Initiatives Under the Sarva Shiksha Abhiyan for Improvement in Basic Numeracy Skills Among Children in the Early Grades

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The Sarva Shiksha Abhiyan (SSA) aiming for universalisation of quality elementary education for each child in the 6 to 14 age group has undertaken several initiatives to improve the quality of mathematics education both at Primary and Upper Primary level. This paper attempts to highlight some of such initiatives. Recently the SSA norms have been revised to strengthen the quality related interventions in a more rigorous manner. However learning achievement surveys undertaken by National Council of Education Research and Training (NCERT) and other agencies show that mathematics pedagogy calls for more attention to help children acquire the basic skills in mathematics. At present the attempt is to strengthen the early reading and mathematics skill development programmes at the Primary level and Mathematics teaching at Upper Primary level to prepare the students in a better manner. The paper attempts to highlight such initiatives, their strengths and limitations and indicates further possibilities to give it the desired direction.

Several initiatives have been undertaken in Sarva Shiksha Abhiyan for improvement of quality in mathematics learning in the schools. In this context following the lines from the position paper of the NCERT on Teaching of Mathematics remain the guiding spirit.

> The main goal of mathematics education in schools is the *mathematisation of the child's thinking*. Clarity of thought and pursuing assumptions to logical conclusions is central to the mathematical enterprise. There are many ways of thinking, and the kind of thinking one learns in mathematics is an ability to handle abstractions, and an approach to problem solving (NCERT, 2006).

Universalisation of schooling has important implications for mathematics curriculum. Mathematics being a compulsory subject of study, access to quality mathematics education is every child's right. We want mathematics education that is affordable to every child, and at the same time, enjoyable. With many children exiting the system after Class VIII, mathematics education at the elementary stage should help children prepare for the challenges they face further in life. In our vision, school mathematics takes place in a situation where: (1) Children learn to enjoy mathematics, (2) Children learn important mathematics, (3) Mathematics is a part of children's life experience which they talk about, (4) Children pose and solve meaningful problems, (5) Children use abstractions to perceive relationships and structure, (6) Children understand the basic structure of mathematics and (7) Teachers expect to engage every child in class.

Findings of the Baseline Learning Achievement Survey (BAS) and Mid-Term Learning Achievement Survey (MAS) of NCERT and other agencies for classes III, V and VII/ VIII have revealed that scores of students in mathematics are low and call for special attention. Table 1 reflects the poor scenario.

Mean Learning Achievement for								
Class III		**Class V**		**Class VII**		**Class VIII**	
BAS	MAS	BAS	MAS	BAS	MAS	BAS	MAS
58.25	60.92	46.51	48.46	30.50	38.76	39.17	41.50

Source: NCERT's Learning Achievement Surveys; Key: BAS - Baseline Learning Achievement Survey, MAS - Mid-Term Learning Achievement Survey

Table. 1. Learning achievement of students in NCERT's Learning Assessment surveys

It has also been realized that acquisition of basic mathematical skills in the early years of Primary schooling is very crucial for higher learning in mathematics. Accordingly SSA interventions have attempted to strengthen the early arithmetic development programmes in each state by identifying experts and resource agencies working in this area, designing plan of action for ensuring quality maths education in the early years, building capacity of trainers & teachers, undertaking organized numeracy assurance programmes for early grades on a large scale and tracking performance of students on a regular basis to sustain their learning continuum. Broadly the activities under SSA for numeracy skill acquisition in early grades can be categorized into the following areas.

a) Preparations at national and state levels for improving quality of maths education in schools

b) Envisioning exercises at national and state level for better understanding about mathematics education

c) Material development for different activities

d) Training of trainers and teachers for maths related activities

e) Promotion of innovative 3 'R's (Reading, 'Riting & 'Rithmetic) guarantee programmes in states

f) Diagnosis and remedial measures for children who need special assistance

g) Action research on basic numeracy related issues

h) Internal and external Learning Achievement Tests to track children's progress

i) Quality monitoring for tracking children's performance on a regular basis

Some of the salient activities under each category are discussed below.

a) Preparations at National and State Levels for Improving Quality of Maths Education in Schools

Following initiatives have been taken at the National level for ensuring the acquisition of basic numeracy skills in early grades.

- The National Curriculum Framework (NCF 2005), Position paper on mathematics education (NCERT, 2006), Syllabus for Primary classes and the textbooks have emphasized the need for improving the quality of Maths Education in the early grades and have defined a joyful and activity based classroom process by mathematizing the thinking process of children to create interest in mathematics, help in conceptual clarity and thereby reduce the math-phobia among children.
- A National Resource Group (NRG) has been constituted to critically look at various quality related interventions including quality of maths education under SSA. The NRG has repeatedly discussed the importance of acquisition of basic literacy and numeracy skills in early grades and has encouraged involvement of different Mathematics resource agencies for capacity building in states.
- A special cell named Group Arithmetic in the Department of Education in Science and Mathematics of NCERT has been formed to work on strategies for strengthening the early mathematics development programmes under SSA. This Cell has developed several mathematics learning aids, guidebooks, teacher training manuals and mathematics worksheets in this regard.
- SSA norms have been revised to accommodate recruitment of maths and science teachers, promotion of Learning Enhancement Programmes with focus on acquisition of basic literacy and numeracy skills, remedial teaching, etc.

In the States and Union Territories (UTs), various types of activities are undertaken in this regard. In states like Andhra Pradesh, Tamil Nadu, Karnataka, Orissa, Jharkhand, Kerala, etc., there are strong Maths Resource Groups at State level. They constantly interact with different Maths Resource Agencies for preparing and facilitating various maths related activities. They keep outsourcing their expertise in various areas. In this process States/ UTs like Jharkhand, Chandigarh, Goa have developed good quality worksheets and maths teaching materials. States also organize various innovative Maths Promotion activities such as *Metric Mela* (Community Maths Festival in good number of states), large number of Maths Clubs in Karnataka and number of states, Maths Marathon in Chattisgarh, Maths Festival in some states, Seminars and Workshops in Mathematics education, etc. The following paragraph highlights some of the types of activities of the Mathematics quality improvement programmes in Andhra Pradesh in recent years.

- Conduct of Maths Melas at district and state level every year by Sarva Shiksha Abhiyan.
- Maths through projects as a pedagogical strategy for understanding maths concepts.
- Development of Maths Forums at State and District Level.

- Development of Self Learning and Interactive Material cards for Classes I to III.

The following are the salient features of a Mathematics Festival called "Metric *Mela*" or "Ganitha *Mela*", in Andhra Pradesh.

- Ganitha *Mela* is an exhibition platform for pupils and teachers displaying potential activities, tasks and Teaching Learning Materials (TLM) which facilitates learning maths concepts.
- It is a demonstration of alternative Teaching Learning and Assessment strategies which encourages the pupils and teachers to participate in the *mela* and understand the logic of maths and comprehension of concepts through variety of activities / tasks / TLMs.
- There is active participation of children and teachers who undertake various competency based activities and individual oriented maths learning tasks and assessment activities to develop the abilities of estimation, logical thinking, problem solving, creative thinking, etc.
- Maths *melas* are organised with community support and provide a platform for their participation.
- In Ganitha *Mela*, there are about 25 suggested items each focusing on a certain specific concept. Each item is in a visitors' stall manned by teachers and students.
- Visitors move from stall to stall with an evaluation sheet. In every stall, students ask the visitor some questions and give certain tasks / activities to perform and assess the competency, and mark the evaluation sheet. The observer can self-evaluate after visiting all the counters by counting the correct answers he has given and arrive at a final score.

The State reports indicate that the Maths Festivals have been very popular and have created interest both among teachers and students. Some factors that may have contributed to their success and popularity are listed below.

- Teachers and parents could assess the mathematical standards of each student through performance tests, unlike the paper pencil tasks in traditional examinations.
- The examinees and the examiners are the students. So students participate freely in the *Mela*.
- Tasks / activities facilitate both learning & assessment.
- The self-evaluation ability and self-confidence also increases among the students.
- The teachers are able to demonstrate their students' mathematical activity to the parents and community.
- The *Melas* are a great source of learning and sharing maths tasks / activities / TLM which are grade & concept specific.

Mandal level *melas* are followed by district and state level *melas* duly displaying the best activities as judged by the expert committee at mandal and district level. Items at these *melas* are video recorded and used in telecasts through Doordarshan or teleconferences for larger sharing among teachers across the state. Such items are also documented and used in teacher training programmes.

This is one example where the State attempts to create interest among students in maths learning through a series of hands on activities in collaboration with community members. There are examples where states have attempted to strengthen their classroom processes in mathematics by using their available facilities like teacher training, materials and indicators. SSA, Goa has gone for an Universal Active Mathematics (UAM) Programme that has been developed in collaboration with some maths resource agencies for achieving quality maths learning in schools.

As per the State reports, UAM is a field-tested, complete and comprehensive programme which includes materials and systems for training of resource persons, teachers training, monitoring and support and also rigorous evaluation and remediation.

Components of the UAM include supply of mathematics kit and teachers' manuals to each school, regular workshops, implementation of programme through teachers, development of guidebooks in collaboration with teachers, school visits, monitoring and support, assessments through teachers, and Year-end assessment through School Chapter Co-ordinators and teachers.

The overall response to this initiative is reported to be good. Students' and teachers' appreciation is reflected in comments such as following:

- The kit includes quality materials that are easy to handle and long lasting.
- Children are engrossed while using the kit, it arouses curiosity, gives them joy. Mathematics seems easy instead of appearing difficult.
- Students get new ideas, understand concepts.
- Those students who were scared of answering earlier

are answering confidently.

- Using the kit the students learn by doing, the teachers do not have to give lengthy explanations and the subject is made easy.
- Good questions were asked by students.

A few quotes from teachers:

"I learnt a lot in the workshops. A number of concepts were clarified. Subject knowledge is strengthened. Workshops should be organized more often. We would benefit greatly".

"We get new ideas to guide students". "Each teacher now enters his class with fresh activities, new ideas. A change in teaching pattern is taking place".

"We realised that we are also largely responsible for making mathematics interesting to the students and for increasing their liking for mathematics".

"I was greatly benefited by the workshop and the handbooks. I was a new teacher with a new book. But the workshop helped me understand how to teach it".

The tests show that children's performance in the written examination is slightly lower than their performance in oral and practical. The relatively high percentage of students scoring above 80% marks, despite implementation of programme over a period of only 6 months, is likely due to the following factors:

- Full and wholehearted cooperation and participation by teachers in the implementation of the programme.
- Intensive interactions and discussions in series of workshops which were held over 6 month period and which were conducted directly by Master Resource Persons.
- The weightage in the test was approximately one third each for practical, oral and written tests.
- The test was designed to assess basic understanding in the various concepts and competencies.

These are two random examples to indicate that States have initiated wide range of activities to strengthen their maths promotion in and around schools. A wide range of teaching learning materials have been designed in states for maths pedagogy. Some of the innovative materials include the Maths Kits of Goa, Chandigarh & Tamil Nadu, audio visual aids including cassettes, charts, CDs, in many states. States such as Andhra Pradesh (through Mana TV), Karnataka, Tamil Nadu, Madhya Pradesh, Haryana, Gujarat, Kerala, Punjab, etc. (through EDUSAT, Satellite Television) are exposing their trainers and teachers to good teaching learning materials and pedagogical methods regularly.

b) Envisioning Exercises at National and State Level for Better Understanding of Mathematics Education

- The Department of School Education & Literacy (DSE & L) of the Ministry of Human Resource Development (MHRD) through the Pedagogy wing of Technical Support Group (TSG) has exposed the State Pedagogy Teams to the best of resource materials, resource agencies and resource persons in the area of Mathematics education. Some of the materials include Voluntary Service Overseas' (VSO) resource book on Maths Education, P. K. Srinivasan's resource books on Maths Teaching, NCERT's publications, wide range of innovative teaching learning materials developed by different resource agencies, etc. Some of the prominent resource agencies who have been involved in the capacity building of states include Homi Bhabha Center for Science Education (Mumbai), Navnirmiti (Mumbai), NCERT & Regional Institutes of Education, Jodo Gyan (New Delhi), Digantar and Bodh (Rajasthan), Eklavya (MP), Ramanujam Museum & Maths Education Center (Chennai), Vidya Bhawan Society (Rajasthan), Pratham (Mumbai & Delhi), Center for Science Education & Communication (Delhi), etc. National Workshops have been organized by the Ministry on Science & Mathematics Education, Resource Enhancement of Teachers, and Multi Grade Multi Level Pedagogy with focus on quality maths education.
- The MHRD has also organized series of workshops for states through Resource Enhancement Programme (REP) in collaboration with Delhi University, and Non-governmental organizations such as Digantar, Eklavya, Vidya Bhawan, etc., to facilitate better understanding among members of State Pedagogy teams regarding different Maths concepts.
- NCERT's Central Institute of Educational Technology, Indira Gandhi National Open University, etc., develop and telecast various types of Maths Learning activities through their audio – visual channels to help the State Mathematics teachers and trainers in their envisioning and preparations.
- A majority of States are collaborating with the resource agencies indicated above to improve the quality of their maths education, especially in the early years.

Similar steps have been taken by States for strengthening understanding, pedagogical preparations and performance of their trainers and teachers. They collaborate with the Maths Resource Agencies on a continuous basis.

c) Material Development for Different Activities

Many states have developed a wide range of materials for improving the quality of maths education, especially in the early years. Some of them include their curriculum documents in line with NCF 2005, syllabi, textbooks, teacher training modules, resource books on Maths learning, Maths Work books, Maths Worksheets, etc. As described earlier, many states/ UTs have developed mathematics kits for the early years.

d) Training of Trainers and Teachers for Maths Related Activities

Every State/ UT develops annual teacher training plans and modules for capacity building of teachers through the annual in-service training (for all regular teachers) and induction training (for new recruits) under SSA. For this each State/ UT develops training modules on Mathematics at both Primary and Upper Primary level. They are generally based on children's district specific needs and they guide the teachers on how to promote effective pedagogy for quality Maths education.

While developing the teacher training plans and training modules states take help from NCERT, Technical Support Group and different Maths resource agencies as indicated above.

e) Promotion of Innovative 3 'R's Guarantee Programmes in States

The MHRD has been constantly encouraging States/ UTs to develop Learning Enhancement Programmes with focus on acquisition of basic literacy and numeracy skills among children in early years. Over the years, States/ UTs have increasingly realized the importance of early literacy and numeracy and have designed 3 'R's guarantee programmes. Such programmes are initiated on a pilot basis in selected blocks. After some successful experimentation, such initiatives are expanded across the State/ UT to universalise acquisition of basic literacy and numeracy skills among children in the early years. More than 23 States/ UTs have already designed such initiatives. Among these most initiatives strive for early numeracy skill acquisition as well.

In such initiatives, States/ UTs undertake Students' Learning Achievement Tests in basic mathematics (Arithmetic) and Language to assess their learning levels. Through these they identify the learning difficulties in different concepts and also the students who need to be supported carefully. They grade the students, schools, clusters and blocks as per their performance in different subjects. Remedial measures are undertaken in an organized manner to develop appropriate learning materials, prepare teachers, and carry out 3 'R's guarantee programme along with effective academic support and monitoring. At regular intervals children's maths abilities are assessed to see that their performance improves over a period. Programmes such as Children's learning Acceleration Programme for Sustainability (CLAPS) in AP, Activity Based Learning (ABL) in Tamil Nadu, Noottikku Noorroo in Kerala, 3 Rs Guarantee Programme in Maharashtra, Integrated Learning Improvement Programme (ILIP) in West Bengal, etc., have demonstrated significant improvement in the numeracy skills of children in early grades.

f) Diagnosis and Remedial Measures for Quality Maths Education

States/ UTs such as Tamil Nadu, Karnataka, Andhra Pradesh, Gujarat, West Bengal, Orissa, Chandigarh, etc., have well organized diagnosis and remedial measures to track performance of children in mathematics and language. In other states they assess the performance of their students through their regular tests in the school internally.

NCERT has also developed verifiable and observable indicators for mathematics learning for class III level (for details write to the author). These indicators are being used by the States to set the tone for their mathematics classrooms as they enable the teachers and teacher support institutions to know how much children learn mathematics during their various mathematical pedagogical processes. Presently NCERT is in the process of developing similar learning indicators for other classes (classes V and VIII).

g) Action Research on Basic Numeracy Related Issues

States such as Tamil Nadu, Andhra Pradesh, Chhattisgarh, Gujarat, etc. have promoted action research on difficult areas in Mathematics learning through DIETs, BRCs, teachers, etc., and have designed remedial measures based on the finding of such research studies.

h) Internal and External Learning Achievement Tests to Track Children's Progress

The HRD Ministry has been insisting on establishment of systems in states for independent learning assessment of students. Other than the NCERT's regular nation wide Learning Achievement Surveys, states are also collaborating with various research & resource agencies and NGOs for getting their children's performance assessed. Some of the prominent agencies include Pratham (Mumbai), Educa-

tional Initiatives Private Limited (Ahmedabad), etc. Also the 41 monitoring agencies under SSA keep tracking the children's performance through regular visits and reporting.

i) Quality Monitoring for Tracking Children's Performance on a Regular Basis

SSA has strengthened quality monitoring through the NCERT's Quality Monitoring Tools that collect feedback from states (from school up to state level). Learning Achievement in different subject areas are regularly tracked at different levels to ensure that States/ UTs manage to identify the learning difficulties and pedagogical issues from time to time and design quality improvement strategies to address such issues and problems. Performance of children in each class in different subject areas is tracked through this. Other than this District Information System on Education (DISE) also reports the learning achievement of students to an extent.

Conclusion

At present the Sarva Shiksha Abhiyan is encouraging all states and UTs to design organized learning enhancement programmes to improve the classroom processes in different subject areas at both Primary and Upper Primary level. Several large scale effective initiatives have been launched including 3 'R's Guarantee Programme and Educational Quality Improvement Programme (EQIP) of Maharashtra, Integrated Learning Improvement Programme (ILIP) in West Bengal, Activity Based learning (ABL) and Active Learning Methodologies (ALM) in Tamil Nadu, Karnataka Schools towards Quality Education (KSQE) in Karnataka, Buniyad in Jharkhand, Neev in Uttarakhand, Aadhar in Himachal Pradesh, Children's Learning Acceleration Programme for Sustainability (CLAPS) in Andhra Pradesh, Gujarat Achievement Profile (GAP) in Gujarat, Nai Disha of Uttar Pradesh, Multi Lingual Education programme for tribal areas in Orissa and AP, Noottikku Noorroo in Kerala, etc. In 2008-09 nearly all States/ UTs are gearing up for similar activities on the large scale with an aim to mobilise their classroom processes towards active pedagogy.

The above interventions make one feel that in terms of numbers and the diverse nature of interventions lots of creative and large scale activities are taking place. At the same time learning outcomes in Mathematics both at Primary and Upper Primary level as depicted by various independent learning assessment studies do not reveal a satisfactory situation in mathematics education at the elementary level.

This makes one ask if these interventions are sufficient and appropriate to improve the mathematics learning skills of students everywhere as desired. It still calls for lot more thinking and preparations to achieve the SSA goals aiming for universal quality education in the 6 to 14 age group. Mathematical resource centers, universities and mathematicians need to think about it more and should explore strategies to improve the quality of mathematics education in the country. Not much research has been done in this area to appropriately and adequately address the problems in India.

References

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