



NUMERACY BOOST INITIATIVE

Endline Report

Sponsorship Program
Egypt Country Office



MEAL Department

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Introduction

In the 2016-2030 strategy, Save the Children is committed to ensure that all children learn from a quality basic education, especially the most deprived children. In educational settings, this entails reaching children with the least access to a quality education and children who are the least likely to be supported to learn. These children often live in remote rural areas or urban slums, they come from families of low socioeconomic status with few learning supports at home, and, in the early grades of primary school; they are often already struggling to master basic skills. Foundational reading and numeracy skills are essential for empowering individuals to lead a productive life.

Numeracy Boost is a research-based toolkit for teachers, students and the entire community that focuses on giving children the basic math skills they need to thrive in daily life. Through games, activities, small group work, and discussion, children learn about foundational math topics like counting, addition and subtraction, geometry and measurement. Teachers participate in math training sessions that help them think differently and more flexibly about how to teach math. Community action activities engage parents and other members of the community in math activities that reinforce the idea that math is all around us and not just a subject taught in school.

Numeracy Boost works at three levels: the student, the teacher, and the community. First, student's skills in math are assessed, then teachers are trained to enhance their teaching methodologies and skills to help develop their students' math knowledge and understanding. Finally, as math isn't just a subject in a classroom, families and communities participate in activities like family math days and math camps with their kids. Fun math projects are introduced—like cooking, going to the market, harvesting—to show how math is an important part of everyone's daily lives.

Sponsorship funded programs in Save the Children Egypt, have decided to pilot Numeracy Boost in 25 primary public schools in Assuit, Upper Egypt. The staff worked closely with the Ministry of Education (MOE) partners to revise and modify the existing tools, materials and curriculum to match the Professional Academy of Teachers (PAT)'s standards. With MOE, directorate and district level selection of trainer criteria-have been done. A training of trainer program has been delivered to 13 master trainers, who in turn trained 120 Math's teachers in the 25 schools. As a first step they contextualized the curriculum to fit in the Egyptian context, afterwards the education program team have developed an improved curriculum for Numeracy Boost adding three separate modules one for the trainers, the second for the teachers, and the third one is enrichment readings & information to obtain MOE's certification. As a result, the Numeracy Boost approach has been spread and scaled up all along the year in all of the 11 Districts in Assiut Governorate, reaching 420 primary schools by providing them toolkits and educational aids and enhancing more than 900 Math teachers through technical workshops on using the materials.

To improve the quality of educational services (Numeracy Boost, social work, psychological support and Arabic booster) provided to students, the program focused on building capacity of teachers' supervisors as well to be equipped to provide on-the-job training to other teachers and to avoid conflict between teachers' performance and supervisor's expectations.

In order to have a better understanding of how children were benefitting from the BE program and to improve their learning, it was decided to assess the numeracy skills of the children in grade 3 as a baseline in 2015 against which the program progress at the end-line assessment which is the subject of this report. This report presents the progress the children at grade 3 have made in their numeracy skills.

The test used is designed to assess children's numeracy skills across three major domains and to reflect the picture of the children's numeracy level and to also guide country teams and technical assistance providers to get clear vision about the program progress and if any correction is needed.

Assessment objectives

The endline evaluation seeks to provide the program with practical recommendations for the intervention that has been done using the numeracy boost approach. The objectives of this endline are as follow:

- To collect data about the current numeracy skills of the targeted students to inform the project planner of the results of the program implementation and for future planning;
- To provide end line measures to serve the future documentation of the project progress against the project's indicators.

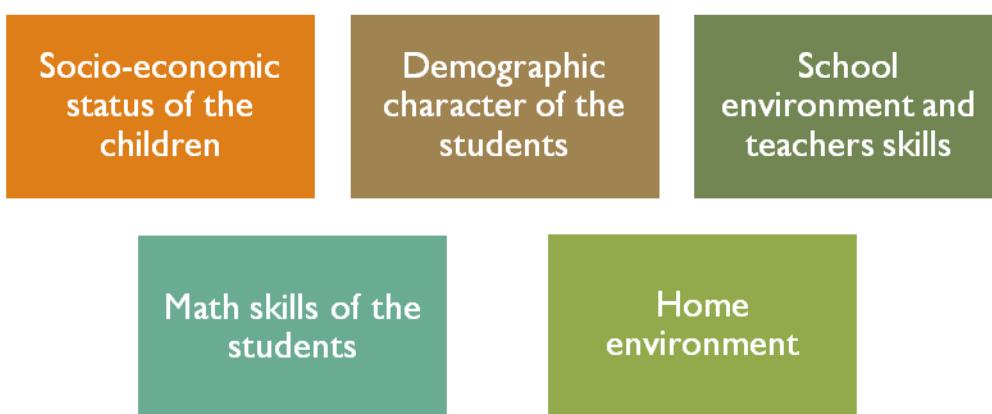
Assessment methodology

Sample size

This assessment was conducted in 25 Abnoub schools (Rural and Urban areas) in Assiut governorate. Sample was drawn from the total students at grade 3 in the 67 schools in Abnoub (7860 students). The students in these schools were assessed for their math level for a second time.

Sample technique

- Random sample from Abnoub schools (provided in a list of 67 schools from the ministry of education) has been taken. 25 public schools (with odd number in the list of the ministry of education) have been chosen as intervention schools in the baseline and the same schools were surveyed in the endline.
- Systematic random sample is selected to be the method of sampling the schools' students. Schools with high students' density, 15 students have been chosen inside these schools. Schools with less students' density, 10 students have been chosen inside these schools.
- Gender representation in the sample is considered, boys and girls are equally represented in the sample



Study Components

Eligible students will be assessed using a tool with 5 sections covering the 3 major domains of Number and Operation, Geometry and Measurement.

- ✓ Demographic character of the students
- ✓ Socio-economic status of the children
- ✓ Home environment
- ✓ School environment and teachers' skills

Math skills of the students and this covers the ability of the child in:

- 
- Dealing with money
 - Numbers identification
 - Value of the number place
 - Skip 5 counting
 - Pattern Identification
 - Identifying missing number
 - Summation
 - Subtraction
 - Math problem solving
 - Geometric shapes identification
 - Identifying measures
 - Time identification

Data management

- Data collection was done by trained team of data collectors in 2 weeks' period using Tangerine.
- Data analysis was done using SPSS version 21.
- The significance of differences among groups was assessed by the Student t-test, and analysis of categorical variables was examined by the chi-square test. A value of $f \leq 0.05$ will be considered significant for all statistical analyses, with a respective 95% confidence interval (95% CI), Value of P “Error” 5%.
- Numerical variables were summarized with mean \pm standard deviation SD.
- Correlation and regression were done to detect the strength of the relations between variables
- Analysis has been developed based on comparing baseline in 2015 against endline in 2017 for the same grade 3.

The critical purpose of this analysis is to present a profile of children's skills in numeracy, as well as an in-depth analysis of each skill. Summary statistics will be used to analyze students' performance in each of the Math sub-tests, and t-tests assuming unequal variance between samples will be used to compare intervention and comparison student scores

The relation between the students' math results and different predictors were tested using correlations to determine the level of effect for each predictor.

Ethical considerations

- Approval from the ministry of education was obtained before applying the program in the intervention schools
- Ministry of education was involved in all level of program approval and selection
- Written approval was obtained from the child if he/she could write his/her name or verbal approval if he/she could not

Assessment findings

Students' socio-demographic characteristics

- The total number of students' assessed was 280 students in the Baseline against 223 students in the Endline for grade 3.

Gender	Baseline	Endline
Males	137 49%	98 44%
Females	143 51%	125 56%
Total	280	223

- The average number of the family members is 5
- 79.4% of the students have one parent working; mainly the father (70%); while 12.5% of the students have both parents working and only 8% none of the parents are working.
- In the baseline, 60.4 % of children were enrolled in ECCD classes against versus 72.2 % in the Endline.
- 79% of the children in the baseline were involved in chores either at home or outside, in the endline the percentage has increased up to 84%. The average time spent in chores recorded is 52 minutes in the Endline comparing to 55 minutes spent in studying per day.

In total, the average socio-economic status of the children is quite similar for both Baseline and Endline evaluations (score was made for each child assuming that car=3, computer =2, play station= 1).

School environment

Teachers not only need knowledge of a particular subject matter but also need to have the knowledge about methodologies of teaching and best way of delivering the knowledge to the students. Teacher competency in these areas should be closely linked to student thinking, understanding and learning in math education.

Teachers were assessed regarding their general teaching skills, active learning approaches and skills in motivating and engaging children in math and learning. Their skills score was recorded before the intervention starts to be a baseline for comparison with the Endline after implementation of the program in 2017.

Children of grade 3 were asked about how teachers teach them in math classes and if they are using the active learning approaches or not. In the Endline (two years after), children have been asked again about their school environment and children answers were as follow:

Table I:

Items	Pre program N=280	Post Program N=223
Teacher uses materials in teaching	26.1%	41.3%
Teacher uses songs	6.1%	5.8%
Teacher uses games	2.9%	4%

41.3% of interviewed children, on average stated that their teachers were using materials in teaching math against 26.1% in the baseline. When asked about using songs and games, interviewed children scored 5.8% and 4% consequently in the endline against 6.1 % and only 2.9% for the baseline.

It is noticed that some skills have improved post program intervention positively such as using materials in teaching math while the other two skills (using songs and games) have not shown significant improvement, either they slightly increased or stayed at the same baseline level.

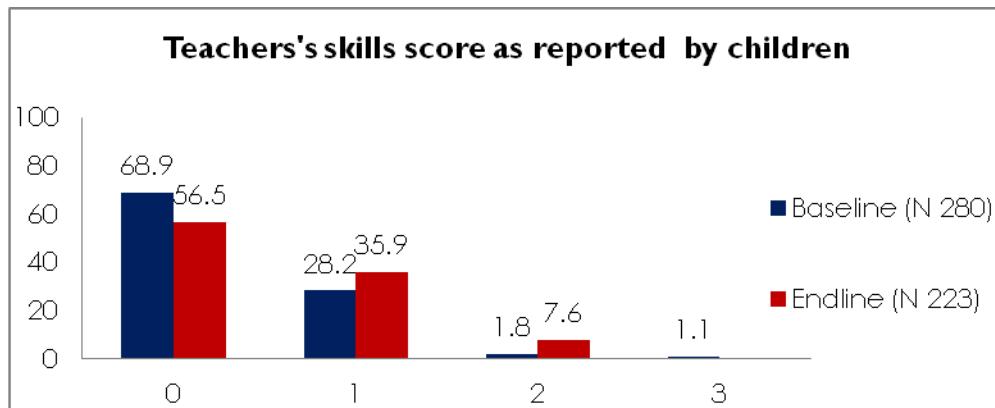
*Figure 1 Teachers' skills when teaching mathematics to children in the school*

Figure 1 illustrates teachers' skills score for grade 3 in both Baseline and Endline groups¹. This indicates a slight decrease in the percentage of teachers who don't use any skill when teaching children (56.5% in the endline against to 69% in the baseline). However, almost 44% of surveyed children reported that their teachers are using more than one interactive teaching methodology against 30% in the baseline.

The average score of the teachers' skills was 0.5 against 0.3 in the baseline which means that almost all teachers do not apply any teaching skills in classes as reported by children.

The program should focus more on coaching and supervising the teachers' skills application in the classroom rather than only training. For better results and engagement, follow ups and supervisors' training are needed to make teachers are using interactive methods in their teaching subjects and reach the optimum subject knowledge and skills for children.

¹ Scoring of the teachers' skills was done according a maximum score given of 3(i.e. 3 items are available). For example, if they use material (score=1), and if they use songs (score=1), use games (score=1), which will add up score: 3.

Home environment:²

Parents' educational level, jobs or income has been believed to be a factor in academic achievement. Parents serve as a role model and a guide in encouraging their children to pursue high educational goals and desires by establishing the educational resources on hand at home and holding particular attitudes and values towards their children's learning.

Figure 2 below explains the average percent of the children reporting having different source of math support in their home.

Children have reported that a least one family member is doing the following

- Using math at home (99% against 84% in the baseline)
- Encouraging the child to do math (99% against 98% in the baseline)
- Helping him/her in math calculations (91% against 67% in the baseline)
- Playing math game with him/her (75% against 56% in the baseline)

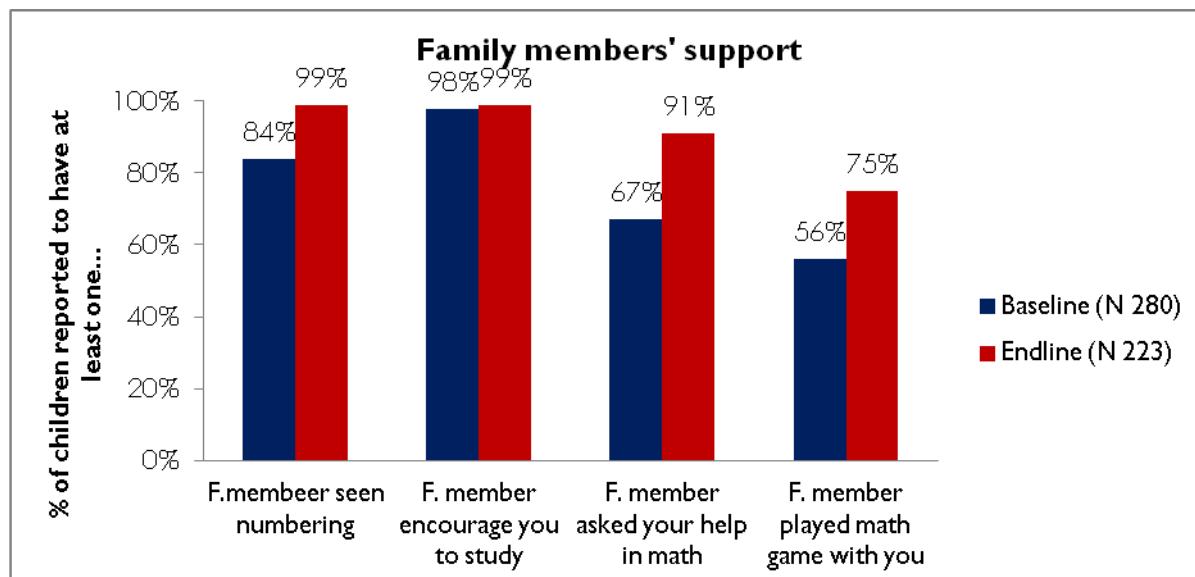


Figure 2 Family member's support in studying mathematics

The average score of home environment which indicates how much support children receive at home, is 11 ($SD \pm 4.5$) out of 25 in the endline while in the baseline it scored only 8.6 ($SD \pm 4.4$). When testing home environment of children; there was no significant difference between male and female.

Socio-economic status of the child³

Socio-economic status might be a predictor of mathematics achievement. Thus testing the home assets and social welfare level of students with their math achievement scores is required.

² Home environment variable is calculated by adding the following: having family member who is practicing math in house (1 per each), family member encourages you to study (1 per each), family member asks your help in calculating something (1 per each), family member plays math games with you (1 per each) plus families who have at least one kind of books (text book, religious, story, coloring, newspaper, magazine) at home.

³ Assets score was done assuming that having a car (score =3), having computer (score=2), having play station (score=1), then the overall score was done per child.

Families with higher socio-economic status might be more involved or have more resources to be involved in their children's education than families of lower socio-economic status. This greater involvement might result in development of positive attitudes of children toward school, classes, and enhancement of academic achievement. Also low socio-economic status might negatively influence academic achievement, in part, because it prevents students from accessing various educational materials and resources, and creates a distressing atmosphere at home, for these reasons; socio-economic status of a student is tested as a common factor that determines academic achievement.

The average assets score is 1.4 out of 6 while in the baseline was 1.2 out of 6. There is no significant difference between the two groups and the overall socio-economic status of the children is considered low. This is tested again the endline to validate the socio economic characteristics of the students assessed as they were not paired sampling.

Child math practicing⁴

Math should be part of the students' daily practices either at home or outside home and school, outside home or school practices is believed to improve students' level in math calculations. For this; children practicing math is assessed, and targeted in the Numeracy Boost program.

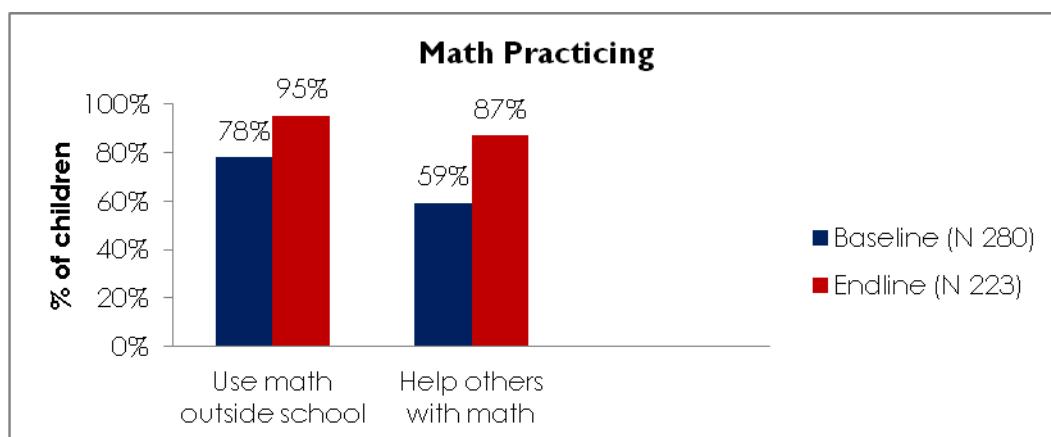


Figure 3 Grade 3 students practicing math

On average 95 % of the children use math outside school while 87% of the children help each other in using math compared to the baseline where on average 78 % of the children use math outside school and 59% of the children help others in using math.

The mean score for surveyed children in the endline was 1.8 out of 2 when the baseline was 1.3 out of 2 with no significant differences between male and female.

⁴ Scoring of the child's math practicing was done by assuming that practicing math outside school =1 and helping others in math =1, so the total score for child practicing math is 2.

The Overall Math Score for each skill:

Comparison _ Mean scores		Baseline N=280	End-line N=223
1.	Money skills (out of 2)	1.1 55%	1.5* 75%
2.	N. identification (out of 12)	4.4 36.7%	7* 58.3%
3.	Value of N. place (out of 4)	2.8 70%	3.4* 85%
4.	Skip 5 (out of 7)	1.7 24.2%	3.8* 54.2%
5.	Pattern identification (out of 3)	1.8 40%	2.4* 80%
6.	Missing number (out of 3)	1.2 40%	2* 66%
7.	Addition correct per minute	2.6 16.2%	4 25%
8.	Subtraction correct per minute	2.2 13.7%	3.3 20.6%
9.	Problem solving (out of 3)	0.5 16.6%	1.5* 50%
10.	Shapes(out of 5)	3.3 66%	4.1* 82%
11.	Measures(out of 4)	1.9 47.5%	3.1* 77.5%
12.	Time(out of 7)	2.5 35.7%	4.5* 64.2%
Total math skills (82 G3)		26.3 (32%)	40.9 (49.8%)

Significant statistical difference between baseline and endline groups,

Table 2 mean of overall Math scores

Math skills:
Money test:

Dealing with money is considered part of the math skills of the child, being able to form sum of money is very important as an application for what the child had learned in Math classes.

- The average score for dealing with money was 1.5 questions correct out of 2, while in Baseline was 1.1 out of 2 where a significant difference was noted.
- A remarkable progress in students' math skills is noticed as only 11 % of interviewed students scored 0 and 63% could answer both questions correctly regarding dealing with money. However, this percentage in the baseline was about 31% and 37% respectively.

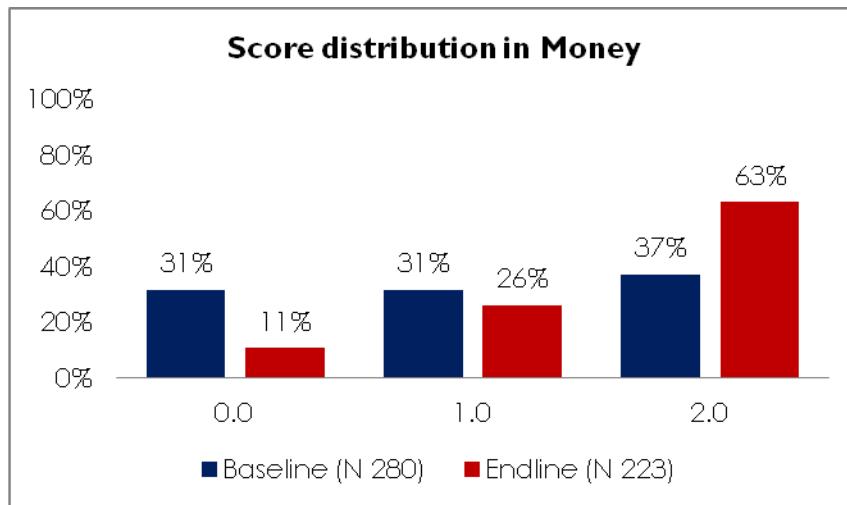


Figure 4 Dealing with Money

Number identification

Children were asked to identify 12 numbers composed of one digit, two digits or three digits. Average score for number identification was 7 Out of 12, comparing to 4.4 out of 12 in the baseline where a statistically significant difference is noted in the endline.

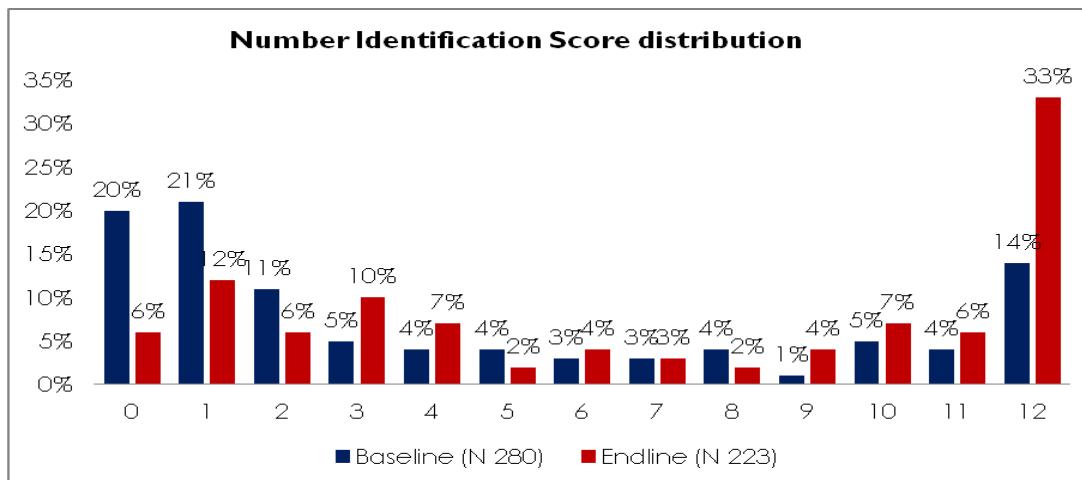


Figure 5 Grade 3 students' Score distribution both baseline & endline

Figure 5 illustrates that the percentage of children who scored 0 decreased to 6% against 20% while more than third of the children scored 12 against only 14% in the baseline.

Place Value:

Four multi-digit numbers have been shown to each child and he/she is asked to identify which number is in a particular place. Scoring was done for the total number place value out of 4.

- The average score for identifying the number place was 3.4 Out of 4 with a statistically significant difference than the baseline average score which was 2.8 Out of 4.

- In the Endline only 9% of interviewed children scored 0 and 81% scored 4 and could answer all questions correctly, while in the baseline almost 23 % of the children scored 0 and 66 % of them scored 4.

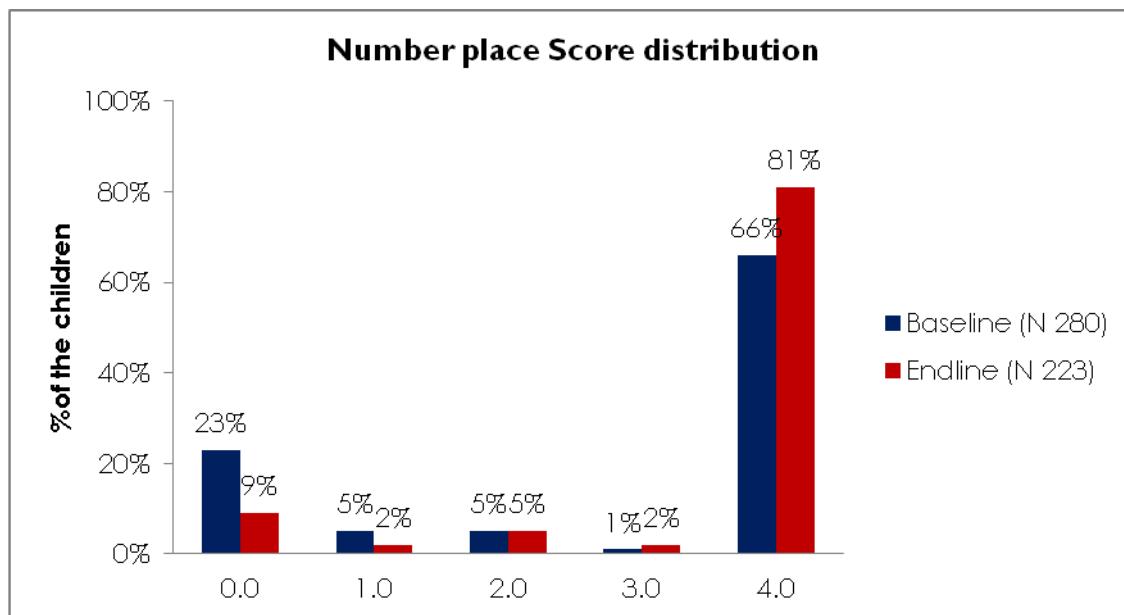


Figure 6 Grade 3 students' responses towards Place Value

Skip 5 test:

Students were asked to skip count by 5s backward from 550 (to 520). Noticeable increase for the Endline comparing to baseline where 32% scored 0 and 49% answered the whole 7 questions correctly and the average score 3.8 out of 7. Meanwhile in the baseline interviewed students' average score was 1.7 and 60% of them scored 0 and could answer no questions of the 7 questions of the skip 5 section.

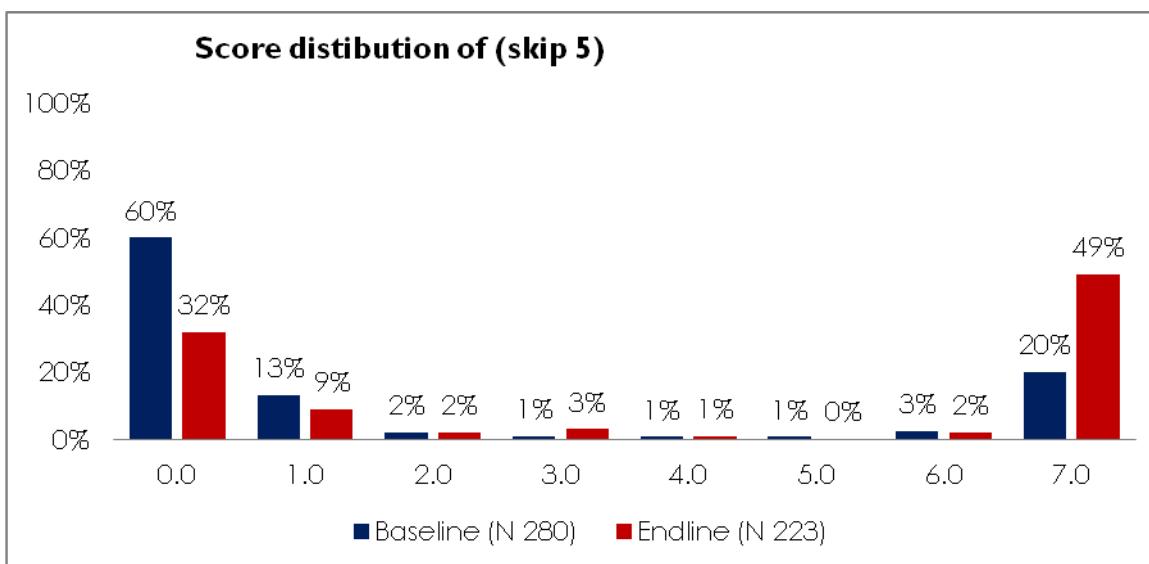


Figure 7 Grade 3 children's score of skip 5 questions

Pattern identification

Students were shown a series of shapes and asked to give the next shape in a repeating pattern.

- The average score for pattern identification in the Endline was 2.4 out of 3 against 1.8 in the baseline.
- Only 2% of the Endline scored 0, 18% scored less than 2 and almost 67% of the students answered the 3 questions of pattern identification correctly. While in the baseline, 10% scored 0 and almost 38% of them less than 2.

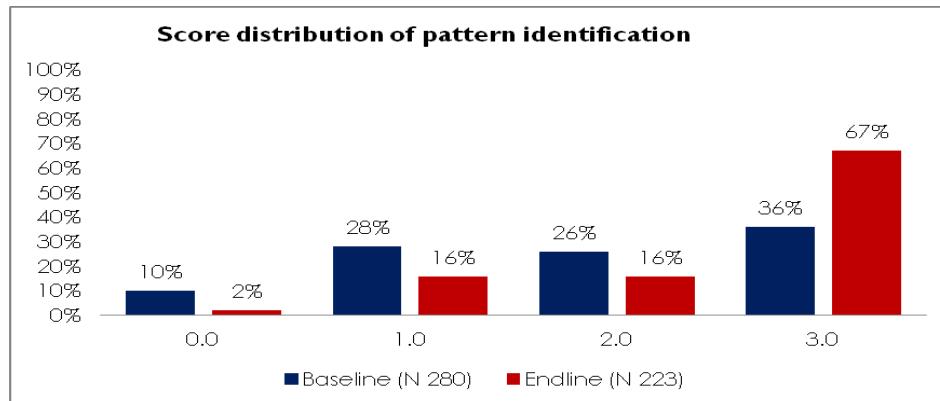


Figure 8 Grade 3 children's score of pattern identification

Missing number

Grade 3 students were shown a series of three numbers, with one number missing, and asked to identify the missing number.

- The average score for missing number identification in the endline is almost 2 when the baseline was 1.2 Out of 3.
- Only 13% of the children scored 0 while 44% answered the three questions correctly while for the baseline, about 42% of the children had scored 0 and only 19% of them could answer the 3 questions.

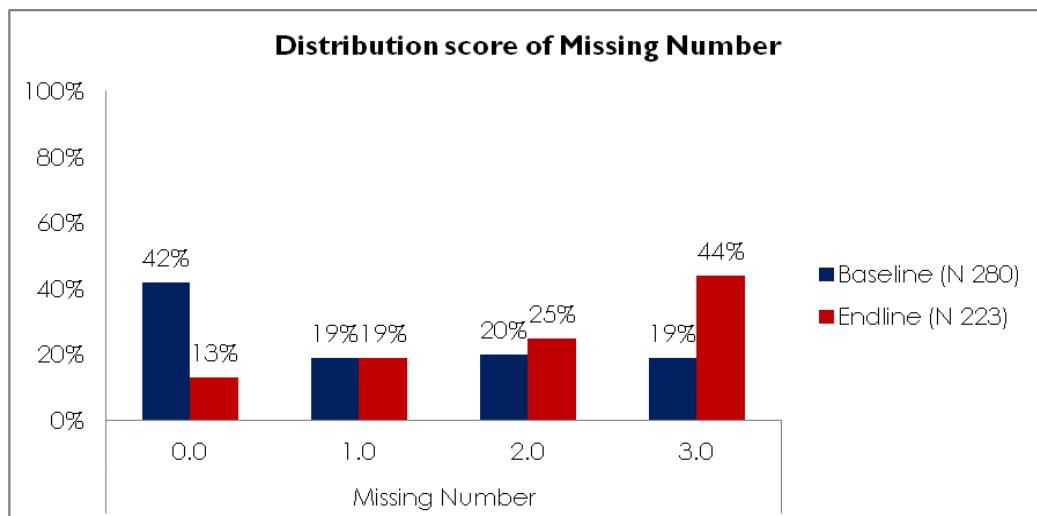


Figure 9 Grade 3 students' answers in the missing number

Addition

Students of Grade 3 were given a paper with 16 addition problems and told to solve as many as possible in one minute. This gives us an estimate of the number of addition problems per minute the child can solve.

The average score for addition in the endline was 4 problems correct per minute when the baseline was 2.6 problems correct per minute.

When students were asked to answer as many problems as possible in one minute, only 6% of interviewed students in the Endline scored zero problems correct per minute. This is in comparison to 28 % of grade 3 students in the Baseline who scored 0.

Children level in addition was classified according to their addition problems correct per minute score:

- Beginner: those scored from 0 to 5
- Intermediate: those scored from 6 to 10
- Advanced: those scored more than 10

According to figure 10, addition skill has improved bringing almost third of the surveyed children in the intermediate level against only 11% in the baseline.

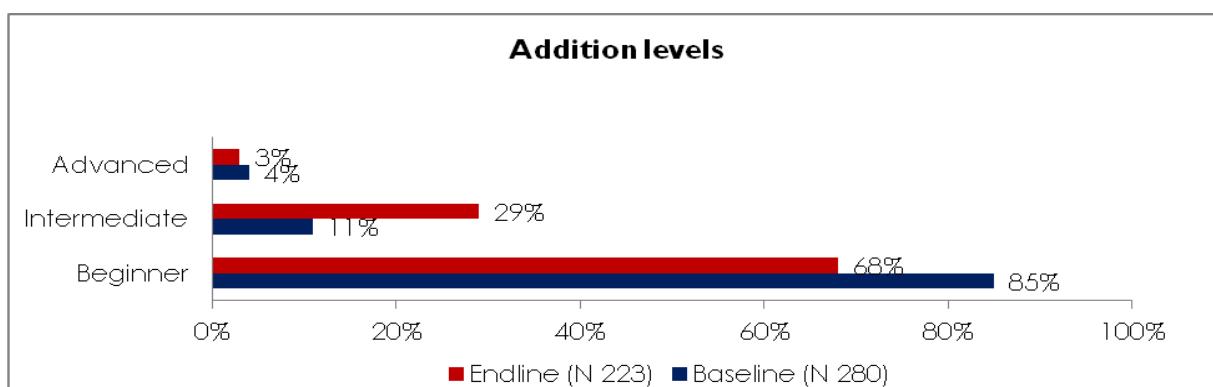


Figure 10 Children level classification according to their score in addition

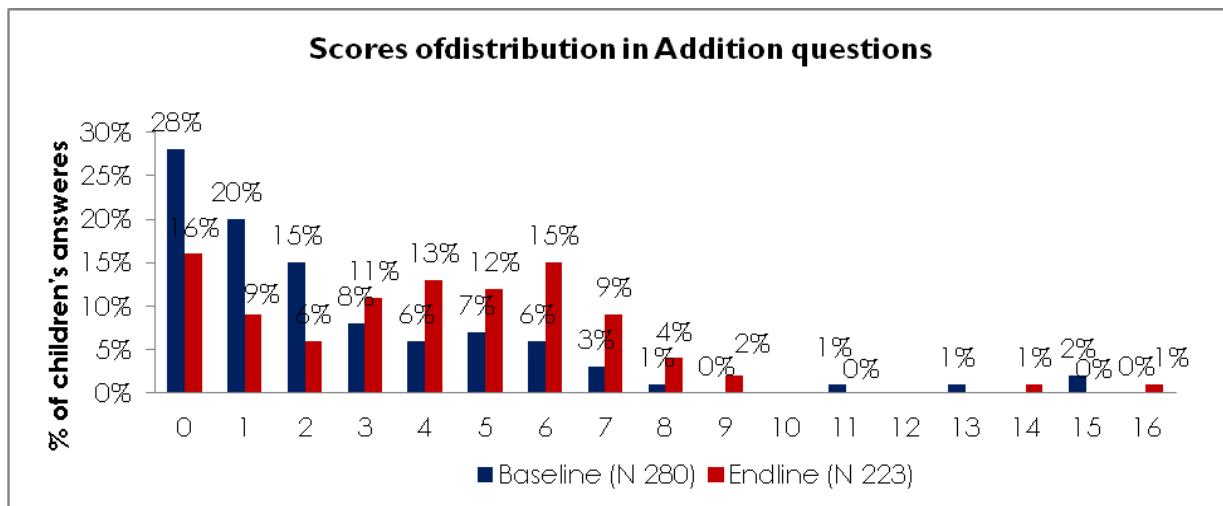


Figure 11 Individual Addition Problems' Score

Subtraction

Students were given a paper with 16 subtraction problems and told to solve as many as possible in one minute. This gives us an estimate of the number of subtraction problems per minute the child can solve.

The average score for subtraction in the Endline was 3.3 problems correct per minute out of 16.

Meanwhile the average score for the baseline was 2.2 problems correct per minute.

Children level in addition was classified according to their score in answering the 16 questions in to:

- Beginner: those scored from 0 to 5
- Intermediate: those scored from 6 to 10
- Advanced: those scored more than 10

According to figure 12, subtraction skill is still a challenge for the students (80% classified as beginner scoring less than 5) with improvement of 18% to the intermediate level against 7% in the baseline.

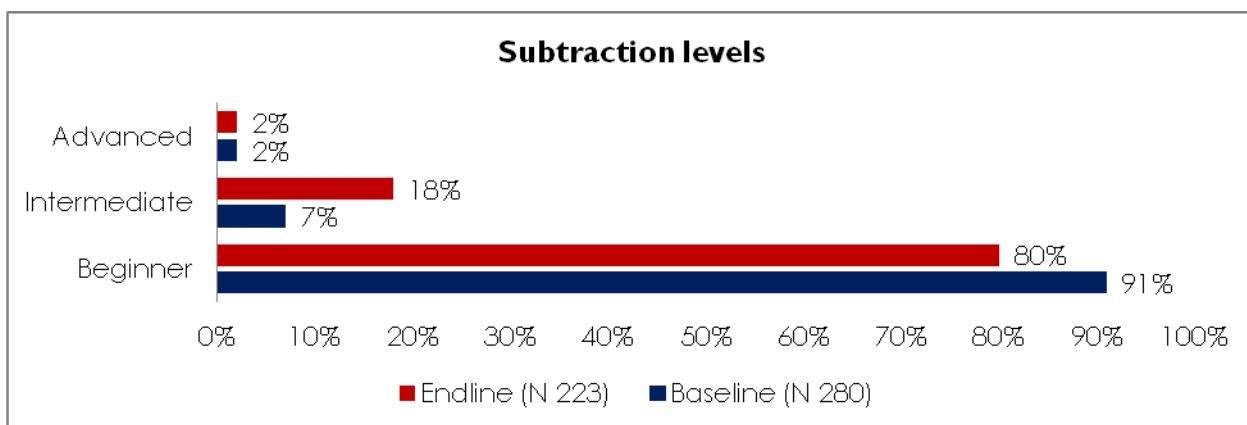


Figure 12 Children subtraction level classification according to their score in subtraction

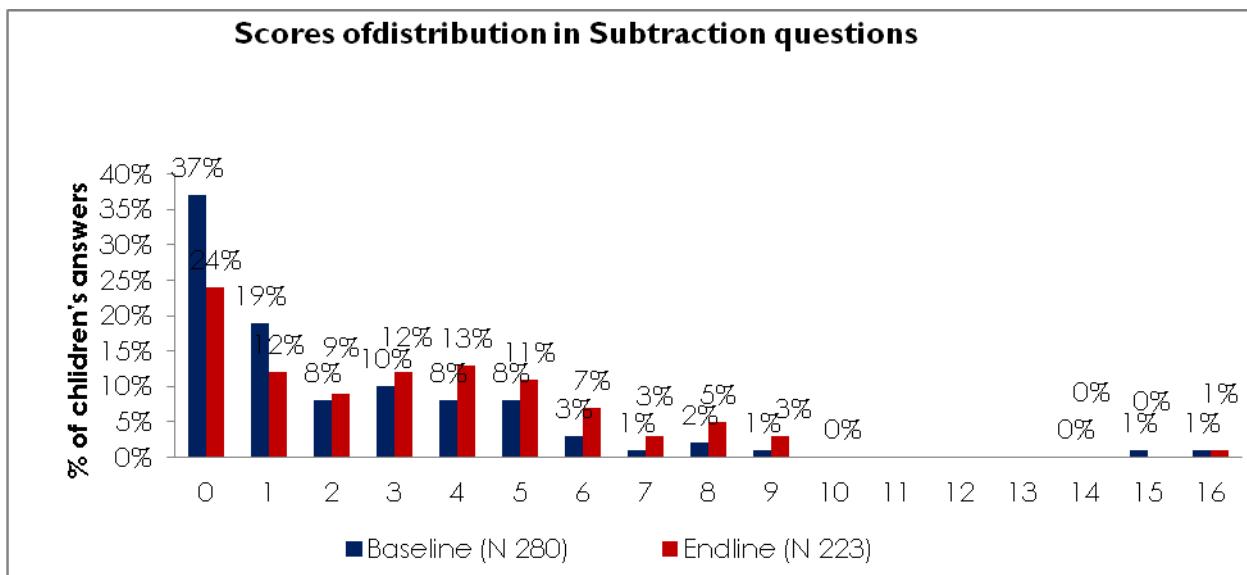


Figure 13 Individual Subtraction Problems' Score

Problem solving:

Students of Grade 3 were given three word problems to solve and the average score for problem solving in the Endline has increased to reach up to 1.5 out of 3 questions when average score of the baseline was 0.5 out of 3.

In the endline the percent of children who scored 0 has decreased dramatically to reach 26% and 25.6 % of the children in the endline could answer the 3 questions completely correct, which indicates significant improvement in the students' skills in solving problem but for the baseline about 67% of the interviewed children scored 0 and answered no questions of the 3 questions regarding the problem solving, and only 6 % could answer the 3 question of the problem solving.

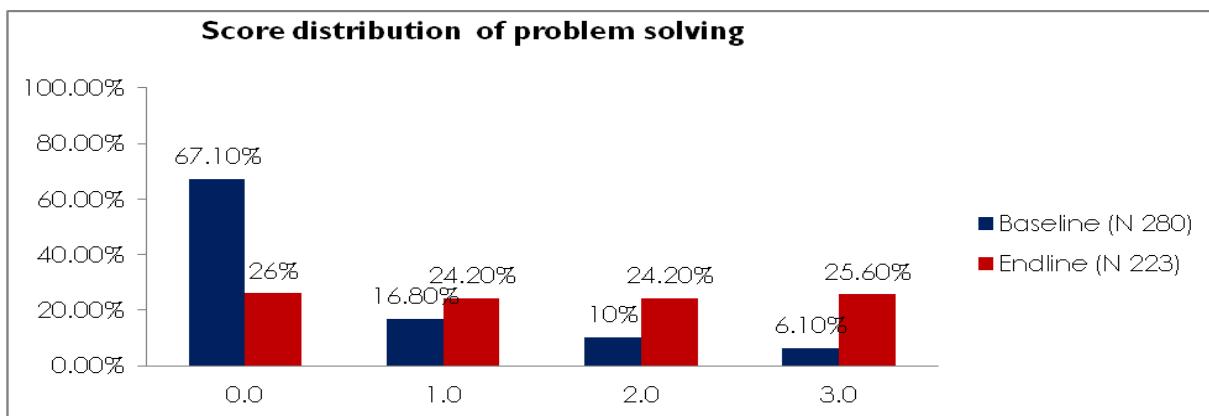


Figure 14 Grade 3 children score in problem solving

Shapes

Children were asked about their ability to identify geometric shapes. The average score for shapes identification in the Endline was 3.7 Out of 5 against 3.3 Out of 5 in the baseline

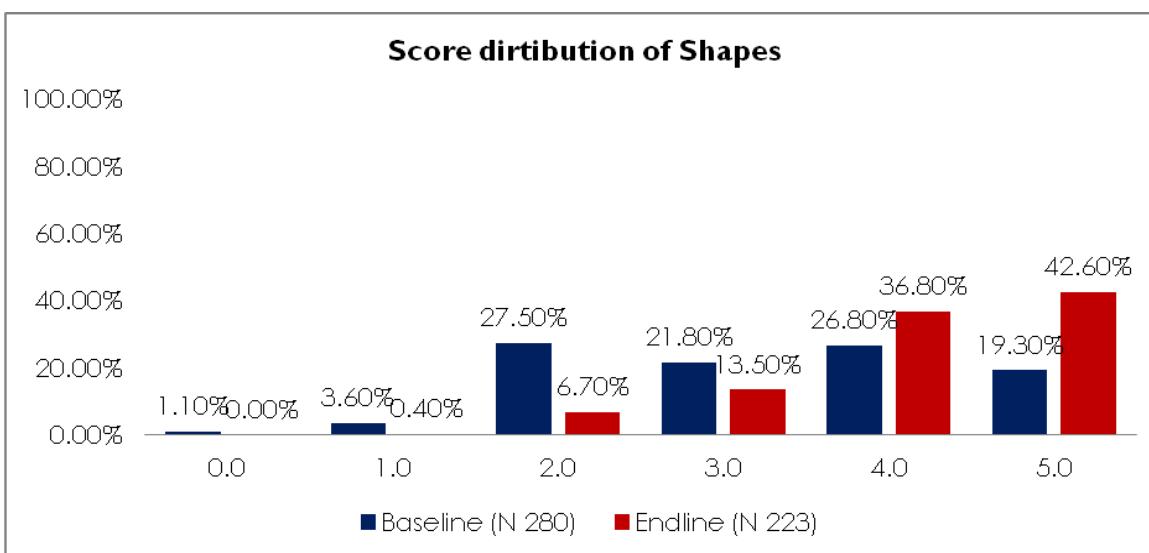


Figure 15 Identifying Geometric shapes

- In the baseline, only 6.7% identified less than 3 shapes and the percent of children answered all identifying shapes questions correctly significantly improved to reach 42.6%.

- In the baseline, 32.2% of children could identify none or less than 3 shapes and only 19.3% scored 5 and could identified shapes correctly.

Measures

Students of grade 3 were asked about their skills of measuring different objects. The average score for measures identification in the Endline group scored 3.1 out of 4 while in the baseline group was 1.9 Out of 4.

Only 18% of the interviewed students in the Endline could answer only one question or none of the questions, meanwhile this percentage was 50% in the baseline. 63% of surveyed students in the Endline could answer the whole four questions correctly and only 27% in the baseline could.

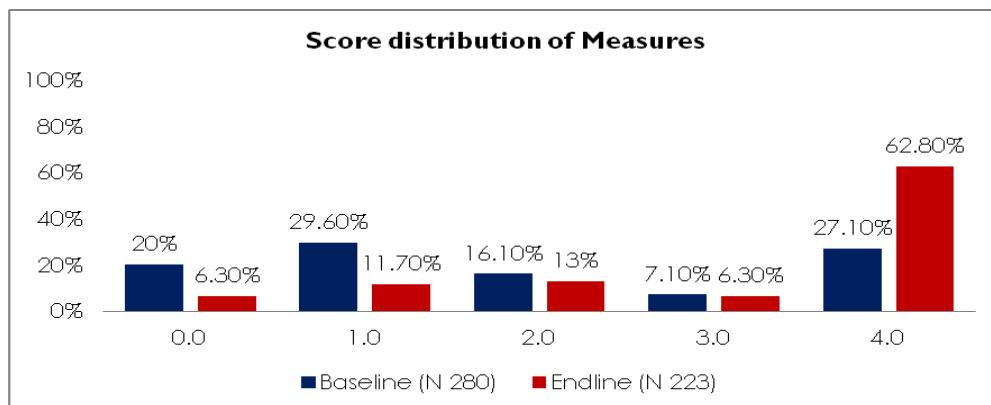


Figure 16 Measures identification

Time identification

A clock was shown to student and several questions were asked about time identification. The average score for time identification in the Endline was 4.5 out of 7, with obviously significant difference than the Baseline average score which was 2.5 out of 7.

Surveyed student of in the endline ranged from 0 to 7 where only 0.4% scored 0 and almost 26% scored 7 compared 8% of them who scored 0 and only 3% who scored 7 respectively in the baseline.

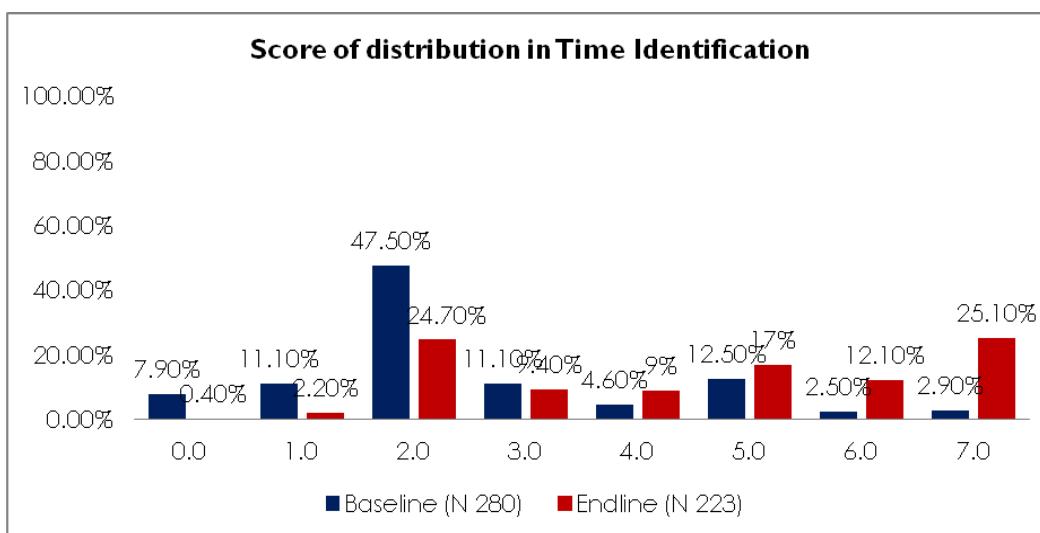


Figure 17 Time identification

Assessment results

Home environment:

There is positive correlation between home environment score and child score in math skills ($R = +0.017$). Numeracy boost program has worked on improving the parent's orientation about the importance of math in the daily activities of the child. Families and communities participated in activities like family math days and math camps with their kids. Fun math projects – like cooking, going to the market, harvesting – are done to show how math is an important part of everyone's daily lives.

Teachers' skills:

Although the students reported that more teacher are using more than one skill, yet none of them is using three skills, the difference between both baseline and endline is not significant. Where a negative correlation is noted between teachers' skills and child score in math skills ($R= -0.036$)

Socio-economic status of the child:

A significant correlation was found between socio-economic status of the child and his overall score in the math skills ($R=0.212^{**}$) Correlation is significant at the 0.01 level (1-tailed).

ECCD:

Students that are reported to have attended ECCD in the past have significantly higher level in Math skills than children who did not attend ECCD classes, there is also a positive correlation between attending ECCD and getting higher results in Math ($R=+0.164^{**}$) Correlation is significant at the 0.01 level (1-tailed). Orientation of parents about the importance of sending their children to ECCD classes is required.

Math practicing outside school:

The overall math score of the child was found to have positive correlation with his math practicing outside school either using math in the daily activities or helping others with math problems ($R= +0.079$). Numeracy Boost should encourage children to realize the diverse range of opportunities for using their math skills outside of schools.

Change for the total Math skills:

Total Math Skills					
Group	N	Min	Max	Mean	Std. Deviation
Baseline	280	2.0	69.0	26.321	16.5959
Endline	223	2.0	71.0	40.964	16.7146

The overall math skills of the surveyed students in the endline are 40.9 out of 82, when the average score of the students in the baseline was 26.3 out of 82. This indicates an improvement of 55.5% of change in the overall math skills.⁵

⁵ Percentage of change is calculated by subtraction of Endline mean from Baseline mean and the result is divided by Baseline mean.

Recommendations

- Focus on the most deprived-significant numbers of children still struggle in basic math skills. How to address this?
- Strengthen operations-a significant percent of children in grade 3 are still at beginner level in addition and subtraction. What kinds of activities can be done to strengthen addition and subtraction skills?
- Need to ensure teachers are incorporating NB practices in the classroom. Observations, model/demo lessons, refresher trainings, focusing on materials and activities and addressing specific math domains where children struggle. Trying to impress upon teachers the importance of incorporating more discussion in the classroom, pair work and small group work and use of materials, particularly in strengthening addition and subtraction skills.