Ganitha Kalika Andolana

Teachers Training Module

Contents

Guideline for using this module:

1. This training module is for the resource persons identified by SSA and have been participated in training conducted by Akshara Foundation.
2. This should be only used as guideline for conducting training for teachers. But the details of the training should be referred from 'Teacher handbook'.
3. Resource persons are expected to refer this book well in advance and prepare for the training along with the content from 'Teacher handbook' and from the content provided during training conducted by Akshara Foundation.
4. Since Ganitha Kalika Andolana's approach is to treat students as a active learner, resource persons are expected to facilitate the session using the TLM and make the participants to perform activities using TLMs. Make sure that teachers understand that every student needs to be given opportunity to use TLMs in the classroom process.
5. Please make sure that the approach of the Ganitha Kalika Andolana is understood by the participants clearly during II session on day one. Since whole program is based on Constructivism, Co-operative learning and CCE it is very important that teachers understands these '3Cs'.
6. Please mention that TLM provided in the Kit will help teachers in conducting classes in joyful manner and helps students in conceptual understanding of the maths concepts covered in the text books of class4 and 5. This is not a separate program and teachers need not to feel that it will be an extra burden on them.
7. It is recommended to use the numbers mentioned in the examples during activities.
8. Resource persons are expected to take measures to adhere to the timing mentioned in the module.
9. Resource persons are expected to facilitate all the content provided in the module without any negotiations.
10. Mention teachers to sick help if needed from CRPs/RPs during their school visits.

TEACHER TRAINING MODULE

DAY 1

Session 1: [10:00- 10:30] Icebreaker:

Make the participants play Fire in the Mountain and then make groups of 5 or 6. The participants sing "Fire in the Mountain run run run" or "Bettadalli benki hachtu odi odi odi". The trainer calls out a number between 0 and 9. The participants make groups indicating the called number. Eg Trainer calls 9 the participants make groups of 9 members. For 0 all have to sit. End this game with 5 or 6 as required.

Session 2: [10:30 – 10:45] Approach of Ganitha Kalika Andolana (GKA):

Intention:

To understand the approach of Ganitha Kalika Andolana.

Material to be used: Teachers manual and other reading materials.

Session details:

Facilitator will explain the following '**briefly**' based on the information given during the training and teacher's manual:

- ✓ **About Akshara**
- ✓ **Importance/need of GKA.**
- ✓ **3 C's :** Explain **C**onstructivism, **C**o-operative Learning and **C**CE – Continuous and Comprehensive Evaluation employed in GKA
- ✓ **CRA cycle:** Elaborate on Concrete, Representational and Abstract phases of math learning.
- ✓ **5 E model of learning:** Explain how 5Es (Engage, Explore, Explain, Elaborate, Evaluate) can be effectively implemented using the TLMs and Concept cards in the GKA kit.
- ✓ **Cooperative or Group Learning:** Explain the process for co-operative learning, like:
    - Making Groups
    - Assigning names and choosing leader.
    - Facilitating the group learning process.
    - Monitoring and motivating the group.

- ✓ **Strategies of Collaborative or Cooperative or Group Learning:** Explain different strategies for driving the group activities:
    - Facilitator driven- Facilitator gives the problem. All groups solve it. Any one member from each group explains the solution.
    - Group driven - Group leader from one group goes to the next group and gives them a problem and observes. Each group leader shares their observation with the class.
    - Group leader driven- Each group leader gives their group members a problem and asks them to explain the solution to the group.
    - Group Member driven- Each group member gives any one member a problem and the rest observe and share their experience with the group.

Session 3: [10:45 – 11:00] Introduction to Number system.

Intention:

Though the GKA is for class 4 and 5 the kit contains the TLM for class 1 to 5. Knowing to use these TLM for teaching number system for class 1 to class 3 will be prerequisite based on which rest of the concept is taught. CRP/RP will only mention the use of TLM for the concept mentioned below without demonstration.

Material to be used: Counters, base ten yellow cubes, abacus rings or real life objects can be used for this. (Note: Counters can be stuck to black board by dipping it in water.)

Session details:

During this session facilitator will explain/demonstrate the concepts of number system required for class 1 to 3 in brief:

- ✓ **Existence and Non Existence**: It is important to understand the concept of existence and non-existence before starting to count. To teach the concept of existence show some objects in one hand to and none in other hand to show non-existence.
- ✓ **Knowledge of objects**: Using counters provided in the kit teach participantsto sort as per color. Using mixed objects ask participantsto sort as per shape.
- ✓ **Comparison**: Take two quantities and ask which is more? and which is less? If participantsstack the two sides and compare do mention this is possible only when the thickness of the objects is same. Use one to one correspondence to compare.

- ✓ **Conservation of Quantity**: To establish this, use Collection of a object with same attributes, different attributes, Collection of different objects with same attribute and different attributes, Arrangement of objects – Closely packed or spread out
- ✓ **Oral Number names**: Using rhymes or chant introduce the names of the number.
- ✓ **Quantity and oral Number name association**: Show particular quantity of objects and introduce the number name. Make sure students recognize the quantity and say its number name; similarly represents a quantity when the number name is said.
- ✓ **Counting**: Forward counting and Backward counting
- ✓ Introduce the **concept of zero** by backward counting and Writing zero.
- ✓ **Comparison:** Introduce <, > and = sign.
- ✓ **Ordering:** Introduce the term ascending and descending and their meaning. Ascending means starting with the smallest number and descending means starting with the biggest number.
- ✓ **Numerals:** Introduce to numerals using flashcards and place value strips. Make use child learns recognition of quantity and matches it with the correct numeral and representation of quantity by identifying the numeral; Writing numerals in square line book. Using Number beads/line introduces two Digit Numbers and place value.

Introduce Number names eleven to nineteen, ten, twenty, thirty, forty, fifty, sixty, seventy, eighty, ninety by counting till ninety nine.

11:00 – 11:15 : Tea break

Session 4 [11.15 – 12.00]: Three/ Four/Five Digit Number concepts

Intention:

This is to address the understanding of 3, 4 and 5 digit number concepts. Emphasis needs to be given on **grouping by ten, place value, face value, ordering and comparing the numbers.**

Materials to be used: *Counters, base ten blocks, place value mat, place value strips, Dice, play money and abacus.*

Session details:

Demonstrate regrouping a collection by tens and left shifting. Mention to make students to say aloud how many groups of tens and ones are there in a collection.

Use analogy of- *"each room is for 'ones' and 'tens' and only 9 members of either 'ones' or 'tens' can be in a room, if it is more than 9 it should be regrouped and shifted to next room towards left"*

On Place Value Mat using base 10 blocks demonstrate 9 and one make a 10 (ten yellow cubes is a blue rod). Similarly demonstrate 99 and one more makes 100 (ten blue rods makes a green plate). 999 and one makes 1000 (Ten green plates makes a red cube). Teacher can also use play money as mentioned in the teacher manual. To demonstrate 10000 in similar way use abacus. With each of this activity teachers can introduce number name hundred, thousand, ten thousand.

Ask participants to represent 3 to 4 digit numbers given below using Base Ten blocks, Play Money, Place Value strips, abacus.
Examples: 503, 9999, 6575, 84356 (use abacus), 07664(use abacus), 85046(use abacus), 35480(use abacus).

Make sure participants are aware that students should be able to recognize, Read and Writing 3-5 digit numbers

Demonstrate activities related to **expansion form of numbers** for learning of Place Value and Face value of digits with the following examples.
Examples: 4007, 8888, 6626, 5046, 3330.

Demonstrate activities related to **comparison of big numbers**. Discuss the algorithm to Always start from the highest place and if the face value of the digit here is same then move to the next lower place. Ask participants to compare the numbers given below.
Examples: 6447 & 6474, 5470 & 3140, 6586 & 6586, 8461 & 8467

Ordering numbers in ascending and descending form: Ask participants to pick the smallest from the set for ascending and continue. Similarly, pick the biggest from the set for descending and continue. Perform the activities using the below examples.
Example: 5994, 8458, 2408, 6620;
482, 29, 715, 5, 8551

Session 5: [12.00-1.00] Addition

Intention:
To demonstrate the activities to Teach/Learn addition operation using GKA TLMs

Materials to be used: *Counters, base ten blocks, play money, place value mat, dice, abacus.*

Session details:

Introduction to addition

- *Using Counters demonstrate the following-*
  - ✓ **Addition is joining:** Take two groups of counters and join. Now count and find the sum; Now introduce the signs and tell children that join is represented by '+' and make/sum by =.
  - ✓ **Commutative property:** Show that 3 + 4 and 4 +3 are the same.
  - ✓ **Identity property:** Show that 4 + 0 is 4.When we add nothing to a quantity the quantity remains unchanged.
  - ✓ Representation using square line book.
  - ✓ Addition table: For each number say 7, ask them to write all combination that make that number using counters.

Addition of 3-5 digit numbers:

- *Using Base ten blocks, Play money or abacus demonstrate activities for Teach/Learning 3-5 digit number addition*
  - ✓ Initially demonstrate addition of two 3-5 digit numbers without carry.
  - ✓ Show how this can be done using square line book.
    - Examples: 234+123 = ? , 555 + 202= ? , 4003+506=? 10430+9030=?
  - ✓ Mention to always start from the units place.
  - ✓ Now choose numbers that generate a carry and show how regrouping is done.
    - Examples: 9999+1= ?, 555 + 606= ?, 4003+909=?, 10430+9070=? 777+7777=?

1:00 – 1:45 : Lunch break

Session 6 [1.45- 2.30] Subtraction

Intention:

To demonstrate the activities to learn subtraction operation using GKA TLMs

Materials to be used: *Counters, base ten blocks, play money, place value mat, dice, abacus.*

Session details:

Introduction to subtraction:

- *Using Counters demonstrate the following:*

  - ✓ Subtraction is removing a quantity from another: Take counters. Now remove a few. What remains is the difference. Now introduce the signs and tell children that take away or minus is represented by ' – ' and get/difference by ' = '.
  - ✓ Ask participants if they can take away 8 from 5. Let them come to a conclusion that only a smaller number can be taken away from a bigger number.
  - ✓ Show that 3-0 = 3. When we remove nothing from a quantity it is unchanged.
  - ✓ Show that for every addition fact there are two subtraction facts. Eg. 5+4 = 9 gives 9-5 = 4 and 9-4 = 5.
- Subtraction on Place value mat.
  - ✓ Using Base ten blocks subtract a smaller number from bigger number. Place the minuend on the mat. Remove subtrahend and place below it. Write the difference. Repeat with different combinations.
- Subtraction of two digit number
  - ✓ Using base ten blocks or Play money
    - Subtract a number form another. Choose numbers that do not need a borrow.
    - Always start from the units place.
  - ✓ Now choose numbers that need borrowing and show how regrouping is done. When the child removes if there is less than what he needs naturally there comes a need to borrow. Explain we can do this only if there is something in the higher place. Show how a blue rod can be exchanged for ten yellow ones. Add these to the already existing and remove from this. Similarly explain the use of play money and abacus for borrowing. Ask participants to perform the following problems using TLMs
- Subtraction of 3,4 and 5 digit numbers
  - ✓ Using Base ten blocks, Play money or abacus
    - Subtract without borrow.

Examples: 4044-4003, 25684-10403,

- Subtract with borrow.

Examples: 10002-9999, 10000-1, 37051-34809, 4638-3929

Session 7 [2:30-3.30]: Multiplication

Intention:

To demonstrate the activities to Teach/Learn multiplication using GKA TLMs

Materials to be used: *Counters, base ten blocks, play money and abacus.*

Session details:

Introduction to Multiplication

- *Using Counters and number line demonstrate the following:*
  - ✓ Using number line demonstrate skip counting.
  - ✓ Using counters start with addition of any two numbers. For example add 3 with 3. To this add 3 and continue. Ask what is different. Establish that we are adding the same number multiple times. This is called multiplication. Multiplication is repeated addition.
  - ✓ Now using number line show repeated addition.
  - ✓ Arrange various repeated additions as a rectangle and show that multiplication is always a rectangle with one number as rows and the other as columns.
  - ✓ Introduce **'X'** sign for multiplication.
  - ✓ Do the multiplications table. Explain how to write this on square line book.
  - ✓ Show that when we multiply anything by 0 we are multiplying with nothing i.e we are not multiplying. So it is 0.
- Demonstrate multiplication activity as repeated addition as given in teachers manual. Ask participants to perform multiplications with following examples using base ten blocks/play money.
  - Example: 465x8, 3082x4
- Introduce the area method. Remind that we can only use rods and yellow cubes even for a 3 digit numbers. Ask participants to perform multiplication of the following numbers using area method.
  - Examples: 12x12, 103x11, 15x13
- Show how to represent this in square line book.
- Show how to connect this with long multiplication method by taking any of the below examples.
  - Examples: 107x8, 300x10, 8x20

3:30-3:45 - Tea break

Session 8 : [3.45-4.00] Factors and multiples.

Intention:
To demonstrate the activities to Teach/Learn factors and multiples using GKA TLMs

Materials to be used: *Counters*

Session details:
Factors and Multiples

- Form rectangles using counter by adding rows to show multiples
- For a given number make different rectangles the row and columns indicate the factors ex: 24 (2x12, 1x24, 6x4, 8x3)

Session 9 [3:45 -5:15] Measurements

Intention:
To demonstrate the activities to Teach/Learn various forms of measurement like money, time, length, weight and volume using GKA TLMs

Materials to be used: *Play money, clock, measurement tape, weighing balance*

Note: *Please make sure students use and experiment with various measurement of the objects found in daily life*

Session details:
Explain/demonstrate the concept of **money and money handling**

- ✓ Introduce Nonstandard measure as in Barter system
- ✓ Introduce money as a standard measure in terms of currency
- ✓ Show/demonstrate various denominations of money (1,2,5,10,50,100,500,100) given in the kit.
- ✓ Show various ways of exchanging money
- ✓ Demonstrate how to make an amount using various denominations. Make sure participants also do this activity.
- ✓ Demonstrate addition and subtraction using play money.

Time

- ✓ Explain 'Time' is a measurement of duration.
- ✓ Introduce Non-standard/ Standard measure of time.
- ✓ Introduce basic structure of Clock (arms and numbers).

- ✓ Explain Reading of hours, Reading half hours, Reading 'quarter past' and 'quarter to'.
- ✓ Explain the clock marking and its relation to multiple of 5
- ✓ Explain reading of minutes, elapsed Time, 24 hour clock, duration, conversion of time from 12 hour clock reading to 24 hour clock reading.
- ✓ Demonstrate reading of Calendar

Length

- ✓ Explain 'Length' as a measurement between two points
- ✓ Explain various vernacular non-standard measurements like Flowers – elbow length for 'mola' and full arm for 'maaru', Hand span, Foot length.
- ✓ Introduce standard units of measurements.
- ✓ Demonstrate the use of measuring Tape for measuring the objects.
- ✓ Perform addition and subtraction using measurement.
- ✓ Explain the conversion of units like Cm to meter, meter to kilometer etc.

Weight

- ✓ Explain 'Weight' as a measurement.
- ✓ Introduce vernacular non-standard measurement of weight
- ✓ Demonstrate standard measure using weighing balance. You can use base ten yellow cubes for 1 gram and blue rods for 10gms, water for other measure.
- ✓ Perform addition and subtraction using weight.
- ✓ Explain the conversion of units like milligrams to grams and gram to kilogram etc.

Volume

- ✓ Explain Volume as a measurement
- ✓ Introduce vernacular non-standard measurement of volume
- ✓ Demonstrate standard measurement of volume using the pans of weighing balance.
- ✓ Perform addition and subtraction using volume.

Explain the conversion of units like milliliter to liter.

DAY 2

Session 1 : [10.30-11.30] Division.

Intention:

To demonstrate the activities to Teach/Learn division using GKA TLMs

Materials to be used: *Counters, base ten blocks, play money and abacus.*

Session details:

Introduction to Division:

- ✓ Ask a student to distribute 12 counters to 3 participantsone by one. From this activity establish that division is equal distribution.
- ✓ Similar to demonstration of repeated addition as multiplication demonstrate that division is repeated subtraction.
- ✓ Show how multiplication and division are connected.
- ✓ Introduce '÷' sign.
- ✓ Show that every multiplication fact leads to two division facts. E.g 6 x 4 = 24 gives 24 ÷6 = 4 and 24÷4 = 6.
- ✓ Explain that you cannot give something to nobody and explain that division by 0 is not possible.
- ✓ Divide 13 by 3. Show that 1 remains. Introduce the words 'quotient', 'Dividend', 'Divisor' and 'remainder'.
- ✓ Demonstrate the division of a 2 digit, 3 digit and 4 digit number by one digit using base ten blocks and play money. You can use the following examples.
  - Example: 30/6, 693/3, 455/5, 144/4 , 714/7 , 9009/9, 600/6, 12/12
- ✓ Demonstrate the division of a 2 digit, 3 digit and 4 digit number by one digit with remainder using below examples.
  - Example: 147/4, 2034/7, 3008/9,
- ✓ Show how to connect this with long division method.

11:30-11:45 - Tea break

Session 2 [11:45 – 1:00] Fractions

Intention:

To demonstrate the activities to Teach/Learn fractions using GKA TLMs

Materials to be used: *Fraction shapes and fraction strips*

Session details:

- ✓ Discuss Division and ask participantsto divide 12 objects (counters) equally to 3 children. Write as $\frac{13}{3}$. Now ask them to divide 16 equally to 4 children. Write $\frac{16}{4}$
- ✓ Using fraction shapes introduce fraction as a part of whole.
- ✓ Now take different whole and show $\frac{1}{2}, \frac{1}{4}, \frac{1}{3}, \frac{1}{10}$ etc
- ✓ Using fraction strips demonstrate reading, writing and value of a given fraction.
- ✓ Introduce Numerator and Denominator.
- ✓ Using counters show Fraction as part of a collection
- ✓ Using Number line show fractions with whole as 100, then with whole as 60, 12 and so on.
- ✓ Compare fractions using fraction shapes and fraction strips. Show ordering of fractions using fraction strip when numerator is same and denominator is same.
- ✓ Show equivalent fractions using fractions shapes and fraction strips.
- ✓ Show how to find a fraction part of a collection the 'OF' operator. Eg. $\frac{1}{2}$ OF 20, $\frac{2}{3}$ of 12.

1:00 – 1:45: Lunch break

Session 3 [1:45-2:45] : Decimals

Intention:

To demonstrate the activities to Teach/Learn decimal using GKA TLMs

Materials to be used: *Play money, decimal grid and decimal place value strip.*

Session details:

- ✓ After discussing fractions, introduce a fraction with 10 as denominator and 100 as denominator.
- ✓ Using the decimal grid explain dividng whole into 10 strips and divinding this further into 10 giving 100 squares. Now show equivalents e.g 3/10 = 30 /100.
- ✓ Using Play money show when 1000 is exchanged we get ten 100's, 100 is exchanged for ten 10's, 10 for ten 1's. When we want to exchange 1 rupee we get ten 10 paise and when 1 ten paise is exchanged we get ten 1 paise. Connect it with the decimal number system.
- ✓ Now write the place value. Thousands when divided by 10 gives 100 which further divided by 10 gives 10 which further divided by 10 gives 1 which further divided by 10 give 1/10 and then 1/100.
- ✓ Now represent various decimal numbers using Play money. Introduce the Decimal point as the separator between the whole and part.
- ✓ Comparison and ordering of decimals.
- ✓ Addition, Subtraction of decimals.

Session 4: [2:45-4:00] Geometry 3D Shapes

Intention:

To demonstrate the activities to Teach/Learn of shapes, angle, area and perimeter using GKA TLMs

Materials to be used: *3-D and 2-D shapes, nets, protractor and geo-board with rubber band.*

Session details:

- ✓ Introduce 3 D shapes with their names based on face, edge vertex and also based on rolling and sliding properties.
- ✓ Compare real life objects that resemble these shapes
- ✓ Use 2 D nets to make 3 D shapes

Angles

- ✓ Explain angle as a means of measurement.
- ✓ Explain capturing angles and measuring angle using protractor.
- ✓ Demonstrate different types of angles by making angles on protractor.

Area and Perimeter

- ✓ Show formation of different 2 D shapes using Geo-borad

- ✓ Introduce the concept of perimeter as a walk or movement along the outline of a shape.
- ✓ Demonstrate measurement of perimeter in units using geo-board.
- ✓ Show that perimeter maybe same even if the shape is different.
- ✓ Show the perimeter of a square on geo-board and derive its formula.
- ✓ Show the perimeter of rectangle on geo-board and derive its formula
- ✓ Introduce area concept as the space within a shape and area as unit squares that fill the shape.
- ✓ Demonstrate that area maybe same but shape maybe different
- ✓ Show that shapes having same perimeter may have different area and vice versa
- ✓ Using geo-board, show the area of a square and derive its formula.
- ✓ Using geo-board, show the area of a square and derive its formula.

4:00-4:15 - Tea Break

Session 5: [4:15-4:45] Data Handling and Pattern

Intention:

To demonstrate the activities to Teach/Learn data handling and pattern using GKA TLMs

Materials to be used: *square counter, abacus rings and shapes.*

Session details:

Demonstrate data collection and handling as follows:

- ✓ Collection of data using different colored square counters or abacus rings
- ✓ Tabulate data of colors collected using tally.
- ✓ Tabulate using Sorting and Counting
- ✓ Represent the collected square counters in the form of horizontal and vertical bar graph using square counters
- ✓ Analyze the Data using Bar graph.

Patterns

- ✓ Demonstrate different patterns using shapes based on color and orientation
- ✓ Show different patterns of Number
  - Squares – how many counters make a square. Eg 4, 9, 16, 25, 36
  - Triangular numbers. How many counters make a triangle 3, 6, 10,

Symmetry

Session 6: [4:45-5:00] Feedback