

Foundational numeracy is an important skill in mathematics, and it has always been a challenge to teach it in the school education system. Without foundational numeracy, by which is meant an understanding of numbers up to at least two digits, the four basic operations with two-digit numbers and applying the concepts in different situations, a child will find it difficult to progress in school and, eventually, in life. One of the reasons for the fear of mathematics and dropping out is the lack of this skill. Various national-level studies and National Education Policy 2020, indicate that a large proportion of students, beginning with elementary school students, have not attained foundational numeracy. The learning gap has further widened because of COVID-19 because schools were closed for the last 16 months. Some schools managed to work with students through the online mode and community classes up to some level, but a large section of students from the public education system were not meaningfully engaged during the closure. So, the concern is: how to achieve foundational numeracy skills and grade-level competencies. This article relates the learning loss across grades and the strategies of working on foundational numeracy and their impact on the learning of students. Our experience may help teachers of the public education system in planning their engagement on achieving foundational numeracy skills and concepts for class-level teaching.

Looking back

Last year the teachers in our school worked with the students of classes III to VIII on foundational numeracy in community classes. This effort has reflected so well in students' learning that this year, we are continuing with the same plan. Since most of the students could not get a proper education for last almost two years, major issues observed are the loss in learning and change in behaviour.

Let us understand the situation with an example. Suppose a student is now in class V and before the lockdown she was in class III. That means

students have been promoted from class III to class V without an engagement with the competencies of class IV and there is a high possibility of loss of learning of class III as well. So, some students who are now in class V cannot write numbers, some cannot subtract numbers with regrouping (making groups of ten in addition and subtraction), and some cannot divide correctly.

Another aspect is behavioural issues. Students are unable to pay attention, or sit through a lesson in the classroom, etc. Therefore, the challenge was two-fold: preparing students to participate in the classroom process to achieve foundational numeracy and higher concepts as well as engaging the students' attention. It requires lots of patience, planning and teamwork within the school.

Methodology

The examples given below are focused on work with students of classes III-V. Here are some of the major requirements for our interventions to be effective.

Preparing the students

Since the students have not been engaged with for 18 months and may have been restricted within a closed environment, some of them have lost the habit of coming to school and focusing in class or interacting with their friends and teachers. We need to create an environment which will attract students by focussing more on activities like drawing, painting, playing games, storytelling etc. This will help them in connecting with the classroom environment.

Identifying student needs

We developed a baseline assessment test on number sense, the four basic operations and their application for the students of classes III-V to assess their levels of understanding and need; and conducted one-to-one interactions to assess their counting and writing skills. This included questions on concepts based on complexity. For example, in the subtraction of whole numbers with regrouping, we had questions such as $152 - 29$ and $1002 - 127$.

In the case of $152 - 29$, the number 152 is regrouped to 1 hundred, 4 tens and 12 units. But consider the different regrouping that happens in the case of $1002 - 127$. First the number 1002 is regrouped to 10 hundreds 2 units, then to 9 hundreds, 10 tens and 2 units, then to 9 hundreds, 9 tens and 12 units. However, students found questions that requires regrouping in different ways difficult (Figure 1).

$$\begin{array}{r} 4 \ 12 \\ 1 \ 5 \ 2 \\ - \ 2 \ 9 \\ \hline 1 \ 2 \ 3 \end{array} \qquad \begin{array}{r} 9 \ 9 \\ 10 \ 10 \ 12 \\ 1 \ 0 \ 0 \ 2 \\ - \ 1 \ 2 \ 7 \\ \hline 8 \ 7 \ 5 \end{array}$$

Figure 1

The children of classes III-V were grouped based on their needs and were assigned to learning stations based on their understanding of number sense, four functions and their grade-level readiness (Figure 2). One teacher was assigned to each learning station. In each learning station, we discussed concepts from classes I to V. For example, in the number-sense learning station, we started the discussion with one-digit numbers, then presented place value to introduce two-digit numbers. This was continued till we reached six-digit numbers. This process included identification, writing, comparison, etc. The emphasis was on both conceptual understanding and practice.

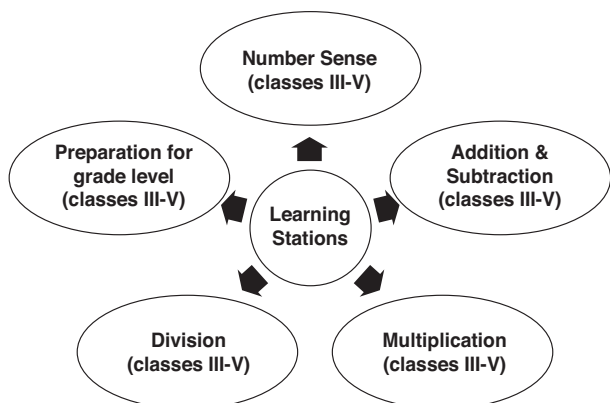


Figure 2

We had observed that about 27 students (out of 90) had issues in foundational numeracy, but the range of the problem varied. For example, some

students could not write some numbers like 79, subtraction with regrouping like $32-19$, mistakes in multiplication and division of numbers due to lack of practice of multiplication tables. The rest of the class were at different levels.

Creating a timetable

Since without foundational numeracy higher concepts cannot be learned, we had decided to focus on foundational numeracy and related higher-level concepts for all students to bring them to class level. Our focus was on three subjects - mathematics, Hindi and English, with about 9 hours' extra classes per week for mathematics to give sufficient time and continuous engagement to the students.

In the present scenario, all government schools have to provide at least 1.5 hours per day in the timetable for the first month of the opening of the school. All the teachers, except teachers of classes I and II have to work together on foundational numeracy. For example, a school can allot one hour (10.30-11.30 am) to classes III-V for mathematics. The children will be divided into three to four groups, based on the number of teachers in a school.

Teamwork and focused engagement

In regular school, one teacher usually teaches all subjects. But now, after schools reopen, imagine the range of the learning loss of students. To ensure effective use of time, students will be divided into groups. For example, in class V, there could be four to five groups of students at different levels of understanding of the concepts of number sense and the four basic functions, similarly with classes III and IV. This means that each class teacher will have to work with all these five groups, which is very difficult from the teaching and time management point of view. If the children are in groups, each teacher will focus on one concept at different levels. Proper focused teaching and good time management is possible when teachers of a school work together. An important point is that the number of groups will depend on the number of teachers in a school.

Preparation and resources

In primary classes, all the teachers teach all the subjects, so it is not difficult for teachers to deal with mathematics. But when schools reopen, planning is important because we have to achieve much more in much less time. We have to decide *what* to teach and how to teach. Suppose a child

makes mistakes in $32 - 14$, (Figure 3), how to make the child understand the regrouping concepts? In this case, we can see that the child has made a mistake in regrouping, she could not consider the 2 in the unit place. So, we need to help the child to understand the regrouping using dienes blocks (Figure 4) or fake currency.

$$\begin{array}{r} 2 \ 10 \\ \cancel{3} \ 2 \\ - 1 \ 4 \\ \hline 1 \ 6 \end{array}$$

Figure 3

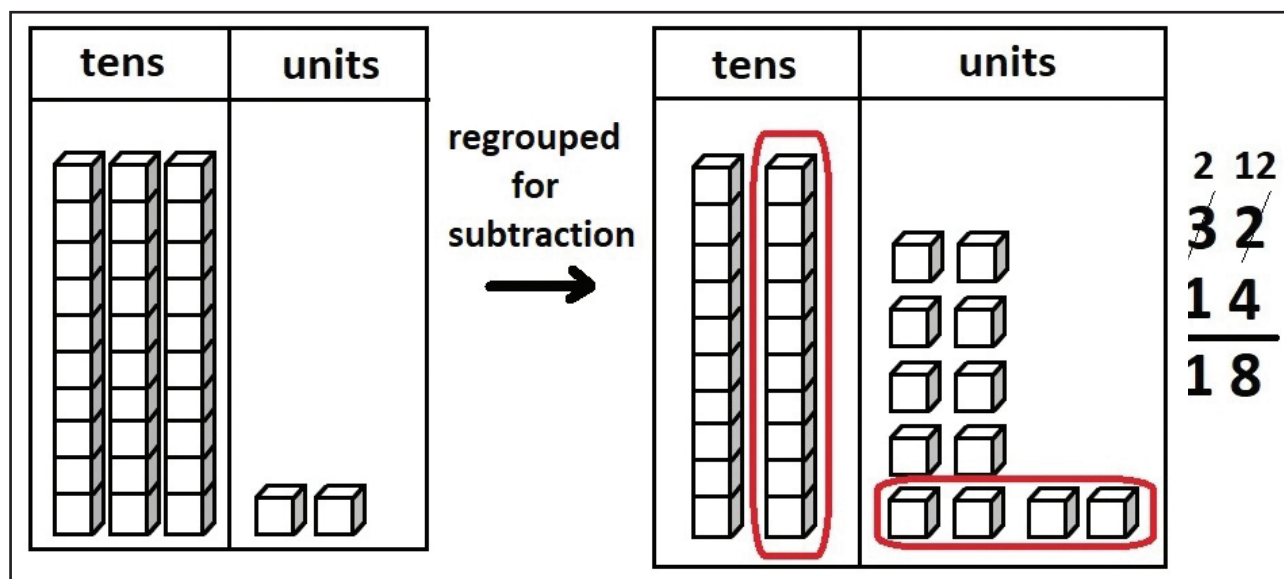


Figure 4

Here using dienes block, the number 32 is regrouped as 2 tens and 12 units. And now the child can subtract 1 tens and 4 units from it to find the answer as 1 tens and 8 units i.e., 18.

After explanation, we should be ready with a set of questions of the same type to assess students' understanding and develop confidence in solving similar problems. Then, more complex problems can be presented for solving and discussion. For example, when a child is confident in solving questions of types $32 - 14$, we can then move on to more complex concepts like: $302 - 25 = ?$, $1002 - 127$ etc. So, we should have a collection of different complexity levels within a concept. Preparation and discussion, including collection of manipulatives, worksheets, and different types of questions could be assigned on that concept are needed.

Recording progress

Even students within the same learning station could be at different levels. Some students will complete the required work sooner than others, so there is a need record the progress of each student for providing proper support.

We have developed two types of formats to keep the record of the learning of students. One is the Individual Learning Progress (ILP, Figure 5), which reflects the completed task and current engagement of individual students. In the ILP record, the teacher working on the specific concept or learning station maintains a written record of each child's progress to show the completion of that specific concept by the student. Then, this record will move to the teacher of the next learning station based on the need of the student.

The other format is the Consolidated Learning Progress (CLP, Figure 6) with the names of all students and learning indicators against each student. It is maintained on a weekly basis when teachers meet. Teachers discuss the progress of the students and update the format. This helps in providing a clear picture of the progress of the whole class.

To summarise

In our school, we had started working with students in January 2021. We used the above method in classes III-V for 1.5 hours a day for about three weeks before schools closed again. We found that about 11 (out of 27) of the students achieved foundational numeracy, achieving class-level competencies related to number sense and the four basic operations. For example, with foundational

