Akshara Foundation

EVERY CHILD IN SCHOOL AND LEARNING WELL

Ganitha Kalika Andolana Phase 2 – An Activity-Based Math Programme for Children in Standards 4-5 in Government Primary Schools in Karnataka

Vision for School Mathematics

Math is a subject that is dreaded and revered at the same time in primary schools. It is widely believed to be a 'foundational' discipline upon which a lot of future learning in school depends. Yet, achievement levels of students in primary school math are generally poor. Less than20% of children in Standard 5 can do simple division (ASER). On the other hand, the National Curriculum Framework (NCF2005) calls for moving beyond the 'narrow aim' of mathematics confined to numeracy to embrace a 'higher aim' "to develop the child's resources to think and reason mathematically, to pursue assumptions to their logical conclusion and to handle abstraction." NCF2005 outlines the following vision for teaching of Math in schools:

- Shifting the focus of Mathematics education: Math teaching should move away from numerical procedures and calculations to the ability to think mathematically to solve problems by building a child's capacity for logical analysis and handling abstractions. Children should be able to see patterns and make connections between concepts within math as well as with other subjects and solve unstructured problems from real life using math.
- Every child should learn math: NCF2005 also emphasise that *"all students can learn mathematics and all students need to learn mathematics"*. Children should learn to enjoy mathematics rather than fear it and teachers should engage every child in class with the conviction that everyone can learn mathematics. One of the ways to do this is to use activities and concrete materials to introduce and develop math concepts. Also, an opportunity for children learning from each other helps in making learning of math less intimidating. As children gain confidence and succeed through these activities, they can be offered more challenging problems that develop their problem-solving abilities.
- Assessments should check a child's ability to think mathematically and not procedures: A change in emphasis of teaching math means that 'what' and' how' of assessments should change accordingly. Instead of pen and paper assessments at the end of the year, assessments can be ongoing and through observing children's activities. Since every child is unique and learns in a different way and at a different pace, teachers need

to be aware of each child's progress in each concept to be able to help them better. Such continuous assessment is one of the important ways to make sure that every child is learning math.

- A resource rich classroom and teacher support: Teachers need support in making this change both through professional development as well as material and ideas that they can readily use in their classrooms.

Akshara Ganitha Methodology

Akshara Ganitha was designed by Akshara Foundation with the NCF2005 vision in mind for teaching math in Standards4and 5. It is a support programme aligned with the math syllabus and math textbooks that teachers follow. The programme uses four main strategies:

- Learning with fun and understanding: A child creates her own knowledge by engaging with the environment while the teacher supports her in this process. The methodology introduces concepts in a graded manner focussing on the higher vision of mathematics as described earlier. The focus is on the child's ability to think mathematically, see patterns and structures and handle abstractions rather than rote memorisation or mastering procedures. Procedures often naturally 'flow out' of understanding a concept. The TLM is used in early stages to build this understanding, but as the child gains confidence she is encouraged to work on her own.
- Co-operative Learning: Learning in peer groups has a positive impact on the learning. The Akshara Ganitha methodology involves co-operative learning in small groups of children (5-6 in a group) with mixed levels of achievement. In these groups the students who are already familiar with the concepts, deepen their understanding by teaching other and students who are having difficulties in grasping a concept.
- Continuous Activity-based Assessments: Every child can and should learn math. But they learn at different speeds and in different ways. Assessments help teachers know the level of understanding of each child in particular concepts so that they can help in advancing that learning. It also serves as a feedback to the teacher so that she can focus on particular concepts that are not understood by many children in her class. Akshara Ganitha uses 'mini' activity based assessments on an on-going basis
- On-going Teacher Support: To make this change happen, teachers need substantial support over an extended period of two to three years. Apart from providing TLM and training, teachers need in-school support to help them with practical issues they face in their classrooms as well as build a community of practice of teachers that supports each other. Akshara Ganitha programme engages teachers from the very first step and supports them for a substantial time so that a long term change in the culture of teaching of math can be achieved.

Pedagogical Approach

The pedagogical concepts are grouped in four broad areas: Numbers & Operations; Geometry; Measurements; Patterns, Data Handling and Problem Solving. The key components and strategies for each of these are shown below:

	Standards 4 & 5
Numbers & Operations	Focus on place value and its connection with all four operations. Addition and subtraction flows from understanding of place value. Multiplication introduced using area model of multiplication. Division is introduced through partial division. In each case, procedures are derived through introductory activities and then reinforced through practice. Introduction to fractions and multiple meanings of fractions. Decimals are introduced by developing connections with fractions and place value.
Geometry	Geometry is introduced as a mechanism of structuring the 3D space using 3D and 2D shapes. Introduction of formal properties of shapes. Focus on spatial visualisation involving representation and transformations of 2D/3D shapes. Linkages to real world is emphasised.
Measurements	Introduction of standard measurements for length, weight and volume and their conversions. Using this measure in real life situations and connecting them to the four numerical operations with decimals. Reading of clocks and calculations involving simple durations either through counting or by calculations.
Data Handling, Patterns & Problem Solving	Deepening the understanding of number and visual / spatial patterns. Introduction to data collection and representation and drawing inferences from that. Emphasis on age appropriate problem solving technique for numerical as well as spatial reasoning.

Programme Components

- Akshara GanithaKit: Each school is provided with an Akshara Ganitha kit with multiple teaching aids that cover all the math concepts for Standards4and 5.

- Teacher Manual & Training Videos: A Teacher Manual describes the way a concept can be progressively introduced and mastered using TLM and with written practice using square line notebooks. It also includes ideas for games, formative assessments and areas that need special focus. A set of training video modules demonstrate how the concept can be introduced using the math kit material.

- Teacher Training: An introductory 3-day training for teachers covering all the lower primary school math concepts; introduces teachers to the philosophy, methodology and the use of TLM.

- **Monitoring Support-SMS based technology for monitoring of implementation of Ganitha Kalika Andolana.** This system will help the education functionaries to track the status of the implementation of the program in terms of usage of the Teaching Learning Materials provided in the kit, teacher facilitating Concrete-Representational-Abstract, steps during teaching learning process, Cooperative learning practice inside classroom and ensuring the coverage of training to Class 4 and 5 Math teachers on Ganitha Kalika Andolana methodology.

The *Ganitha Kalika Andolana* (GKA):

In February 2014, in the Budget Speech the Chief Minister of Karnataka who also happens to hold the Finance portfolio made the following comment:

107. Akshara Foundation has developed Akshara Ganitha kits to facilitate teaching of Mathematics in simple way to enable the 4th and 5th standard students to understand Mathematics. These kits will be provided to students of Government schools in Hyderabad-Karnataka area in the first phase, in collaboration with Akshara Foundation utilizing the assistance from Hyderabad-Karnataka Development Board.

Akshara Foundation has been actively advocating bringing in effective teaching/ learning material (TLM) in primary schools to teach math to children in standards 4 and 5 along with building capacity in the public education system to sustain this over the long term. This commitment by the state to take our programme to all the 46,000 government schools in the state in a phased manner is a booster that will go a long way in enabling better learning outcomes of children in the state over the long term.

This initiative includes the following:

1. Ensuring that every school has teaching / learning material (TLM) kits to cover the needs of children in standards 4 &5.
2. Training for teachers in all the schools and for all Cluster Resource Persons (CRPs) in the state. We believe that once this is done across the state nearly **725 person years of training** will have been added to increase the state's systemic capacity.
3. Assessments for children in standards 4 and 5 by third parties.
4. Sharing information on a regular basis with all CRPs, Block Education Officers, DDPIs and other senior education department officials in the state.

The ***Ganitha Kalika Andolana (GKA)***was launched in the six districts of the Hyderabad Karnataka Region in the academic year 2015-16. To facilitate this programme, the state government had issued a formal Government Order granting exemption under Section 4G of the Karnataka Transparency in Public Procurement Act. GKA till date has been able to execute as follows:

(a) As per the Memorandum of Understanding between *Sarva Shiksha Abhiyan* and Akshara Foundation, 7,522 Akshara Ganitha kits were delivered by Akshara Foundation to schools in the districts of the Hyderabad Karnataka Region maintaining high quality, timely delivery and within budget.
(b) Akshara Foundation trained a total of 1280 Resource Persons of the State, who in turn have trained 7827 teachers in the schools of this Region.
(c) Akshara Foundation have developed training video modules for all the math concepts for grades 4 and 5 and have made this available through distribution of DVDs at Block levels and through *Gram Panchayats* and government high schools; through the website of Akshara Foundation (www.akshara.org.in).
(d) The *Sarva Shiksha Abhiyan* and the state DSERT have commissioned assessment studies through third parties.
(e) Akshara Foundation has also been maintained a field support team in all 32 educational blocks of the six districts of the Hyderabad Karnataka Region for over 20 months at a monthly cost of nearly Rs 12 lakhs. This staff has been trained and are available to support teachers and Cluster Resource Persons (CRPs).

GKA is now ready to be rolled out to additional districts in the state. Please find attached cost estimates to implement GKA in the districts of Bangalore Rural, Chikkaballapura, Chitradurga, Chamraj Nagar, Dharwad and Gadag. The **cost estimates do not include** Akshara Foundation's costs such as:

(i) Cost of time of senior personnel for our Research and Resource Groups
(ii) Cost of time and effort for fundraising personnel
(iii) Cost of programme management time

To get this phase of GKA implemented Akshara Foundation would request that the state government do the following:

(i) Issue a formal Government Order to implement this programme in the districts selected and mentioning the role of Akshara Foundation in the implementation.

(ii) Organize for the speedy execution of the process of procuring Akshara Ganitha kits and making them available in all government schools in the selected districts. Delays in the procurement and availability of kits in the schools will have an adverse impact on the programme.

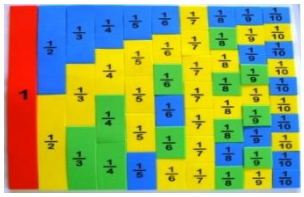
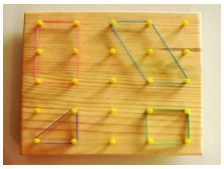
(iii) Organize for all Cluster Resource Persons (CRPs) and Block-level resource persons to utilize the IVRS / SMS-based tools developed by Akshara Foundation to report on the rollout of the programme. Akshara, in turn, will generate reports based on this data and share them with CRPs and block-level personnel as also with senior officials of the Education Department in the state.

(iv) Organize for the training of CRPs and teachers in the selected districts in a speedy manner.

(v) Instruct all Education Department officials on this implementation and requesting them to support Akshara Foundation field staff in making this happen.

Annexure- 1

The Akshara Ganitha Mathematics Kit

 Abacus	 Fraction strips	 Base 10 Blocks	 Geo Board
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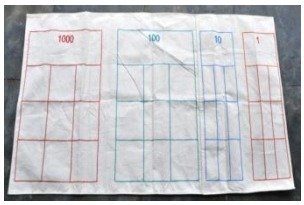
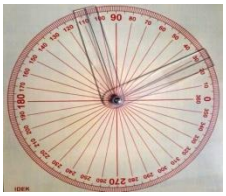
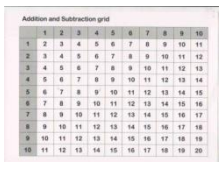
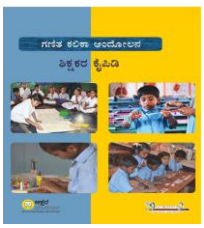
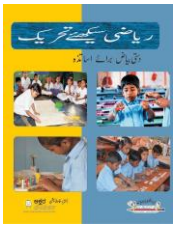
 Dice	 Measuring tape	 Number line	 Elementary pattern blocks
 Place value strips	 Place value mat	 Tangrams	 Play Money(currency)
 Compass and protractor	 Addition/ Subtraction and Multiplication Grid		

Annexure- 2
Teacher Manuals

Annexure- 3
Teacher Training in Phase-1


Annexure- 4
Inside the classroom- Phase-1