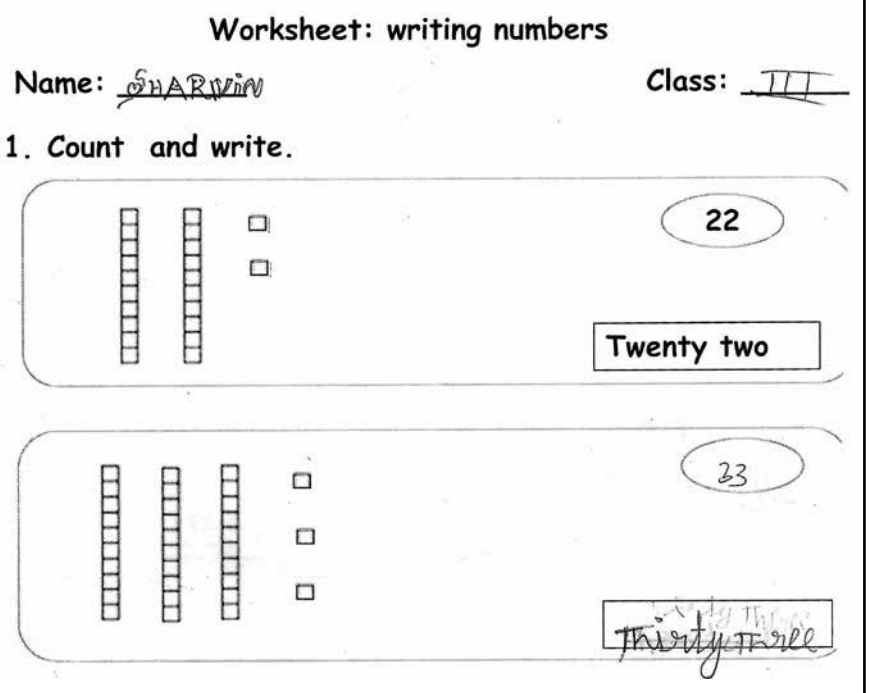
Activity	Practice
	Students practised using the worksheet below, individually. 

Figure 8. Worksheet used after activity of drawing tens and ones

(ganitmala) to further strengthen the concept of counting in tens and ones. The worksheet devised is also based on number beads. Followed by number beads, we used base-10 materials for the same concept, that is, counting in tens and ones. The purpose of this exercise is to help students move from the material stage to the pictorial and then to the symbolic stage. After working with the beads, students started drawing tens and ones as in the worksheet shown in Figure 8. This enables them to move to the abstract stage and they can then stop using materials altogether.

With this counting objects up to 20 came to an end. We consolidated and revised students' learning again using worksheets at the end of the week. Meanwhile, students' progress was also recorded by their performance in worksheets (Table 2), which was mapped with specific competencies as shown in Figure 9.

S.NO	Name	Reads and writes up to 99	Counts in groups of tens and ones.	Uses place value in writing numbers
1.	NEELA MEGHAM	✓	✓	✓
2.	DEVA	✓	✓	✓
3.	DHARMESH	×	×	×
4.	VIGHNU	✓	×	×
5.	JEYAPRASATH	×	×	×
6.	SURESH	✓	✓	✓
7.	YOKESH	✓	×	×
8.	SHARVIN	✓	✓	×

Table 2. Students' performance in worksheets

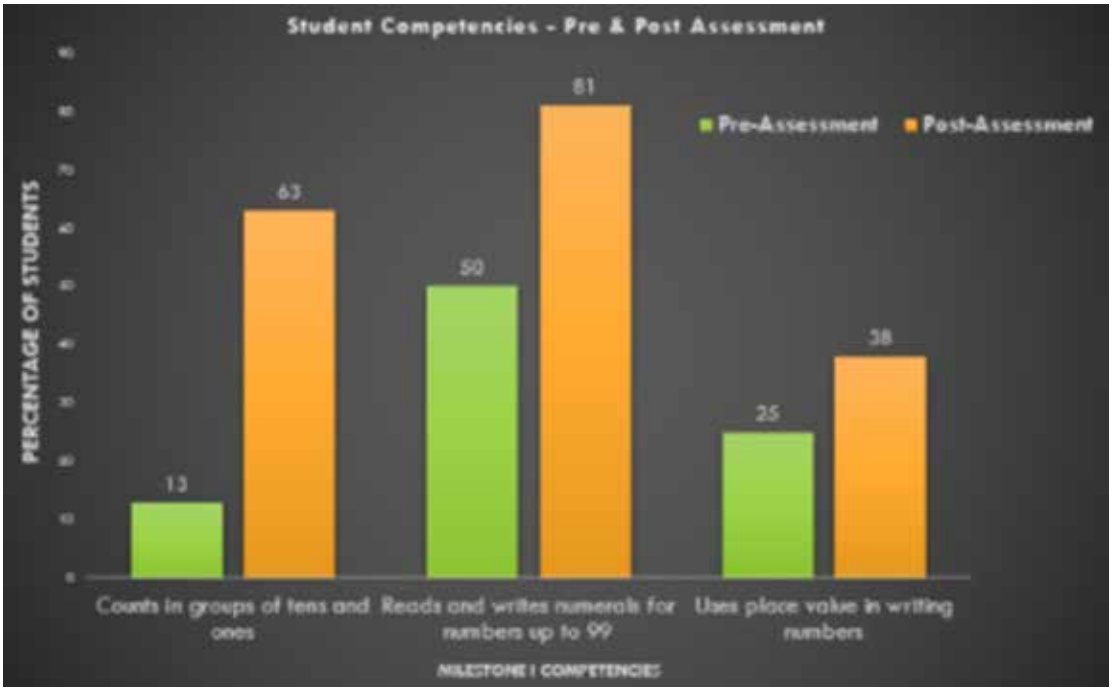


Figure 9. Students' performance mapped with specific competencies

Conclusion

Students enjoyed working on worksheets. They would eagerly ask for worksheets every day. We used worksheets as a means of classroom management strategy to get their attention in some classes. The very idea of solving worksheets gave them the motivation to pay attention in classes. One student was so keen on working on worksheets that he would stay active only during that part of the class.

Also, we were able to see the usage of worksheets in different areas, like enriching teacher-training programmes and strengthening ties with functionaries. We used the worksheets with errors during online training for primary school teachers and it improved the level and quality of interaction. Teachers were able to note where children struggle and think in terms of solutions. As discussed, in various teacher-education studies, starting with the students' work made the discussion richer and created awareness amongst the teachers about students' problems.

**Names have been changed to protect children's identities.*

Gowthama Rajavelu is an educator who believes in bringing about an active environmental and mathematical mindset among kids through strategic planning with teachers and functionaries. Currently, he is working as a maths and EVS Resource Person at the Azim Premji Foundation, Puducherry . He may be contacted at gowthama.tr@azimpremjifoundation.org