Save the Children

Ethiopia Sponsorship-funded Early Childhood Care and Development (ECCD) Program

Emergent Literacy and Math (ELM) Intervention

Endline Report

November, 2013

ECCD Children Photo at Altufa Gov-funded School, Photo taken by Bultu Hailu, ECCD Prog. Assistant, Save the Children

Ali Amente, Alene Yenew, Ivelina Borisova and Amy Jo Dowd

Special thanks to the enumerators: Bilise Amena, Beyene Chalchisa, Fikadu Damisu, Kumsa Dangea, Lelisa Deme, Dinaol Dugasa, Beliyu Ejo, Shewaye Fatuma, Asfaw Fita, Dinsa Getachew, Nimona Shaka and Selamawit Zelalem

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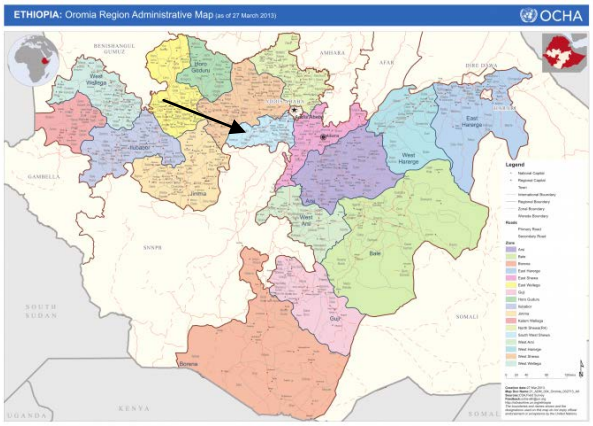
Early Childhood Care and Development (ECCD) in Ethiopia

Ethiopia is progressing well in education over the last two decades and the country is also at the vanguard of Africa's move toward improving access to education. Enrollment in primary education has increased from less than 30% twenty years ago to 95.4% (gross enrollment) and 85.4% (net enrollment) in 2012. During these decades of progress, however, Ethiopia paid little or no attention to ECCD, viewing it as the responsibility of families and communities. In recent years, the Government of Ethiopia has paid more attention to ECCD through policy development and by encouraging enrollment.[1]

Research evidence shows that early childhood is a critical phase for human development, and that access to early childhood care and education (ECCE) services can improve children's nutritional, health and education outcomes.[2] Cognizant of this rationale, the Federal Democratic Republic of Ethiopia is giving due attention to pre-school education and has prioritized it in the Education Sector Development Program of the country. Accordingly, the government is implementing the program as "Early Childhood Care and Education (ECCE)" in all the schools. As a result, the gross enrolment rate of pre-school children has increased from 5.3% in 2010/11 to 21.6% in 2011/12 academic year.[3] Though the government is very ambitious of the program, the pre-school education is marred by many challenges such as lack of trained and independent facilitators/teachers, unavailability of curriculum and guidelines, lack of adequate center facilities, developmentally appropriate learning materials, play grounds and lack of incentives/salary for teachers assigned for this program among others.

Save the Children supports the Ethiopian government to strengthen Early Childhood Care and Development (ECCD) in Tigray, Oromia, Gondar (Amhara) and the Southern Nations Nationalities and Peoples Region (SNNPR) through both grants and sponsorship funding. In 2013, the partners reached over 10,000 pre-school aged children of which 45% were addressed through sponsorship funds. The sponsorship-funded ECCD program started in 2008 in Tigray and in 2009 in West Showa where it is implemented in Dendi and Ambo.



Save the Children invests in ECCD programming because it is fundamental to the optimal development of children, school success as well as overall lifetime achievement. Participation in quality ECCD programs results in improvements in quality of education, reduction of drop out and repetition rates at later stages of schooling and leads to higher enrolments in primary school, particularly of girls. Moreover, the early years are the optimal time to support children's school readiness for school.

[1] Ethiopian Ministry of Education, 2012. Education Statistics Annual Abstract 2011-12.
[2] Young Lives, 2010. Early Childhood Care and Education as a Strategy for Poverty Reduction: Evidence from Young Lives. Young Lives Policy Brief 9.
[3] Ethiopian Ministry of Education, 2012. Education Statistics Annual Abstract 2011-12.

A key aspect of a quality ECCD program for 3-5 year old children is the focus on supporting children's foundational literacy and math skills. The foundations of learning to read and write are set long before a child enters first grade. *Emergent literacy skills* and the experiences children have with language, print and books during the early childhood years are hugely important for later reading success. Emergent literacy includes such aspects as speaking and listening, alphabet knowledge, early phonological awareness (such as rhyming), and knowing that print can carry meaning, among many others.[4]

Much in the same way, even before children learn to add, subtract, multiply or divide, children learn many concepts about numbers and mathematics that are a part of e*mergent math* and that pave the way to more complex math competencies and proficiency in early primary grades and beyond. Emergent (or early) math skills include such aspects of math as patterns and sorting, basic number knowledge and counting, simple geometry (i.e shapes) and problem solving, among others.

Unfortunately, support for these foundational emergent literacy and math skills is lacking in the early years, yet sorely needed. Save the Children developed an innovative toolkit aimed at supporting these critical **Emergent Literacy and Maths (ELM)** skills in our preschool programs globally (ELM toolkit) and began piloting it in Ethiopia in 2012/13 (Ethiopian academic year). The main goal in integrating this toolkit into the existing ECCD center based program was to improve the quality of the ECD program and ensure a substantive focus on early **literacy and math skills** as a part of the curriculum in order to strengthen children's readiness for school. The ELM toolkit was tested in 18 ECCD centers in West Showa impact area, Ethiopia.

The ECCD and ELM interventions

In 2012 at the start of this study, Save the Children supported 36 ECCD centers in Ambo and Dendi Districts of West Showa in the Oromia Region. Of these, 19 are community-based, built in partnership with communities and 17 are government run centers, based on the grounds of primary schools. The community based centers have learning materials such as puzzles, manipulatives and books, as well as child-sized furniture, and playground equipment. The facilitators in these and in the government centers receive 32 credit hours (11 courses over two months) of pre-service/basic teacher training in a private, accredited institute and are monitored by the SC-ECCD team in collaboration with ECCD focal person at District Education Offices. Government centers, however, do not receive support for infrastructure or materials. All ECCD program sites also conduct community awareness sessions as well as monitoring and supervision to support community involvement in ECCD center support, however the government centers generally have less community involvement.

Finally, all ECCD children also benefit from the child-to-child program where an older child who is doing well in school supports young children in their own community. The older children attend training about how to mentor the younger children and then identify out of school/center young children in their surrounding (at least 10). They then organize basic

[4]Whitehurst, G. J., & Lonigan, C. J. (1998). Child development and emergent literacy. *Child development, 69(3),* 848-872. Chicago, IL.

numeracy and literacy games, different culturally and child-friendly plays, prepare play materials from locally available materials, advise and let the young children practice practical life skills such as how to get dressed, eat, wash hand, respect others and be fair to one another. The older children also read short stories for the young children. From SC, members of the child-to-child club receive training, a guiding manual, and materials such as story books, slates, chalk, markers and erasers. For ELM, members of the child-to-child program are additionally assigned to mentor the 10 sample children in their respective in school.

Half of these 36 sites – randomly assigned, stratified by type – were the location of an intervention during 2013 aimed to improve the focus of these centers on emergent literacy and math skills development. All 18 ECCD centers selected for ELM intervention were equally provided materials (child friendly furniture, 5 sets of indoor games, shelves, storybooks, activity cards). The Emergent Literacy and Math (ELM) program tools developed by the global ECCD team were adapted to the Ethiopian context and used to further train facilitators running these preschool programs, and support parent and community activities. During a five day basic training on ELM, teachers received interactive training on how to incorporate ELM in their daily classroom routine through playful games and materials. They were also provided with a resource bank of 50 early literacy games and 50 math games and were trained in their use. Parents and mother groups linked to each ECCD center have model parents from the community. In the case of the ELM centers, the 180 parents/caregivers whose children are selected for school Readiness Assessment (SRA), have been additionally trained on the importance of ELM and the support they should render to their children. Therefore, mother groups and parents in treated schools/centers are better aware of and actively involved in ELM than those with no ELM. Appendix A provides a full table of ECCD and ELM intervention details.

Baseline data was collected in November/December 2012 by trained enumerators. The program began implementation in January 2013 with a basic training on ELM for ECCD facilitators as well as an awareness-raising workshop for Educational Officials, parents, school directors, PTAs and community representatives, and members of the child-to-child program. The CO team also purchased and distributed ELM supporting materials during this time. Therefore, the implementation of program activities in the selected sites was started at the beginning of February 2013. Endline data was collected in June by 14 trained data enumerators (8 of them were who participated in baseline survey) after 5 months of intervention, during which children attended the centers 4 hours a day for 5 days a week.

Evaluation Design and Methodology

This evaluation aimed to both assess the effectiveness of the Save the Children ECCD program in Ethiopia as well as the new Emergent Literacy and Math Intervention (ELMI) in enriching the developmental outcomes of children who are already enrolled in the ECCD programs. As such, this report will answer several questions:

(1) What is the comparative effectiveness of the *Save the Children regular ECCD program* and the *ECCD program incorporating the Emergent Literacy and Math intervention* for improving children's school readiness skills?

(2) Is there a detectable relationship between caregiver support for learning at home and

school readiness and what are the implications of that for programming?

(3) What is the effectiveness of the *Save the Children's ECCD program* and *Emergent Literacy and Math intervention* on children's outcomes for students enrolled at the community-based schools as opposed to government schools?

This evaluation is the first study the Ethiopia team has embarked on to investigate the effectiveness of the Save the Children ECCD program. Its results will be informative to the country office's staff involved in the design and implementation of the program to learn about the results of its efforts, but also to guide future improvements.

Sample

In order to estimate the impact of the ELM intervention on school readiness skills, the evaluation implemented a randomized control trial. ECCD centers were randomly assigned to receive the ELM intervention or not. At ELM centers, teachers received the training aimed at straightening their understanding and practice on teaching of emergent literacy and math skills. At control centers, teachers didn't receive any additional training. Randomization helps ensure that these comparisons are valid so that estimated program effect can be attributed to the ELMI intervention and not hidden characteristics of children, schools and communities, such as parental education level, socio-economic status, school infrastructure and management, etc.

The evaluation used a stratified randomization by type of ECCD center. Save the Children currently supports 36 schools, out of which 19 are community-based centers and 17 are government centers. Both types of schools receive teacher training and monitoring from Save the Children. They differ, however, in some aspects, such as funding source, school infrastructure (e.g. community-based schools are built by Save the Children, and receive indoor games, books and outdoor playground equipment whereas government schools do not have access to these resources), school management, parental involvement, among others. Based on literature on ECCD quality, these additional inputs are linked to higher program quality, and consequently better child developmental outcomes. Half of the schools assigned to ELMI are community-based schools and the second half are government funded.

The secondary goal of this study is to estimate the impact of the Save the Children ECCD program in the West Showa region in promoting school readiness skills in the participating children. In order to assess the program effectiveness, the evaluation implemented a semi-quasi experiment by comparing children enrolled at the Save the Children ECCD program, and children who never attended school (non-ECCD children). In order to recruit the non-ECCD group, two communities where chosen to participate in the study according to a few key criteria (see description below). Within each community, a census was conducted and children were randomly selected to be assessed.

The three groups are thus:

1. ELMI Group: children in ECCD centers receiving the ELMI intervention;
2. ECCD: children in ECCD centers with no additional intervention;
3. Comparison: a group of children who have never attended ECCD (non-ECCD children).

The total enrollment rate at the ECCD centers at the beginning of the 2012 academic year (i.e. September) was 2,648 children. For the ELMI and ECCD Groups, we randomly selected ten children from each center, totalizing a sample size of 360 children. The selection was stratified

according to age. We selected children who were either five or six years of age according to the information obtained from the directors' report.

The initial sample selection for the Comparison Group aimed for a total of 120 children from a rural and semi-urban communities that were (1) not being directly served by Save the Children's program (i.e. have an ECCD center in the community), or indirectly served (i.e. receive caregiver trainings, other projects such as Literacy Boost), and (2) have a large number of young children not in ECCD, i.e. 100 or more. The number of children from each community was determined by calculating the proportion of children from the ECCD group who are in rural and semi-urban communities in order to mimic the proportion of children from ECCD centers. We conducted a census at the two communities and randomly selected our sample of children. During the baseline data collection, however, only 91 children were assessed.

At endline, instruments were re-administered to all but 41 children. Of these, four had dropped out of ECCD, one refused consent and 35 were absent or could not be located. Table 1 shows the sample of children at each point in time by group.

Table 1. Sampled Children by Group and Time

Group	**N at baseline**	**N at endline**	**N absent**	**% absent at endline**
no ECCD	91	76	13	16%
ECCD	180	158	22	12%
ELMI	180	174	6	3%
total	451	408	41	10%

More children are absent from the control group, but there are no discernible patterns related to age or sex. Baseline parent surveys are available for half of the children not located a second time and indicate that those who are absent at endline have slightly lower SES on average (but not statistically significantly so), and a significantly greater number have fathers who do not read. This is as true in the two treatment groups as well as the non-treatment group. While only a very small sample is available for analysis, this suggests further exploration of ECCD demand among less literate households may benefit overall program participation.

Data on age and sex for 445 children assessed at baseline in Table 2 shows that 56 percent of the children in the sample are girls, and 96.8 percent are Oromo. Most children are 5 or 6 years old and according to their caregivers, all but 2 are most comfortable speaking and interacting in Afan Oromo, the language of the assessment.

Table 2. Sampled Children by Age and Sex

Age Group (Years)	**Total**		**Gender**			
			Male		**Female**	
	N	**%**	**N**	**%**	**N**	**%**
4	1	.22	1	.50		
5	225	50.56	88	43.78	133	56.12
6	215	48.31	108	53.73	104	43.88
7	4	.89	4	1.49		
Total	**445**	**100%**	**201**	**100%**	**237**	**100%**

Some children in the ECCD and ELMI samples have been attending early childhood programming for some time, while for others it is their first year. Parent report on years of participation in any early childhood program is available for 336 of the 360 ECCD participants (93%) and shown in Table 3.

Table 3. Years of ECCD Experience by Treatment Group

Years in ECCD	ELMI		Regular ECCD	
	N	%	N	%
1	103	60.23	82	49.7
2	26	15.2	15	9.09
3	41	23.98	62	37.58
4	1	.58	6	3.64
Total	**171**	**100%**	**165**	**100%**

Among this group, the majority of ELMI and nearly the majority of ECCD are first year ECCD participants, while over a third of ECCD and nearly a quarter of ELMI children are in their third year of particiaption.

Data Collection

The participants' mother tongue is Afaan Oromo, thus all the material was translated into the local language. Data were collected by a group of twelve assessors with bachelor's degree, with some previous experience with data collection, and whose mother tongue was Afaan Oromo. The assessors were trained for one week prior to the data collection process, on how to carry out both the Caregiver Questionnaire and the School Readiness Assessment.

School readiness endline assessment at Ula Dulo school, photo by Bultu Hailu

The data collection was divided into two phases. First, the assessors visited each school once to test all the 360 selected ECCD/ELMI children. During the second phase the assessors visited the non-ECCD communities as well as revisiting the centers to collect data with caregivers and children who were absent during the first round of data collection.

The baseline data collection took place from November to December of 2012. The majority of the ECCD/ELMI centers operate in the morning, from 8:30 am to 12:30 pm, with a few exceptions. Data collection was usually scheduled from about 8 am to 2 pm, and assessors usually asked a few children to stay a little longer in order to complete all ten children in one visit, unless children were absent. It ran from Monday through Saturday: even though schools operate until Friday, children were asked to come to school on Saturdays so the data collection could be completed as planned.

The data collection for ECCD children took place at the ECCD centers (preferably at a quiet space with minimum noise and interruption, such as an empty classroom and/or a resource/administration room). Non-ECCD children and their caregivers were invited to meet with the assessors at the nearest public school in their community in order to maximize the time for the data collection. Data on child outcomes were collected one-on-one with the assessors. The average time per child was 60 minutes, and took place during school-time, with a few exceptions when children were asked to stay for no more than one hour after school was over. The caregiver interview lasted about 20 minutes. Caregivers were invited to come to the ECCD center where her/his child is enrolled, either in the morning or afternoon.

At endline, the data collection process took three weeks. Fourteen enumerators were trained for four days (three days in data collection and one day practice at schools). Two enumerators were assigned to conduct parent interview and 12 were assigned to conduct the school readiness assessments among the same children assessed at baseline. One enumerator was responsible to assess 4 children and 5 caregivers in a day. The team was grouped in two and conducted assessment in two different centers/schools at once each day. Each team had its own team leader from the group. SC-ECCD program team staff supervised to ensure quality data collection.

Measures and instruments

The School Readiness Assessment (SRA) was developed in 2011 by Save the Children to provide accessible measures on school readiness skills of young children aged three to six years. The development and piloting of the tool was undertaken by the India and Bhutan Country Offices, and later used in evaluations carried out in Bangladesh and now in Ethiopia. The instrument assesses children by using one-on-one activities to measure children's core developmental outcomes: Emergent Literacy & Language, Emergent Math, Socio-Personal Development, Gross and Fine Motor Development and Hygiene, Safety and Nutrition. The tool can, and should, be adapted by each country office to be context appropriate to the target population being tested.

In Ethiopia, the tool was adapted and pilot tested in the course of one month in close collaboration with the Country Office team. An example of the adaptation was the choice of the letters of the alphabet that were the most common, and the ones not as common in Afaan Oromo. Table 4 below shows SRA tool domains, sub-domains for math and literacy, as well as examples for health, nutrition and safety as well as socio-personal development. The final column of Table 4 reports the reliability of School Readiness Assessment domains, (details for subdomains and their components can be found in Appendix B). The tool used in Ethiopia excluded the Gross and Fine motor development domain due to time constraints.

Table 4. Domains, sub-domains, and reliability in SC's School Readiness Assessment

Domain	Sub-domains/examples (number of items in parentheses)	Reliability (Cronbach's alpha)
Emergent Literacy and Language (86 points possible)	concepts of print (11), alphabet (3), expressive (5) and receptive language (9), phonological awareness (8), listening comprehension (5) and emergent writing (1)	.78
Emergent Math (68 points possible)	Number sense (14), concepts of time (3), space (9) as well as sorting (3), patterns (3) and problem solving (4)	.58
Health, Nutrition & Safety (22 points possible)	identifies healthy foods (8), knows healthy hand-washing, dental hygiene and toilet habits (10), makes safe choices around fires and strangers (4)	.89
Socio-personal development (38 points possible)	Knows personal information and emotions, takes perspective, lists preferences, shows compassion (22 items)	.84

The reliability levels suggest that that there are improvements to be made in capturing math sub-domains, while all other domains are at acceptable (.7 and higher) or good (.8 and higher) levels. Further, these domains are all highly significantly correlated as can be seen in Table 5 below.

Table 5. Inter-correlations between school readiness domains

	Emergent Literacy and Language	Emergent Math	Health, Nutrition & Safety
Emergent Math	0.736***	1.000	
Health, Nutrition & Safety	0.595***	0.574***	1.000
Socio-personal development	0.575***	0.551***	0.729***

***p<.000

The parent questionnaire includes a number of aspects useful for considering how a child's background and home environment might relate to their school readiness. First, it covers key socio-demographic characteristics of the family including number of children in the family, parent education, parent work, and household possessions, among others. In addition, the questionnaire includes questions capturing the frequency of various types of parent-child interactions (including items such as how often parents play with child, read stories with child etc.), the home literacy environment (including number of book types available in the household, are parents seen reading, reading to their children, etc.), the toys and learning materials available for the child at home (i.e. puzzles, drawing materials, among others). All tools used are attached to this report in Appendix 1.

Results

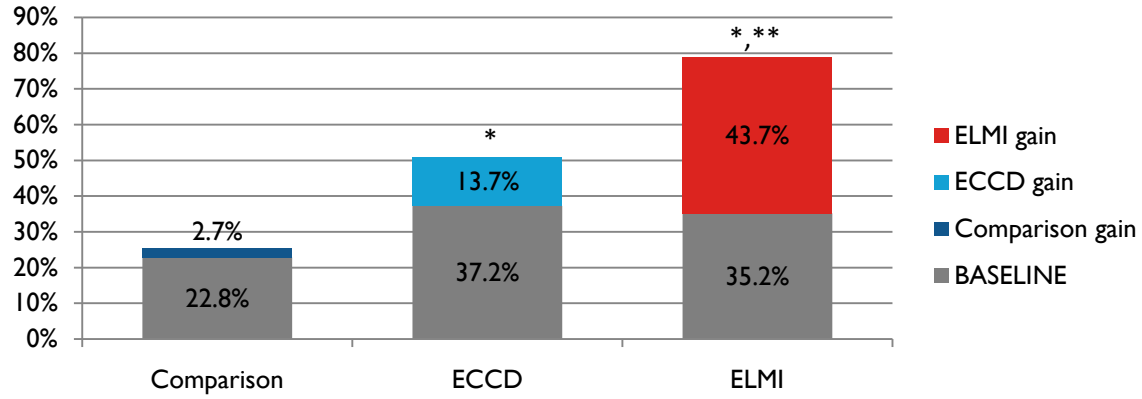
Program Impact on School Readiness Skills by Domain

This section presents the program results in each of four school readiness domains – language, math, socio-personal development, and health, nutrition and safety. Each section considers overall domain competencies as well as progress within sub-domains, where applicable. Finally, we calculate effect sizes for each of the domains for ECCD and ELMI to capture and compare their impact.

Emergent Literacy and Language Learning

The language domain combines items on concepts of print, alphabet, expressive and receptive language, phonemic awareness, listening comprehension and emergent writing. Adding these together, there are 42 items and 86 possible points. Figure 1 shows the dominant pattern in all of the child outcome data: the ELMI group learned significantly more than the ECCD group without ELMI, who learned significantly more than the group without any ECCD exposure.

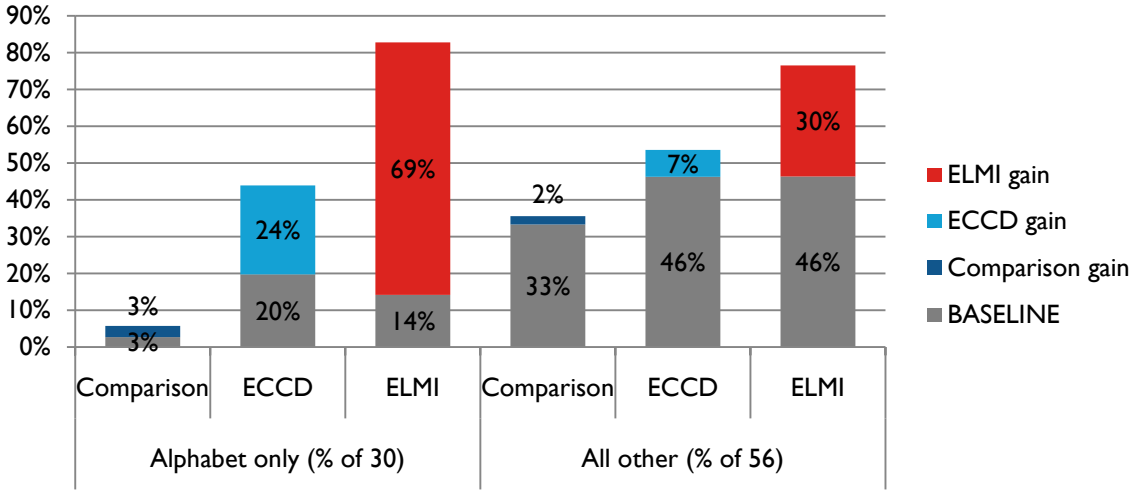
Figure 1. Language Domain: average baseline and gain by group (% of 86 correct)



*gain significantly greater than comparison group at p<.05
**gain significantly greater than ECCD group at p<.05

Children in the EMLI group made more than three times the emergent literacy learning progress that children in regular ECCD did during the course of these five months. The emergent literacy learning of children without ECCD at all is negligible in comparison. Because this score is dominated by alphabet knowledge, (3 items with a possible score of 30) separate analysis was conducted with and without this sub-domain and confirmed the trend of significantly greater overall language learning in ELMI sites. Figure 2 presents the echo of the Figure 1 finding for only alphabet items on the right and all other items on the left.

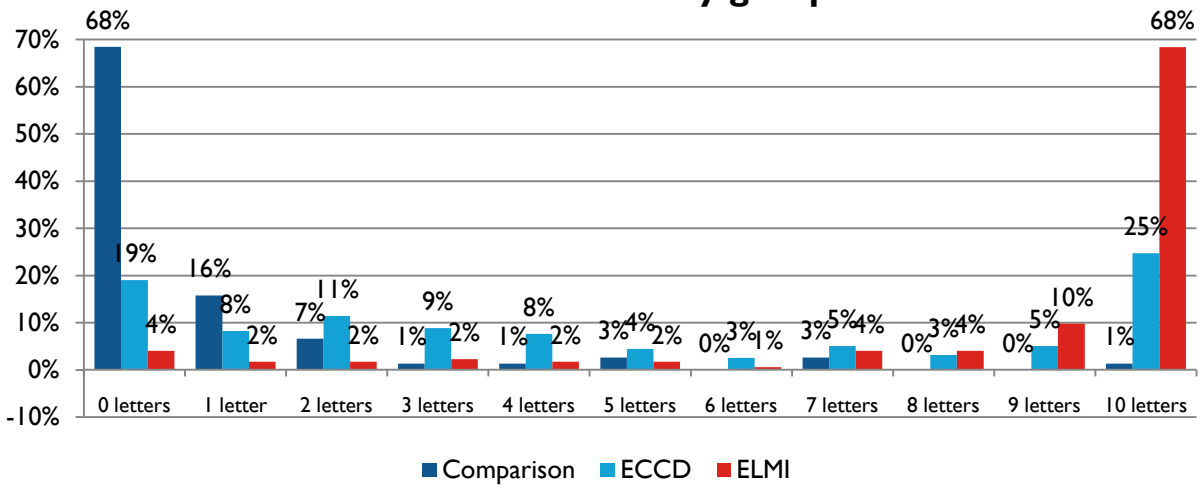
Figure 2. Alphabet and Other: Average baseline and gain by group



The left hand set of columns in Figure 2 shows that ELMI is clearly supporting children in learning their letters; while the right hand set of columns demonstrates significantly greater progress in all other areas of emergent literacy assessed as well.

During the assessment administration, children were asked to identify three groups of letters identified as low, medium and high frequency in Afaan Oromo. At baseline, 89% of Comparison and 47% of children in each ECCD group knew no high frequency letters and another 20% of each ECCD group knew only one. Twelve ECCD (8%) and three ELMI (2%) children knew all 10 high frequency letters. Figure 3 shows that this situation changed substantially by endline, just five months later: 68 percent of ELMI participants know all 10 high frequency letters.

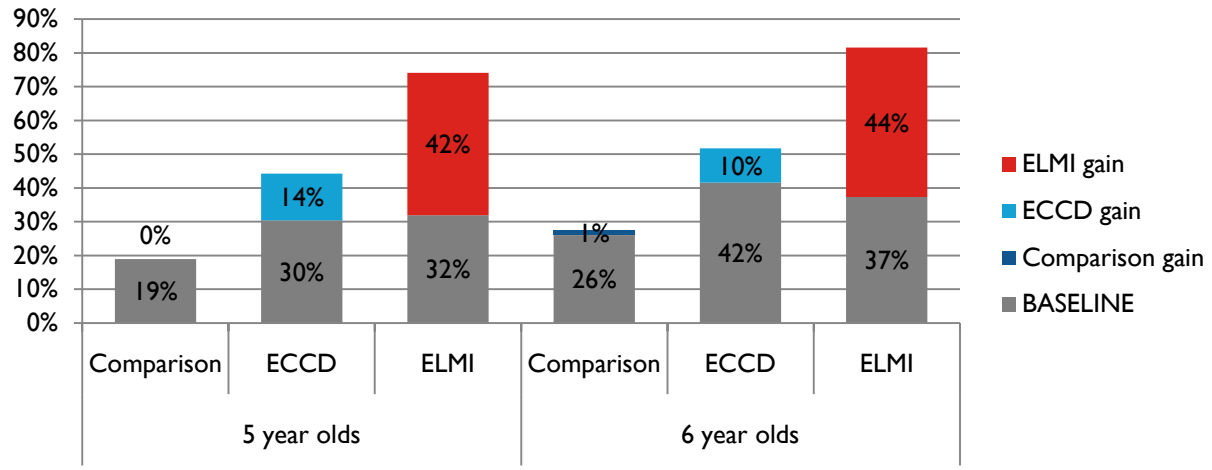
Figure 3. Percent of children who know high frequency letters at endline by group



ELMI is supporting learning letters in ways not realized by either regular ECCD or in daily life. A final look at language learning in Figure 4 offers a view of learning by age: six year old children

began at a higher average language scores than their younger five year old peers, but their gains were similar in both ECCD and ELMI groups.

Figure 4. Language Domain: average baseline and gain by group and age (% of 86 correct)



For the subgroup of students for whom we have parent report on length of time in ECCD, baseline language score is predicted by number of years in ECCD. However, at endline, number of years exposure fails to predict score. Given that nearly two thirds of the children in ELMI – the group that made the greatest gains - were first year ECCD participants, this makes sense. Being in an ELMI center now has greater explanatory power than years of prior exposure to early childhood programming.

Sub-domains of Emergent Language and Literacy

Table 7 presents the average percentage gains and endlines for ECCD and ELMI participants in each sub-domain of the language assessment as well as ranking of ELMI progress in the final column from the greatest to least progress. This offers a more granular view of emergent literacy development to derive suggestions for program improvement.

Table 7. ECCD/ELMI Language gains, endline scores by sub-domain

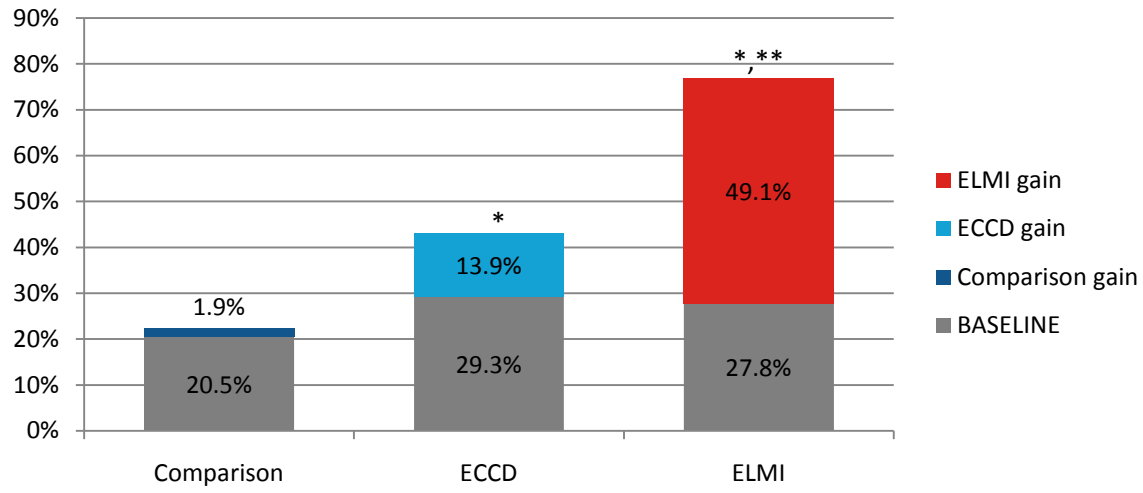
Emergent Language/ Literacy Sub-domain	Points possible (endline range)	ELMI Average Gain	ECCD Average Gain	ELMI Endline Average	ECCD Endline Average	ELMI % Point Gain
Letters	30 (0-30)	20.59	7.25	24.98	12.13	69
Writing	4 (0-4)	1.86	.65	3.45	2.06	47
Listening Comprehension	5 (0-5)	1.74	.07	4.83	3.02	35
Receptive Language	9 (0-9)	3.05	1.09	8.13	5.32	34
Expressive Language	19 (0-19)	5.63	1.28	12.42	7.11	30
Concepts of Print	11 (0-11)	2.73	.2	8.66	5.52	25
Phonemic Awareness	8 (0-8)	1.74	0	5.36	3.33	22

All differences between the two ECCD groups are statistically significant. This shows that in the first five months of the ELMI program, the greatest progress was made in learning letters and in moving from scribbling to writing simple things like the child's own name. This suggests that the letters and writing ELMI games and facilitator materials and support for their use are among the most often and possibly easiest to use. Given lower learning gains in the areas of listening comprehension as well as receptive and expressive language, the effective use of these materials and games may require further reinforcement as the program moves forward. Also note, that high endline scores relative to the total possible mean that these children are mastering the type of items the assessment contains and further assessments to capture their progress will require the assessment of more advanced skills. The least progress was made in phonemic awareness and concepts of print, so additional attention in refresher training and awareness sessions on these materials and strategies can assist ELMI participants to make greater strides.

Emergent Math Learning

The math domain combines counting, number and quantity identification, concepts of time, direction, space and shapes, as well as sorting, patterns and problem solving. There are a total of 36 items for a possible 68 points. Figure 5 shows again that the ELMI group learns significantly more than the ECCD group, who learns significantly more than the group without any ECD. The no ECCD group makes barely any gain in the course of the five months between baseline and endline.

Figure 5. Math Domain: average baseline and gain by group
(% of 68 correct)

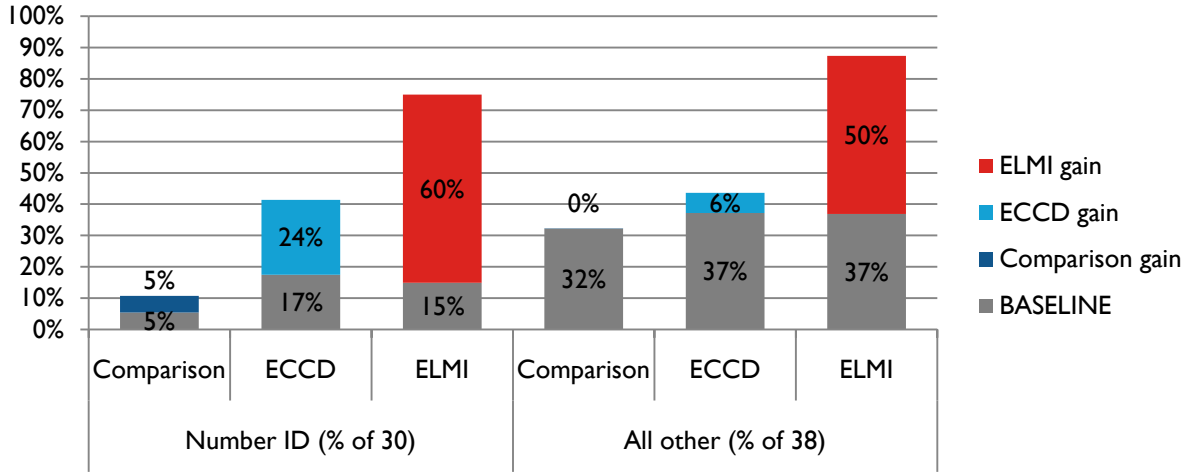


* gains significantly greater than comparison group at p<.05
** gains significantly greater than ECCD group at p<.05

On average, children in the ELMI group made more than three times the progress in emergent math of children in other Save the Children sponsored ECCD centers during this five month period. The emergent math learning of children without ECCD at all is negligible in comparison.

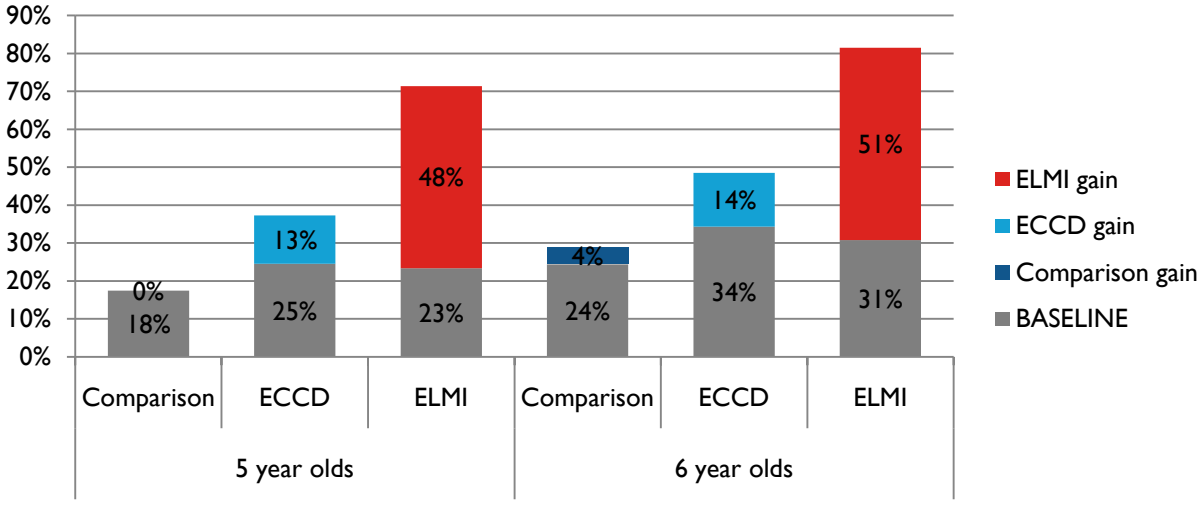
As with language, the emergent math domain is dominated by number identification (3 items for a total of 30 points), so again we split the overall average of Figure 5 into a consideration of gains in number identification versus all other math items in Figure 6.

Figure 6. Number ID and other: Average baseline and gain by group



While greatest gains were made in number identification, ELMI improvement beyond this one skill is ELMI is an even greater contrast to the regular ECCD group. Figure 7 shows that six year-old children made slightly more progress in all groups on average, but this difference was not significant.

Figure 7. Math Domain: average baseline and gain by group and age (% of 68 correct)



Finally, unlike language total score, math total score at baseline is not predicted by length of exposure to ECCD. This remains the case for math gain and math endline scores as well.

Sub-domains of Emergent Math

Table 8 presents the average percentage gains for ECCD and ELMI participants in each sub-domain of the math assessment as well as ranking of ELMI progress in the final column from the greatest to least progress. This offers a more granular view of emergent math development to derive suggestions for program improvement. Here it is very clear that the greatest gain is in identifying shapes and the average score is knowing five of the six shapes in the assessment correctly.

Table 8. ECCD/ELMI math gains, endline scores by sub-domain

Emergent Math sub-domain	Points possible (endline range)	ELMI Average Gain	ECCD Average Gain	ELMI Endline Average	ECCD Endline Average	ELMI % Point Gain
Shapes	6 (0-6)	4.95	.55	5.12	.68	83
Number Identification	30 (0-30)	17.97	6.67	22.54	10.89	60
Time	9 (0-9)	5	.5	6.18	1.51	56
Counting	5 (0-5)	1.54	.5	4.36	3.21	31
One to One Correspondence	3 (0-3)	0.9	.47	2.43	1.79	30
Solving Puzzle	3 (0-3)	0.82	0	2.31	1.28	27
Patterns	3 (0-3)	0.69	.02	1.83	.92	23
Sorting	3 (0-3)	0.66	0	1.9	.96	22
Left to Right	3 (0-3)	0.44	.1	2.7	2.21	15
Quantity identification	3 (0-3)	0.22	0	2.9	2.29	7

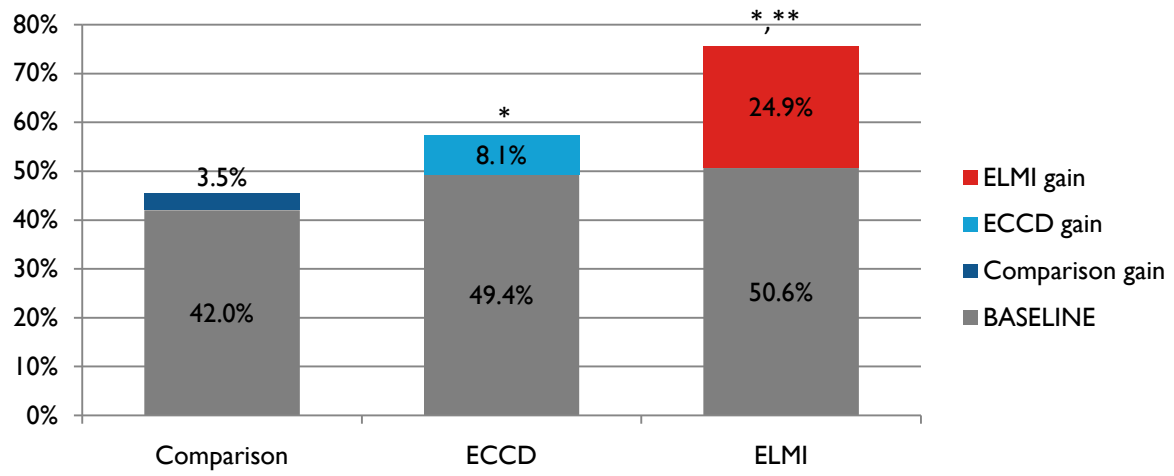
While there is great progress as well in identifying numbers and using concepts of time like length and order, there is still work to be done here and many remaining sub-domains of emergent math.

Many of these are interrelated and progress in one depends on progress in another. For example, to correctly answer items in quantity identification – telling which picture has 9 birds – requires counting. Those subdomains in which the value of the endline average is similar to the total points possible require additional or more challenging items in order to demonstrate child growth moving forward.

Socio-personal Development

Socio-personal development is gauged by asking children about their identifying information, preferences, reacting to situations involving emotions, perspective taking, conflict resolution, and compassion. There are a total of 22 items with 38 possible points. Figure 8 shows that the ELMI group significantly outperforms the ECCD group, and also reveals that the group without any ECCD made very few gains in this domain between baseline and endline.

Figure 8. Socio-personal Development: average baseline and gain by group (% of 38 correct)



* gains significantly greater than comparison group at p<.05
** gains significantly greater than ECCD group at p<.05

This progress within ELMI schools is understandable given the amount of collaborative work, dialogue, discussion and participation promoted in the materials for facilitators, parents and community members alike. ECCD classrooms with fifty or more children can lend themselves to "easy" practices like choral all class learning rather than opportunities for small group work, corners time and other interactive and age appropriately playful methods. The ELM training emphasizes the importance of breaking these habits to get children moving and interacting in large, small groups as well as individually. For example, in the game "Find your Herd," the teacher whispers the name of an animal to each child and then the children mingle outside making the noise of the sound of their animal trying to find the other children who are animals in their "herd." Once in a herd/small group they are often assigned a group task- go find 5 leaves, 6 rocks, 7 sticks etc and they work together as a team to do so.

Note also the difference between exposure to any ECCD and no ECCD underscores the importance of any program for helping children to be ready for school in non-cognitive ways in addition to the more academic or skill-oriented ways in which we often consider readiness. There is no difference in socio-personal gains made by children of different ages or with different years experience in early childhood programming.

Sub-domains of Socio-personal Development

Table 9 presents the average percentage gains for ECCD participants with and without ELMI in each question of socio-personal development as well as ranking of ELMI progress in the final column from the greatest to least progress. This offers a more granular view of socio-personal development to derive suggestions for program improvement.

Table 9. Average ECCD/ELMI Socio-personal Development gains, endline scores by sub-domain

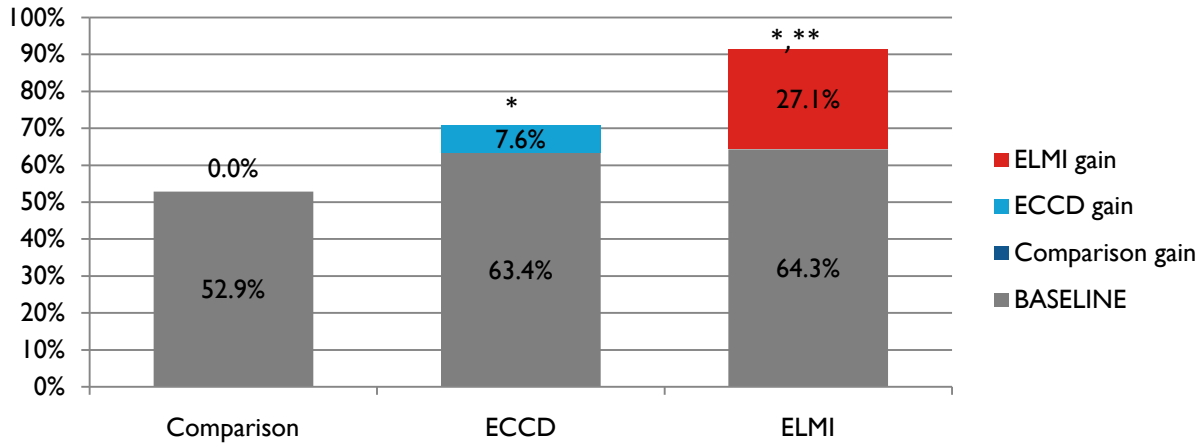
Socio-personal Development domain	Points possible (endline range)	ELMI Average Gain	ECCD Average Gain	ELMI Endline Average	ECCD Endline Average	ELMI % point gain
Personal ID	4 (0-4)	2.27	1.42	3.64	2.86	57
Perspective Taking	5 (0-5)	1.57	0	3.56	1.86	31
Conflict Resolution	2 (0-2)	.56	0	1.63	.93	28
Express compassion	4 (0-4)	.88	.21	3.69	2.92	22
Express Preference	10 (0-10)	1.63	0	6.24	4.28	16
Recognize Emotions	2 (0-2)	.35	.03	1.84	1.34	18

The group work focus of many activities could be fostering this greater growth in perspective taking and conflict resolution, but other elements could be target topics for future trainings of both Save the Children ECD staff and center facilitators.

Health, Nutrition & Safety Learning

The health, nutrition and safety domain reflects the child's knowledge of important health-related information such as healthy foods, good cooking, hand washing, dental hygiene and toilet practices, as well as good decision-making about proximity to fire and strangers. While ECCD participating children at baseline knew nearly two thirds of these items, the children in ELMI sites increased significantly more than those in ECCD sites to knowing better than 90% of this information on average by endline.

Figure 9. Health, Nutrition and Safety: average baseline and gain by group (% of 22 items correct)



*gains significantly greater than comparison group at p<.05
** gains significantly greater than ECCD group at p<.05

Figure 9 shows again that the ELMI group significantly outperforms the ECCD, and also reveals that the group without any ECCD made no gains in this domain. As the ELMI intervention did not specifically target sharing or addressing these topic areas of information, it is not clear why this would be. The program team reflects that while ELMI specifically targets literacy and numeracy skills development, care is the central dimension of the program. Care is touched upon in practical life activities that are discussed and then practiced. These are common to all ECCD projects, but special attention within ELMI might be done by facilitators, parents, and older children in child-to-child club as these components are part of the assessment. ELMI specifically targeted the parents of sampled children with awareness-raising to support their children at home on health, nutrition and safety practices and behaviors and to send their children to ECCD centers daily. Further, reasoning, estimating and decision-making skills are part of cognitive development that ELMI addresses and there is an activity card to help develop such skills. It is important to note in this and all categories that the children in the study were supported throughout the five month intervention period by an older child in the community. Finally, more attention was given to ELM-based centers during monitoring and supervision to ensure quality of the pilot program. Hence, ELMI center facilitators were frequently supervised so that they were active in supporting children develop intended life skills in these areas. Thus, while proving that child to child mentoring and facilitator monitoring and support is effective, the team must address how to generalize this support across all children to ensure similar growth in future program cycles.

While the five year olds seemed to make greater progress in acquiring this knowledge – possibly because they had more to learn – the differences by age were not significant. In addition, years of exposure to early childhood programming did not affect the health knowledge score at baseline, endline or change between them.

Sub-domains of Health, Nutrition & Safety

Table 10 presents the average percentage gains for ECCD participants with and without ELMI in each sub-domain of the health, nutrition and safety section of the assessment as well as ranking of ELMI progress in the final column from the greatest to least progress. This offers a more granular view of emergent literacy development to derive suggestions for program improvement.

Table 10. ECCD math gains, endline scores by sub-domain

Socio-personal Development domain	Points possible	ELMI Average Gain	ECCD Average Gain	ELMI Endline Average	ECCD Endline Average	ELMI % Point Gain
Health	10	2.60	.07	8.81	6.11	26%
Nutrition	8	2.11	.07	6.83	4.68	26%
Safety	4	.78	.05	3.78	2.9	20%

The groups of items all show similar progress.As mentioned above, personal care and hygiene are central developmental competencies for preschoolers. Even though the ELM program did not specifically target these competencies, in the context of this evaluation we felt it was

important to capture children's progress in this area. This allows us to ensure that in future trainings we continue to support teachers in promoting hygiene and nutrition knowledge.

Overall School Readiness Impact and Equity

We fit regression models that control for age and gender, and account for clustering in ECCD sites to estimate effect sizes for the two program types in Table 2.

Table 11. Estimated program effect size by school readiness domain

Domain	ECCD effect size	ELMI effect size
Emergent Literacy and Language	.46	1.73
Emergent Math	.42	1.71
Socio-personal Development	.23	1.04
Health, Nutrition & Safety	.35	1.10

Effect sizes translate measures from different metrics into a standardized unit to allow the comparison of treatments. Widely cited statistician Jacob Cohen describes effect sizes of .2 as small, .5 as medium, and .8 as large.[5] By this standard ECCD impact is between small and medium, but evident in just five months. All of the ELMI effect sizes are huge and are more than three times as large as the impact of the ECCD program for language and health, and more than four times as large for math and socio-personal development. While this large effect size is driven by the relative lack of improvement over time among the comparison students, the contrast for school readiness between the two interventions is clear.

Fitting additional regression models to consider interactions between these interventions and sex, there is no evidence that girls and boys are benefitting any differently from either the ELMI or ECCD programs. That is, if gaps exist, then they are not being closed, but neither are children of one sex benefitting disproportionately.

Caregiver impact

Among the caregivers of children interviewed 53% were mothers, 35% fathers, 6% grandparents and 2% siblings. At endline, 77% of the interviews were conducted with the same family member. Among the non-ECCD program children, reasons given for not enrolling in ECCD were: child is too young (51%), economic difficulties (26%), it is too far (7%), the child has other responsibilities (goats, cows, house, other children) (7%), or the child is disabled/ill (5%). The majority of caregivers who have children in ECCD/ELMI report sending their children to the program in order to learn.

Quality of home environment

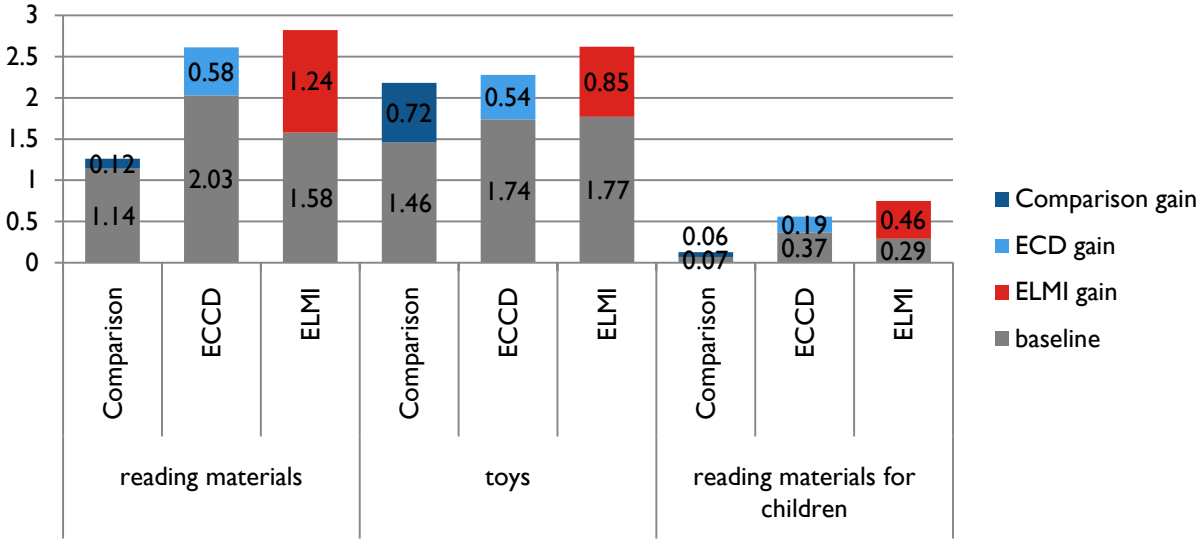
The caregivers were asked questions about resources for children's early learning (books and toys) as well as time spent with children and interactions (talk, play, read, draw, sing, etc.).

[5] Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. (2nd ed.) Hillsdale, NJ: Erlbaum.

During the ELMI program, 180 parents of the students sampled for this assessment from treated centers were given a two-day orientation on how to support their children both at home and in school with different materials. Topics included child developmental domains, the ELM intervention and its importance, components of ELM, The role of parents/care givers in early child development, and children's rights and health issues. The first four topics were handled by SC ECCD team and the last portion was delivered by experts from district women and child affairs and health offices. It is therefore of interest to see if these changed between baseline and endline and if that is related to school readiness. This will be the main focus of this analysis.

Among household resources for reading and playing reported by caregivers, there are several significant differences in the change between baseline and endline scores by groups. For example, ELMI caregivers report having gained significantly more reading materials and toys than ECCD caregivers as can be seen in Figure 10.

Figure 10. Average baseline and gains in number of types of materials for children by group



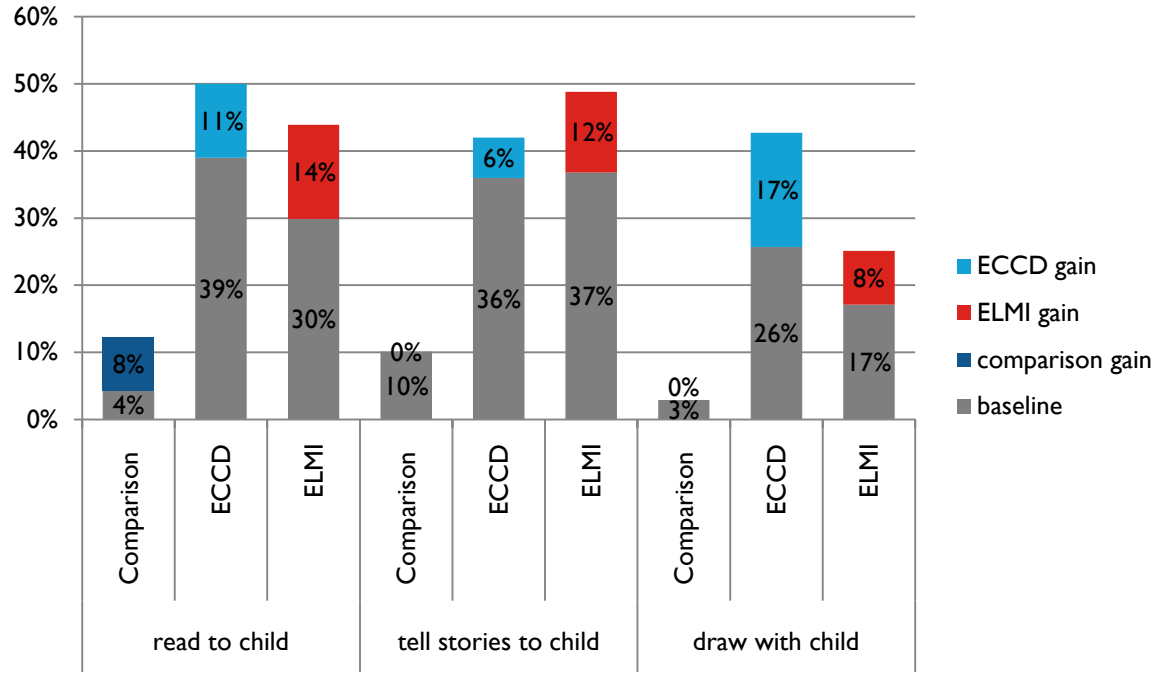
While this shows gains in resourcing children's learning environments, the third set of columns shows that the average child still has less than one reading material appropriate for his/her age at home.

Turning to the amount of time parents spend interacting with children, average gains in hours per day that mothers and fathers spend talking, walking and playing with the child was negative for all groups – but significantly less so for the ELMI group. It is not clear why this is, but the program team notes that the culture of parents-to-child communication is very insignificant, making this a key area on which to touch in the future.

Of note for programming is the fact that there are very few changes during these five months in types of interactions during this time. The interview collected detail on whether or not anyone over 15 years of age in the family had in the past three days interacted with the child in nine possible ways: reading stories, telling stories, singing songs, taking outside the home, playing,

drawing, teaching something new, teaching abcs, teaching numbers. At baseline, the average caregiver of children in ECCD and ELMI groups reported family members were doing 2 or 3 of these and at endline, just 3 or 4. There was little or no movement in singing songs, taking outside the home, playing, teaching something new, teaching abcs, or teaching numbers. Figure 11 shows the three areas in which there was some movement: reading and telling stories and drawing.

Figure 11. Percent of children with at least one family member interacting in target activites in last three days



Interestingly, there is as much drawing and more reading and telling stories reported at endline by caregivers in ECCD as in ELMI sites. Also, note that at baseline the parents in the study are much higher that the comparison parents, meaning that parent engagement is already pretty high for families whose kids are in an ECD center.

Table 12. % of Children whose Caregivers Report each Type of Parent-Child Interaction by Group

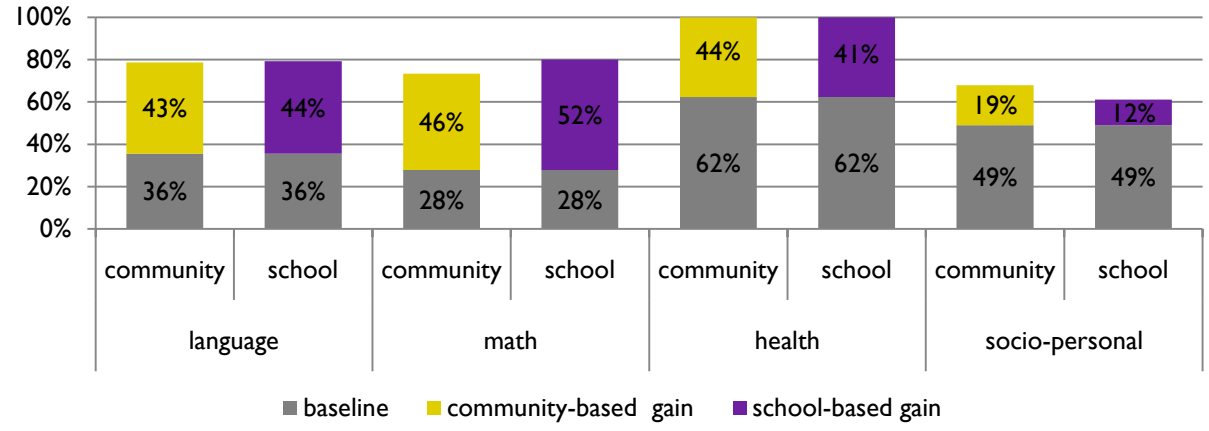
	Comparison		ELMI		ECCD	
	baseline	endline	baseline	endline	baseline	endline
1. Reads to the child	4%	12%	30%	41%	39%	53%
2. Tell stories to the child	10%	9%	37%	42%	36%	48%
3. Draw with the child	3%	3%	17%	34%	26%	33%
4. Sing to the child	12%	3%	30%	34%	33%	38%
5. Go outside with the child	10%	3%	25%	27%	21%	22%
6. Play with the child	19%	9%	38%	41%	44%	45%
7. Teach the child	1%	1%	20%	22%	24%	23%
8. Teach the child abc's	7%	7%	35%	38%	42%	43%
9. Teach the child numbers	6%	7%	37%	40%	40%	40%

Given this progress is seen in just three of nine targeted areas for interaction, the agenda for awareness raising in the parent-oriented activities that begin in earnest during the next cycle should be clear. While these parents were targeted by outreach, in five months it did not change key parent behaviors at home but may have increased ECD attendance or built upon existing ECCD support. The ELM parent component will be a very relevant next step given the relatively low levels of support for learning provided at home. We next turn to a consideration of intervention impact in different types of centers.

ELMI Impact in community-based versus government centers

Using the subgroups of ELMI children within community-based and government ECCD centers, we see two areas of equivalence and two of divergence in Figure 12. The language and socio-personal gains of children in ELMI are similar regardless of type of school.

Figure 12. Domain baseline averages and gains in ELMI centers by type



However, children in government school-based ECCD centers make significantly greater gains in math while those in community-based ECCD centers make significantly greater gains in

health knowledge. It is encouraging to see that both types of center benefited almost equally from the training and materials. This is important because the government run centers can be more challenging to intervene in and are generally weaker. Knowing that the children in these centers did just as well enhances the potential reach of this intervention for addressing quality and school readiness.

Conclusion/next steps

In several domains above, implications emerge from the details of progress by subdomain. We also observe that overall there is an imbalance between progress on concrete and "rote memorizable" items like letters, shapes and numbers and progress on the less easy concepts like one to one correspondence, patterns, critical thinking and vocabulary. This is understandable in a short time period, but holistic and longer term programming will require attention to these lagging areas to ensure children are ready for school.

Since we have no data about the teaching practices and how teachers are putting in place the games and training, and whether/how parents were trained in using such techniques, it is possible that teachers are gravitating towards the rote memorization methods for some items such as alphabet. Implications for next steps would be to refocus attention on the "softer skills" especially talking and listening so we can see large gains in all school readiness skills. Why these? Because talking and listening are the backbone of oral language development, which in turn is the backbone for later literacy and other school outcomes. And larger vocabulary size for example is linked to so many later gains, but harder to see gains if kids don't have the chance to express ideas or to talk regularly –which is something many Save the Children ECD programs struggle with.

An important next step is a more focused engagement with parents and caregivers. Clearly there are limited interactions and play activities between parents and children and support for parents will likely yield very good results. Parent programs might be especially useful to consider as a strategy where we are not able to start ECD centers – such as the control areas. While ECD centers take a lot of initial capital and mobilization to get started, a strong parent education program might be able to bridge the divide between the children with no ECCD exposure and those participating in an early childhood program. This study clearly demonstrates the value and need for learning support, so it's our imperative to think of ways of expanding coverage through new methods.

Appendix A. Intervention Chart

Program element	In Regular ECCD Centers	Additional/different in ELMI ECCD Centers
Teacher Training	• Basic (pre-service) training. All(46) ECCD facilitators attended the training for 2 months. They completed a total of 32 credit hours in 11 courses: Pedagogical Science (3crhrs), Child Psychology(2crhrs), Philosophy of teaching young children(2crhrs), special Need/Inclusive Education(2crhrs), English Language(3crhrs), Classroom Management(2crhrs), Health and Nutrition(3crhrs), Practical life Activities(2 crhrs), Sensorial Activities(2crhrs), Language Activities(2crhrs), mathematics Activities(2crhrs), Culture Activities(1crhr), Play, Music and Art(2 crhrs), Material Production(2crhrs) and Peer teaching(2 crhrs) • **Refresher training**. This 3-day training included: Activity /lesson planning and preparation, ECCD center/Class organization and Management, Montessori/ Indoor game usage, maintaining child discipline.	Basic 5-day training on ELMI.
ECCD center teaching resources	Culturally appropriate reading materials(esp. story books), indoor games (5 set), outdoor games (only CBS), black board, and teaching materials like chalk, card stock, markers, shelves,	More than 10 different stories, tape recorder, puzzles, blocks, toys, colored pencil, colored papers, papers, rulers, large papers, and glue for posting paper on the classroom walls
ECCD center facility	• All CBS (10 centers) and two government-supported centers have been provided with five shelves (indoor game case), outdoor games, child-friendly chair and table • 7 Government-supported centers have not yet been provided with shelf and indoor games (purchase is under process)	All ELMI centers provided with five shelves, child-friendly chair and table
ECCD center organization	Corners organized in to six areas: Language, Reading, Maths, Practical life skill, Sensorial, Science & Geography	Corners organized in to four areas: Language/Reading, Maths, Constructive and Dramatic play
Teacher to student ratio	1 teacher :80 children	1 teacher:50 children, attendance records indicate that 55 regularly attend.
Parent involvement/education	- There are MOTHER GROUPS(comprise five model mothers) established in each center. The groups undertake the following roles: - *Conduct community mobilization to send their children to ECCD center and support the program* - *Promote fund-raising opportunities to support facilitators' monthly incentives and OVC's learning materials,* - *Participate in income generating activities such as gardening* - *Clean and organize ECCD centers* - *Organize ECCD events and fair days,* - *Conduct parents/ community conversation on ECCD program.*	- Mother groups are aware of ELMI - Regularly follow up and oversight (one mother in one day assigned from the group) the activities at the center(esp. attendance of the 10 selected children) - In ELM Centers a total of 180 representative parents (10 from each center, parents of sampled

	- The group supported and strengthen through capacity-building training at least twice a year - Parents (esp. mothers) do also conduct ECCD center visiting - Group training for parents are conducted twice/year	chidlren) were given awareness creation training on ELM.
Community involvement	- Contribute money for facilitators' monthly incentive - Provide labor support in organizing, fencing and cleaning ECCD play grounds, - Participate on ECCD program events and meeting	- Community involvement has no significant difference for regular ECCD centers and ELM-based centers.
Teacher /Site Monitoring and Super-vision	• Children's daily attendance • ECCD center organization. Corners should be organized in to six areas: Language, Reading, Maths, Practical life skill, Sensorial, Science & Geography • ECCD center's neatness • Print rich environment • Children discipline • Facilitators rapport to children • Daily Activity schedule • Daily lesson plan • Availability child friendly center(esp. in government supported centers), learning materials(in door games, outdoor games, puzzles, culturally appropriate story books…) and furniture • Safe playing ground and conducive learning center • Availability of drinking water suitable for young children • Availability of sanitation facilities segregated by sex • Parents' and Community involvement • Roles of mother groups	• Center's organization: Corners should be organized in to four areas: Language/Reading, Maths, Constructive and Dramatic play • Daily Activity schedule mainly focuses on numeracy and literacy activities cards of ELM • Facilitators' activities managing skills

Appendix B. Reliability of outcome measures

Domain	Sub-domain	Reliability
Emergent Literacy and Language	Overall reliability of 86 language items	**0.78**
	Print-book awareness	0.83
	Alphabetic awareness	0.98
	Receptive oral language	0.62
	Multistep instructions	0.77
	Identify actions	0.81
	Expressive oral language	0.45
	Naming objects	0.68
	Constructs using picture cards	0.7
	Phonological awareness	0.75
	Rhyming pairs	0.36
	Beginning sounds	0.43
	Listening comprehension	0.89
	Writing – one item	n/a
Emergent Math	Overall reliability of 68 math items	**0.58**
	Number sense	0.4
	Number identification	0.95
	One to one correspondence	0.72
	Quantity identification	0.47
	Counting	0.77
	Concepts about time	0.23
	Spacial concepts	0.41
	Differentiates left from right	0.69
	Shape identification	0.93
	Sorting and classification	0.68
	Patterns	0.35
	Problem solving	0.44
Health, Nutrition	identifies healthy foods, knows healthy hand-washing and toilet habits, safety around fires, strangers	**0.89**
Socio-personal development	Knows personal information and emotions, takes perspective, lists preferences, shows compassion	**0.84**

This item analysis suggests that there are improvements to be made in capturing math sub-domains such as patterns, problem solving and concepts of time. Further, expressive language elements do not seem to hang together well within that framework, but do so separately; while the opposite is true for components of phonological awareness. Further study across countries in which this instrument has been used, as well as consideration of correlations between items within sub-domains and their components is needed.