

**FOSTERING MATHEMATICAL SKILLS THROUGH COMMUNITY BASED
EDUCATION PROGRAMME****Dr. Mayur Pujari**

Assistant Professor, Dept. of Education

Central University of Karnataka, Kalaburagi, Karnataka, INDIA

Abstract

The purpose of this study is to investigate the influence of community-based education on mathematics learning of elementary school student's. For the present study experimental method was adopted. The researcher has selected 2619 students from class III, IV, V, VI, VII and VIII through simple random sampling technique. Mathematics Skill Inventory developed by the researcher is used to collect the data. Findings of the study revealed that, the average overall Endline (EL-86%) score is higher than baseline (BL-51%) score, with 34.9% gain in Mathematics. The average endline performance for mathematics test ranges from 78% to 92.7% across classes (grade III to XIII) for all the students. Common students have scored in range of 83.4% to 91.3%. Meaningful improvements are observed from BL to EL with differences statistically significant, and large effect sizes.

Key Words: Academic learning, Pandemic, Community learning centers and Animators.

Introduction

Education, particularly at the elementary level, is deemed crucial for every individual in a democratic society. Primary education lays the essential groundwork for enhancing human resources, which are vital for our personal, social, and national growth. The development of our nation depend on both the accessibility and quality of primary education.

In the above context “The COVID-19 pandemic had a very negative impact on formal educational activities since March 2020. School have been closed and students have been away from their traditional classroom learning setup for extended periods of time. A total of 320 million learners in India have been adversely affected with e-learning as the only solution offered (Khan and Mohakud 2020). With significant regional and household disparities in access to the internet and technology, this transition has not been possible for many students, especially students from disadvantaged, rural backgrounds. The education system in India is facing a new crisis. Besides the anticipated effect on learning outcomes, experts suggest that the extended school closure is likely to result in a loss in human capital and diminished economic opportunities in the long run (UNICEF 2021)”.

Need and Importance of the Study

Primary schooling is the starting phase of education that lays the foundation for a child's learning journey. It is a crucial period where children develop fundamental skills, gain knowledge, and shape their overall growth. In India, primary education has two parts: lower primary (grades 1 to 5) and higher/upper primary (grades 6 to 8). This education helps students between the ages of 6 and 14, when children begin to seek information, skills, and personal development. In India, for many students, primary education is the gateway to a better life. It teaches children fundamental reading, basic mathematical operations, and life skills necessary to escape the cycle of materialism and achieve success in life.

In Yadgiri district of Karnataka, COVID-19 had a direct impact on children's education and well-being, as well as on family health and livelihoods. Consequently, the 2021-22 academic year required significant attention from external organizations in addition to government agencies to mitigate the adverse effects of the pandemic on education. Schools were closed from mid-March 2020 and reopened only in December 2020. However, the second wave of COVID-19 in Karnataka led to another closure of schools from April 2021 onwards. Parents' fears and anxiety about COVID-19 resulted in a steep decline in student enrollment and attendance, leading to poor learning outcomes during 2021-22. The situation was further exacerbated by the ongoing pandemic, school closures, and loss of livelihoods. While e-learning became the norm in private elite schools and received considerable media attention, it was not a feasible option in this context. When schools reopened, it was anticipated that student attendance would be low, learning levels would have deteriorated, and the psychological impact of fear and misinformation would further affect schooling.

Considering the ground reality in ensuring continued effectiveness and impact of last six years investment of Kalike on primary education in North-East Karnataka for strengthening the system and ensuring quality education, it was found highly desirable in engaging the system during the pandemic situation. The objective was to support the system to respond to the situation more effectively in promoting academic activities through running up community level learning centres for school children, onsite support and community/SDMC engagement to keep the tempo and spirit of school functionaries, parents, and children.

The present study assess the school students learning facility even during COVID pandemic situation and the impact of alternate mode of learning engagement to students during school closure due to COVID pandemic in Yadgiri district. The findings of the study may help to understand the learning achievement of students and design an appropriate remedial input to cope of grade specific learning's. Further, bring an insight to build activities to enhance student's mathematics learning and provide a broader frame in such community level intervention.

Objective of the Study

- To examine the influence of community-based education interventions on students' mathematics performance.
- To compare the mathematics learning achievements of elementary students.

Methodology

The present study was experimental cum analytical research in nature and the study was designed to understand the influence of community based education programme. The study was conducted in Yadgiri blocks of Yadgiri district in Karnataka state by adopting random sampling technique. Out of 156 villages in Yadgiri block, 50 villages were selected with considering where enrolment is higher than 150 students in the elementary grade. In these 50 villages, the intervention was implemented with taking consensus of various stakeholders including the parents.

Sample of the present study was selected through simple random sample technique from 50 villages. For the Baseline 11 villages and Endline 12 villages were selected and tested 1243 and 1376 students in baseline and endline respectively from grade III to VIII. The following table-1 gives details of students tested in baseline and endline assessment with coverage of girls and boys.

Table-1: Total Number of Students Tested							
Baseline (Oct 2021)				Endline (April 2022)			
Grade	Girls	Boys	Total	Class	Girls	Boys	Total
III	131	92	223	III	138	99	237
IV	124	100	224	IV	145	99	244
V	112	100	212	V	117	110	227
VI	125	114	239	VI	147	110	257
VII	143	106	249	VII	147	92	239
VIII	50	46	96	VIII	94	78	172
---	685	558	1243	--	788	588	1376

Variables

- Independent variable – Community Based Education
- Dependent variable – Achievement in mathematics
- Background variable – Gender, Locality

Intervention of the Study

The prime objective of this intervention is to support children's learning and engage within community with various activities during school closure and support active participation in schools once they re-open. Therefore, to ensure the children participation in learning activities and provide individual attention, village level children groups were formed with consisting of 25 children. Mostly these are grade-based groups and planned 2-hour academic input sessions (an alternate day) with establishing Community Level Learning Centers (CLCs). These CLCs were led by a qualified

partially paid Animators or Volunteer. Animators were trained on comprehensive plan to conduct academic and co-curricular activities to facilitate the sessions with children (face-to-face). Further, supplied a workbook and learning materials for individual children to practice and acquire mathematics skills. The workbook was designed with considering basic competencies of mathematics subject. Animator monthly meeting was conducted to review the implementation of progress and provide additional inputs on monthly basis to Animators.

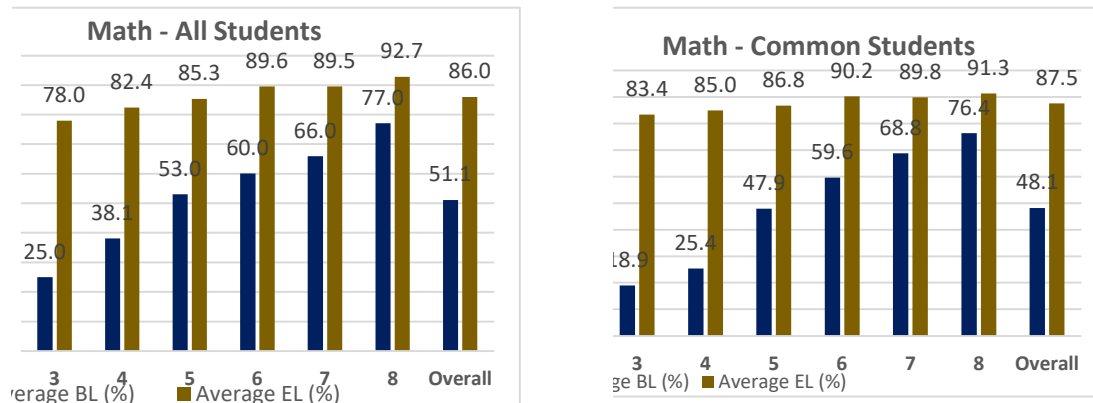
The assessment tools are developed by investigator with referring resource available in relation to mathematics skills development and assessment with consulting various consultants and experts in the field of education. The assessment tools are intent to understand learning level of students in Mathematics subject. The tool consists of 14 items (both including oral & writings items) to assess the basic skills like understanding the numbers & numerals upto 1000, 2 digit addition with and without carrying over, subtraction of 2 digit numbers with and without borrowing, word problems on addition and subtraction, operation of multiplication and division to solve daily life problems, Understands fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{3}{4}$. Further, as part of this study appropriate process was followed while finalizing the assessment tools and checked the reliability and validity with using technical tool.

Statistical Techniques

- *Average Score* - An average test score or mean score is calculated by summing up all the scores on an assessment and dividing the total by the number of scores.
- *Standard Deviation* - Standard Deviation (SD) is one of the basic methods of statistical analysis. It typically shows the deviation (variation/dispersion) from the mean/average.
- *Gain (El-BL)* - Gain is difference in the scores of endline and baseline tests.
- *Cohen's D/Effect size* - Cohen's D or standardized mean difference measures the effect size of difference between two groups or means.
- *Effect Size* - Effect size is a quantitative measure of the magnitude of the experimental effect. The larger the effect size the stronger the relationship between two variables. The interpretation of effect size is based on Cohen's d values. The value of 0.2 is considered as Small effect = 0.2; the value of 0.5 represents Medium Effect = 0.5 and the value of 0.8 a Large Effect. If the difference between two group's means is less than 0.2, the difference is negligible even if it is statistically significant.

Analysis and Interpretation of the Data

This section presents the overall findings of the study as well as describes the grade wise performance of students with comparing baseline and endline. The data reveals that the average overall Endline score is higher than baseline score, with 34.9% gain in Mathematics (Fig-1). The average endline performance for Mathematics test ranges from 78% to 92.7% across classes for all the students. Common students have scored in the range of 83.4% to 91.3%. Meaningful improvements are observed from baseline to endline with differences statistically significant, and large effect sizes.

Table-2: Overall Performance of Students

Overall, 96% students scored above benchmark cut-off in Language. 30 to 69% point increase is observed in the percentage of students above benchmark cut-off from baseline to endline. The study reported 30 to 50% increase in students scoring ‘above 80%’ in endline in Mathematics. The average endline scores are higher than baseline scores for all classes by 15.7% to 53% points for all students and 14.9% to 64.4% for common students between baseline and endline.

The study revealed that, girls have shown marginally higher improvements than boys in class III and VIII. Boys have performed better than girls in class IV, V, and VII. However, the difference is statistically significant in class VII with small effect size. A weak positive relationship is observed between the attendance percentage and student’s performance in endline. However in Math, students who have attendance ‘above 75%’ have performed higher than the students in other attendance categories.

The performance in mathematics oral, ranges from 67.2% to 97.9% across classes in Endline. 6.7%. to 24.9% point improvement in mathematics oral is observed across classes. However, the difference in the performance is statistically significant in classes III & IV have shown the highest improvement over baseline.

Table-3: Overall Performance of Students

Class	Math – All students				Math – Common Students between BL and EL			
	Gain (EL-BL)	Significance *	Cohens' d	Effect Size	Gain (EL-BL)	Significance *	Cohens' d	Effect Size
Class 3	53.0	Sig*	2.7	Large	64.4	Sig*	3.7	Large
Class 4	44.3	Sig*	2.1	Large	59.6	Sig*	3.2	Large
Class 5	32.2	Sig*	1.6	Large	38.9	Sig*	1.9	Large

Class 6	29.5	Sig*	1.6	Large	30.6	Sig*	1.7	Large
Class 7	23.6	Sig*	1.2	Large	21.0	Sig*	1.0	Large
Class 8	15.7	Sig*	1.0	Large	14.9	Sig*	0.8	Large
Overall	34.9	Sig*	1.5	Large	39.4	Sig*	1.6	Large

Skill-wise Performance result: This skill-wise result is an important observation for the research point of view to understand how students have performed on different skills. It also shows the high and weak performing skills among all the skills tested in each grade. The skill-wise report shows the skill name and questions in each skill along with their average scores and SD for both baseline and endline tests. Skill-wise analysis of mathematics paper shows that among all the skills tested, students have done well in skill, Students have scored in range of 53.9% to 96.7% across classes in this skill (Table 4 & 5). The lowest performance is in skill, ‘subtraction of 2 digit numbers with borrowing’ across classes. Most of the skills tested across classes have shown the improvement by 5% to 61% points across classes.

Table-4: Mathematics Skill performance among students of Class III to V

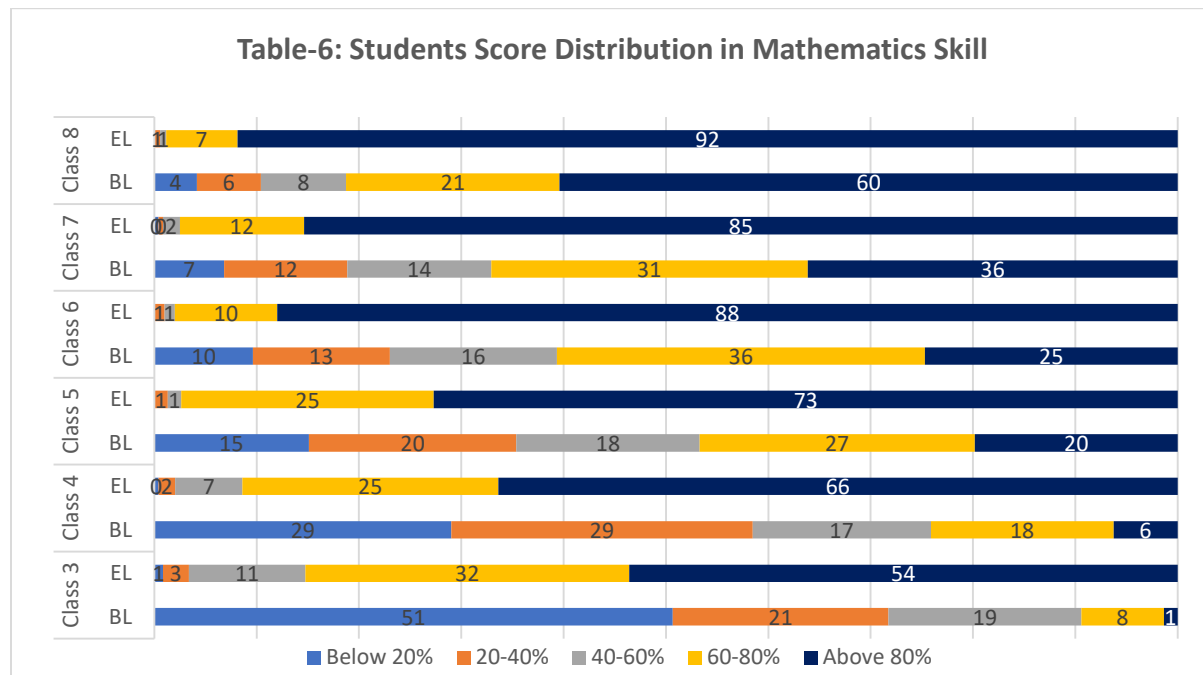
Sr. No	Skill Name - Math	Question	Sub Question (Items)	Class 3 BL	Class 3 EL	Class 4 BL	Class 4 EL	Class 5 BL	Class 5 EL
1	Understanding numbers and numerals upto 99	1, 3	8	45.2	89.2	61.7	93.5	73.3	94.5
2	Understanding numbers and numerals upto 1000	2,4,5,6,7	20	27.9	79.5	41.9	84.6	56.9	88.6
3	2 digit addition without carrying over	8	4	30.8	87.6	48.7	92.9	71.6	93.6
4	2 digit addition with carrying over	9	4	11.1	69.4	25.9	77.0	44.9	80.7
5	Subtraction of 2 digit numbers without borrowing	10	4	16.4	77.0	28.9	81.5	47.6	88.4
6	Subtraction of 2 digit numbers with borrowing	11	4	2.4	53.9	10.9	61.9	23.8	61.2
7	Word Problems on Addition and Subtraction	12	4	24.2	83.5	39.1	82.9	56.6	84.3
8	Operations of multiplication and	13	4	14.8	73.7	16.2	76.1	31.4	76.2

	division to solve daily life problems								
9	Understands fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{3}{4}$	14	4	20.4	70.5	30.8	70.8	35.5	77.5
	Overall		56	25.0	78.0	38.1	82.4	53.0	85.3

Table-5: Mathematics Skill performance among students of Class VI to VIII

Sr. No	Skill Name - Math	Question	Sub Question (Items)	Class 6 BL	Class 6 EL	Class 7 BL	Class 7 EL	Class 8 BL	Class 8 EL
1	Understanding numbers and numerals upto 99	1, 3	8	78.1	95.9	81.9	95.8	89.2	96.7
2	Understanding numbers and numerals upto 1000	2,4,5,6,7	20	64.0	91.7	69.9	91.5	77.4	95.2
3	2 digit addition without carrying over	8	4	78.1	96.0	81.7	94.4	91.4	96.5
4	2 digit addition with carrying over	9	4	60.9	87.4	62.6	87.8	79.4	90.1
5	Subtraction of 2 digit numbers without borrowing	10	4	61.7	88.9	68.0	89.6	84.1	89.8
6	Subtraction of 2 digit numbers with borrowing	11	4	33.6	76.9	40.6	77.7	60.7	81.0
7	Word Problems on Addition and Subtraction	12	4	60.5	85.7	69.6	87.1	77.1	94.0
8	Operations of multiplication and division to solve daily life problems	13	4	29.1	80.8	39.1	84.3	54.7	88.2
9	Understands fractions $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{3}{4}$	14	4	40.6	87.9	48.7	83.2	65.4	89.4
	Overall		56	60.0	89.6	66.0	89.5	77.0	92.7

Students Score Distribution



The student score distribution data (Table-6) shows that, in Mathematics, the percentage of students scoring ‘below 20%’ are Nil across classes in EL as compared to BL. A very few students are in lower scoring bands. About 54% to 92% students have scored ‘above 80%’ across classes in Endline. Primary (III to V) classes have observed significant shift from students scoring in lower bands to higher bands in comparison with higher primary (VI to VIII).

Major Findings

The findings of the present study are as follows,

- The average endline performance for Math test ranges from 78% to 92.7% across classes for all the students. Common students have scored in range of 83.4% to 91.3%.
- The average endline scores are higher than baseline scores for all classes by 15.7% to 53.0% for all students and 14.9% to 64.4% for common students between baseline and endline 15.9 to 34.4%-point improvement in language oral is observed across classes.
- Meaningful improvements have been observed from baseline to endline with differences statistically significant with large effect sizes.
- Primary classes (III to V) have shown the highest improvement across classes in comparison with higher primary classes (VI to VIII).

Education Implications

Based on the results, the following educational implications can be drawn:
The primary goal of this intervention is to support children’s learning and encourage students to persist in their education even under challenging circumstances. The study indicates that

implementing such an innovative approach will help students acquire essential academic skills and stay engaged with various learning activities. In this context, developing learning strategies at the community level, with active participation from local resources and resource persons, will emphasize the importance of education and enhance academic performance. Additionally, this will help create an enabling environment to achieve the universalization of education and establish a high-quality education system in the country. Therefore, initiatives such as public-private partnerships and the involvement of community stakeholders have a significant impact on achieving universal education and delivering quality education.

Summary and Conclusion

The study findings suggest that a comprehensive and constructive design of intervention inputs effectively enhances students' learning levels. Community-based engagement involving the school system significantly reduced adverse impacts on enrollment, attendance, quality of teaching, learning, and children's overall well-being. To ensure student participation in learning activities and provide individual attention, village-level student groups, each consisting of 25 children, were formed. These groups were mostly grade-based and participated in planned 2-hour academic sessions every other day at Community Learning Centers (CLCs).

Qualified and partially paid Animators/Volunteers led these centers. These animators were trained to conduct both academic and co-curricular activities through face-to-face sessions with the students. Additionally, workbooks and learning materials were provided to individual students to practice and acquire basic mathematics skills. As a result, students' academic performance improved, with average endline scores surpassing baseline scores by 15.7% to 53.0% across all classes. These kinds of interventions could be designed and implemented in various locations within the state to further validate and refine the results.

Limitation of the Study

The major limitation is,

The community-based education intervention was designed and implemented in only one block of Karnataka, and similar experimentation is needed in other regions.

References

- Impact of Covid-19 on students living in Poverty by UNICEF (technical note by Dec 2021).
- The loss of learning for students during the pandemic by Azim Premji University (Feb 2021).
- Examine the learning losses of students in the Covid-19 process according Teacher's opinion (Fehmi, Faysal & Murset –Sept 2022).