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Report

Addressing transitions into public schools for children undertaking Complementary Basic Education in Ghana

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Summary

Children who completed the Complementary Basic Education (CBE) programme in the academic year 2016/17 (known as CBE Cycle 4) made the transition into public schools for the academic year 2017/18 (commencing September 12, 2017). During October and November 2017, the research team visited the public schools where the CBE children made the transition and collected learner assessments on local language literacy (i.e. the Ghanaian language taught at the student's school), English and numeracy for all CBE Cycle 4 children who were present in school during the data collection visit and also on a comparable group who was selected based on a similar set of characteristics including gender, age and grade attended by the CBE Cycle 4 children.

This report presents the main findings on the information collected from CBE Cycle 4 children and the comparison group, referred in this report as non-CBE children. Firstly, we focus on establishing the likeness of the sample based on variables including gender composition, age, grade, region, language and implementing partner representation. This will be done to demonstrate the robustness of the research design for the current study. We then examine whether there are differences based on household characteristics, work status, family status, experience in school and attitudes to school. This is followed by a comparison of students' proficiency levels and learning outcomes which are examined by gender, language and region. The main aim of the report is to provide evidence on whether CBE and non-CBE children are comparable, in a statistical sense, and if this provides a strong baseline analysis to then measure changes over time between these groups.

Overall, results show that for age, grade, gender, region, language and implementing partner representation, CBE and non-CBE students showed strong comparability thus indicating the effectiveness of the sampling approach. We found some differences with respect to family status and household possessions, but these differences although statistically significant, were small. We found minimal difference in the opinions of children regarding their previous school experience, which interestingly for CBE children referred to the CBE programme while for children in public schools this referred to the academic year 2016/17. CBE students consistently outperformed non-CBE students in local language literacy. In English literacy, there were some differences whereby non-CBE outperformed CBE students, but these differences were marginal. For numeracy we found no differences between the proficiency of CBE and non-CBE students. Although we found small differences in factors that predict proficiency between CBE and non-CBE students, these differences could be accounted for with statistical tools for matching CBE and non-CBE children.

1. Introduction

Following from previous rounds of data collection, children who were part of the Complementary Basic Education (CBE) programme during the academic year 2017/18 have been followed longitudinally into public schools for the academic year 2018/19. Children who completed the CBE programme were supported to make a transition into public schools and were assessed by Head teachers and allocated to the appropriate grade according to their academic abilities in literacy and numeracy. Once in public schools, the research team collected information on CBE children and a comparable group of children who were not part of the CBE programme, but who nonetheless have been attending public schools. We referred to this group as non-CBE children.

The selection of a comparable group for a literacy/numeracy programme that is targeted required a careful consideration of who are children most likely to share certain observable characteristics like the CBE children who were part of the project. The research team agreed that a sensible approach for the selection of a comparable group will be to visit the schools on a given school day and select for every CBE child of a certain age and gender and in a specific school grade another child of similar age, same gender and in the same school grade. By design, we expect to find small differences, if any, in terms of children's age, gender and school grade attended between those who were part of the CBE Cycle 4 programme and the selected non-CBE group. However, the team collected a number of observable characteristics to assess if there are systematic differences between CBE and non-CBE children and to the extent that these differences exist whether it is possible to condition them out in our empirical models. It is also important to assess the potential bias to the results obtained from the systematic differences between CBE and non-CBE children and the implications for the conclusions that may be drawn as part of this research.

This report presents evidence on the differences between CBE and non-CBE children in terms of local language literacy, English and numeracy, as well as children's engagement with school and whether there were more boys than girls in CBE relative to non-CBE groups. We also assessed whether there were age differences between CBE and non-CBE children, differences according to language of instruction as well as availability of reading materials at home. Once we assess these differences, we use the methodology called propensity score matching to investigate whether despite all the observable differences, we are able to obtain a statistical comparison between CBE and non-CBE children.

Although the report presents evidence on some differences between CBE and non-CBE children, it is important to highlight that these differences may not be generalizable to the population of children in public schools. The selection of non-CBE children was not done at random but focused on children with similar characteristics in terms of age, gender and grade to those who undertook the CBE programme and made the transition into public schools. As such, it may be that the selection of non-CBE children contains children who were overage for the grade. There may also be other systematic differences based on the idiosyncratic selection of public school teachers and/or head teachers who discussed the sampling needs with our enumerators during the data collection period. Therefore, differences between CBE and non-CBE should not be seen as generalizable to the whole population of children in public schools. Our aim, as highlighted above, is to present evidence that we have a comparable group to measure continued proficiency in local language literacy, numeracy and English for children who undertook the CBE programme.

The report is structured as follows:

- Chapter 2 describes the methodological considerations, research instruments including the child survey and assessment instruments and tracking. It also outlines the training and data collection procedures as well as analytical strategy.
- Chapter 3 compares the sample of CBE and non-CBE students in terms of gender, age, grade, region, language and implementing partner. It also examines students' household characteristics and opinions about their previous school experience.
- Chapter 4 presents the results of learner assessments for English literacy, local language literacy and numeracy for CBE and non-CBE students. It investigates if there are differences overall and by gender, language and region.
- Chapter 5 examines the relative influence of previously explored variables on learning scores through the use of linear regression modelling. It further assesses the extent to which CBE and non-CBE students can be distinguished through logit regression modelling and propensity score matching.
- Chapter 6 presents conclusions on the findings presented in this study.

2. Methodological Considerations: Research Instruments, Tracking and Analytical Strategy

2.1 Child background questionnaire

The child background survey was administered to tracked CBE children from Cycle 4 who had transitioned into public school and the matched sample of non-CBE students who represented students who had only been learning in a public school setting (i.e. those who had not had access to CBE). The survey was the same as that used at the start of the CBE programme in the academic year 2016/17. The Cycle 4 endline survey was not used as it applied a restricted number of items, given that some of the information collected during baseline was unlikely to change (eg. language of instruction and language used in the home). The child survey collected information on the students related to their demographics, family status, household economic situation, school, language backgrounds, work history, and personal opinions about school and learning. It was designed to permit the analysis of patterns of differences in performance linked to the students' background and in particular this information is key to investigate differences between CBE and non-CBE children.

2.2 Local Language Literacy, Numeracy and English assessments

The assessments used for the CBE and non-CBE students were based on Early Grade Reading Assessment (EGRA), for local language and English, and Early Grade Mathematics Assessment (EGMA) for numeracy. EGRA instruments in Ghana were developed in 2013 in the following languages: Akuapem Twi, Asante Twi, Dagaare, Dagbani, Dangme, Ewe, Ga, Gonja, Fante, Kasem, Nzema, and English. The subtasks in literacy were letter-sound identification, non-word reading, oral passage reading, reading comprehension and listening comprehension,¹

EGMA was designed to provide information about basic mathematics competencies—those competencies which should typically be mastered in the very early grades, and without which pupils will struggle, or

¹ EGRA and EGMA instruments and software were selected for the Cycle 4 Tracker study rather than the CBE assessments used for the Cycle 4 Baseline and Endline studies as they enabled results to be examined from an individual item level, thus promoting deeper understanding of student progress.

potentially drop out in later years. The subtasks in numeracy were number identification, single digit addition and subtraction, number discrimination, missing numbers in patterns, two-digit addition and subtraction as well as word problem solving.²

2.3 Tracking information

Table 1 shows the number of students who were available for data collection at each round of the CBE Cycle 4 study (baseline, endline and transition) as well as the percentage of male and female students. As can be seen, learner assessment and child survey data were collected for 1228 CBE students³ for the transition phase. This represents a considerable proportion (61%) of those students available at endline (2002). It is important not to misinterpret this figure as representing the proportion of CBE children who made the transition. Rather, this figure shows the proportion of CBE cycle 4 endline students who were present at school at the time of data collection. This same point applies for male and female students; i.e. percentages indicate the number of males and females that were available during data collection, rather than the complete number of those who transitioned.

A better estimate of the attrition rate can be gained from information collected from the household survey.⁴ As shown, information for 1215 CBE students was collected from this survey. Of this figure, 1117 were defined as transitioned students and 98 as non-transitioned students. This constitutes 88% of the sampled group. Regarding the discrepancy between the number of transition students for the learner assessment/child survey (1228) and household survey (1117), in some cases students but not their families could be located and vice versa. This resulted in some missing data and merging issues across surveys.⁵

Table 1: Tracking information for CBE Cycle 4 and non-CBE

Instrument	Baseline	Endline	Transitioned CBE	Non-Transitioned	
				CBE	Non-CBE
Learner Assessment and Child Survey	2401	2002	1228	NA	1352
	Male -53.27%	Male -53.75%	Male-47.80%		Male 46.01%
	Female 46.73%	Female 46.25%	Female-52.20%		Female 53.99%
Household Survey	NA	NA	1117	98	0

Source: CBE Cycle 4 Tracker Study Round 3.

2.4 Component scores and proficiency levels

The English literacy assessment used for this study consisted of six subtasks. The local language literacy assessment was made up of 5 subtasks while the numeracy assessment was made up of eight subtasks. The approach used for analysis in the current report was designed to match that of the Cycle 4 endline and baseline studies. It therefore examines student performance at a subtask level and further calculates proficiencies (basic, advanced and overall) through the use of principle component analysis (PCA). Due to the inclusion of

² For a more thorough review of learner assessments see <https://www.epdc.org/data-about-epdc-data-epdc-learning-outcomes-data/egra-and-egma> and <https://shared.rti.org/>

³ The field research team will be making a further attempt to collect data on the remaining CBE students. This data will be reflected in the final tracking report.

⁴ Implementing partners (IPs) and the CBE Management Unit maintain monitoring information which includes CBE completion rates, dropout rates, transition rates. Our research aims to provide additional support to the monitoring information provided by IPs.

⁵ Due to merging issues with data collected for the Household Survey, the exact breakdown of transitioned and non-transitioned students according to gender could not be added to the current report. These issues are currently being addressed. It is expected that the rest of household surveys could be retrieved during the next round of data collection in May 2018.

three different assessments (English, local language and numeracy) and the need to compare these between CBE and non-CBE students, the analysis in this report will primarily focus on overall scores. Basic and advanced proficiency scores, however, have been included in the Appendix D.

Whilst subtasks differed slightly for this study (compared with those used for Cycle 4 baseline and endline reports), for consistency, composite scores were created that could best match previous examples. In the end, six separate score categories were defined (Table 2). All Cronbach's alphas⁶ in Table 2 were well above the acceptable cut-off of 0.7. Additionally, the final column shows that between 0.74-0.86 of the variation in scores was explained by the categories as defined in these models. Therefore, the subtasks were effectively reduced for analysis, while still achieving variation (as opposed to just a single measure).

Table 2: Measure of internal consistency for the three learner assessments

Component score category	Subtasks	Cronbach's alpha (internal consistency)	Proportion of variance explained by first component
Basic English literacy	<ul style="list-style-type: none"> Letter sound identification Non-word reading 	0.73	0.79
Advanced English literacy	<ul style="list-style-type: none"> Oral reading Reading comprehension 	0.84	0.86
Basic Local Language literacy	<ul style="list-style-type: none"> Letter sound identification Non-word reading 	0.83	0.86
Advanced Local Language literacy	<ul style="list-style-type: none"> Oral reading Reading comprehension 	0.75	0.81
Basic numeracy	<ul style="list-style-type: none"> Number identification Number discrimination Missing number One-digit addition One-digit subtraction 	0.91	0.74
Advanced numeracy	<ul style="list-style-type: none"> Two-digit addition Two-digit subtraction Word problems 	0.85	0.77

Source: CBE Cycle 4 Tracker Study Round 3.

After component scores were created, all scores were scaled from 0-100, for ease of interpretation. As a final step, as in our previous analyses, the scaled component scores were then divided into four proficiency categories. These were defined based on the students' performance of the component scores, as follow:

1. **Non-performer**, comprising those who scored zero on a component score;
2. **Beginner**, comprising those who scored greater than zero but less than 50;
3. **Approaching proficiency**, comprising those who scored greater than 50 but less than 80; and
4. **Proficient**, comprising those who scored greater than 80.

In addition to beginner and advanced component scores, overall scores were generated for English literacy, local language literacy and numeracy. They were then divided into the four proficiency categories described above. These scores comprised all subtasks that were administered to students for the assessment. The only exception was the overall score for English literacy, which omitted the subtask of oral vocabulary. As this

⁶ Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group.

subtask was not given in the local language literacy assessment, it was excluded from the overall English score to make the results more comparable.

2.5 Analytical approach

Analytically, we first investigate whether there are systematic differences between CBE and non-CBE students in terms of age, gender and grade attended. By selection design, we do not expect to see large differences, nonetheless it is important to assess this aspect for quality assurance of the fieldwork. Additionally, we investigate whether there are systematic differences between family status, work status for the children, housing characteristics and wealth index. Finally, we assess differences in local language literacy, English and numeracy in a test applied to CBE and non-CBE children during school visits. As previously indicated, since the selection of CBE and non-CBE children was not random, it was likely that there were differences between them during baseline. We utilised propensity score matching (PSM) techniques (Rosenbaum and Rubin 1983; Heckman, Ichimura and Todd 1997) to investigate the systematic differences and whether we could find a common support for estimation of the value-added models which will take place during data collection at the end of the 2018/19 academic year.

In our particular case, PSM involved estimating a binary treatment model (in our case a logit model) that predicted the probability of each child to have been part of the CBE programme as a function of observed characteristics. The variables included in the analysis are those that influence simultaneously the participation in the CBE programme and the later learning outcomes in literacy, numeracy and English as well as school engagement. We used Stata 13 and the Stata commands p-score (to identify the matching).

2.6 Field Enumerators Recruitment Procedure

All the fifty (50) enumerators recruited for the Cycle 4 baseline and end line data collection were again engaged in the Cycle 4 tracking of transitioned CBE students. Candidates had previously been subjected to a written test in the various languages and their ability to speak the language tested. The customised software – CBE App, designed for the baseline learner assessment was replaced with the Tangerine software, which is more robust and had wider adaptability. Enumerators were adequately trained and able to understand how the software worked and used it effectively on the field. There were some challenges, however, when enumerators were required to enter identification numbers generated during the Child Background at the survey stage at the learner assessment stage. A couple of the enumerators made mistakes while entering these identification numbers at this stage and so we encountered some data that could not be merged between the learner assessment and the child background survey. Around 235 records could not be merged as a result of this, however this was later resolved.

3. The CBE Cycle 4 Tracker Report Sample

3.1 Sample of students

For CBE, the sample was made up 47.8% male and 52.2% female students; for non-CBE, 46.01% of the sample was male and 53.99%, female. Because the CBE students had been involved in the previous Cycle 4 baseline-endline studies, they provided a proportional representation of gender, language, region, district and centre. As the non-CBE students were directly matched to the CBE students, they similarly represented a proportional representation of these variables. Table 3 provides the percentages of students in the CBE and non-CBE group by region, language, implementing partner and grade (See Appendix A for Districts). As shown by these figures,

the number of students for CBE and non-CBE were very similar across variables with the highest proportion of both groups coming from the Northern region. The majority of students for CBE and non-CBE were from the language group of Dagbani. For implementing partner, the largest proportion of both student groups came from School for Life. For CBE and non-CBE groups, whilst most students came from Grade 3, the proportions across grades were very similar between and within groups. It is important to underscore, however, that these grades do not represent comparable levels of education experience between CBE and non-CBE groups. For example, whilst it can be assumed from the grade-level aggregation that non-CBE students, already within the formal school sector, would have had, on average, 3.9 years of schooling prior to data collection (including one year of pre-primary), for CBE students this was not the case. Based upon information that was collected in the Cycle 4 Baseline Study, prior to CBE, 77.3% of CBE students had never attended school. Of the 22.7% who had previously attended school, the average number of years was 2.2. In addition to this, it must be highlighted that CBE students had only between 5-7 weeks of experience at their transitioned formal school when administered the learner assessments and child survey, which means that compared to their non-CBE counterparts, they had considerably less opportunity to become accustomed with their school environment and notably, instruction in English. Many students (43.01%) also undertook local language assessments in a language differed from that used in CBE. These factors must be considered when comparing results.

Table 3: CBE and non-CBE disaggregated by region, language and IPs

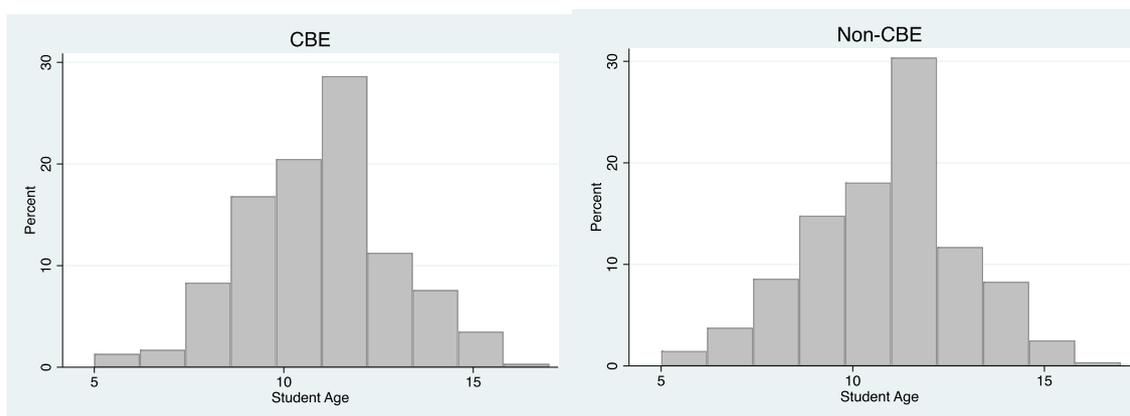
Region	Percentage of CBE students	Percentage of non-CBE students
Ashanti	3.01	2.44
Brong Ahafo	9.28	8.58
Northern	60.42	61.09
Upper East	14.82	14.94
Upper West	12.46	12.94
Language		
Asante-Twi	9.2	7.77
Dagaare	24.51	29.96
Dagbani	43.08	43.05
Ewe	3.09	3.25
Gonja	7.98	5.99
Kasem	12.13	9.99
Implementing Partner		
Action Aid	9.85	10.21
AfriKids	17.18	15.83
CARE International	9.53	8.58
GILLBT	5.05	4.22
IBIS	9.36	12.06
LCD	6.6	5.62
Plan Ghana	6.11	5.25
ProNet	17.43	16.94
School for Life	18.24	20.12
World Education	0.65	1.18
Current Grade in School		
Grade 2	21.66	19.46
Grade 3	22.52	23.80
Grade 4	21.23	20.47
Grade 5	16.57	16.90
Grade 6 and above	18.03	19.38

Source: CBE Cycle 4 Tracker Study Round 3.

3.2 Socio-economic and demographic information

Students' ages ranged from 5-17 with the average age being exactly 10.8 for both groups (see Figure 1).⁷ Table 4 shows that there were comparable averages for household size and number of siblings. Results indicated, however, that for the non-CBE group, slightly more students in the family attended public school. Whilst the percentage of children who had literacy materials in the household and engaged with literacy and numeracy activities at home was slightly higher for CBE students, this difference was small. For both CBE and non-CBE groups, over 90% of students worked at home and over 40% worked outside of home with many of these students not receiving payment for their work.

Figure 1: Age distribution between CBE and non-CBE



Source: CBE Cycle 4 Tracker Study Round 3.

With respect to household possessions, significantly more students from the non-CBE group reported owning household items. Moreover, less CBE students had access to electricity. A comparable ratio of CBE and non-CBE students said they had the same or less money than others in their community and enough food each day. Responses to the household economic questions were used to create a wealth index as a proxy for socio-economic status. This was created through using tetrachoric correlations for all binary variables and then split into quartiles by district. These quartiles are Low, Mid-Low, Mid-High, and High. These were then used to help differentiate among students who were relatively richer and relatively poorer than others in the sample. After conducting a two-sample test of proportions for the relative frequencies, significantly more CBE students were found to be in the lowest quartile and fewer CBE students were in the highest quartile. The other two categories represented minimal difference between groups. Within groups, the largest proportion of students within CBE fell into the low quartile (30.15%) and the smallest into the high quartile (21.06%). For non-CBE students, this was reversed with the largest number of students in the high quartile (27.45%) and the smallest number in the low quartile (21.8%). Overall, however, the proportional differences were not substantial.

⁷ There were a few outliers, but it was unsure if they were data entry issues.

Table 4: Socio-economic and demographic characteristics for CBE and non-CBE students

Family Status	CBE students	Non-CBE students	Statistic	Significance	P Value
Household size	8.35	8.13	t-test	No	0.3479
Number of siblings	4.92	4.70	t-test	No	0.0814
% siblings attending school	58.02	62.35	t-test	Yes	0.0023
% siblings attending this type of school	40.95	47.20	t-test	Yes	0.0001
% children with books/reading materials at home	71.64	67.04	chi2	Yes	0.0120
% children undertaking literacy activities at home	67.48	66.00	chi2	No	0.4250
% children undertaking counting activities at home	36.51	36.23	chi2	No	0.8810
Work Status					
% children working at home	95.68	94.28	chi2	No	0.1060
% children working outside of home	42.5	45.91	chi2	No	0.0810
% children working receiving payment for outside work	15.89	12.75	chi2	No	0.1310
Household Characteristics					
% children owning a mobile phone	71.18	76.19	chi2	Yes	0.0040
% children owning a bicycle	66.42	72.07	chi2	Yes	0.0020
% children owning a motor bike	29.75	37.18	chi2	Yes	0.0000
% children owning a radio	52.67	55.3	chi2	No	0.1830
% children owning a TV	15.45	24.76	chi2	Yes	0.0000
% children with access to electricity	32.87	43.28	chi2	Yes	0.0000
% children with same/less money than others	95.6	94.29	chi2	No	0.1440
% children with enough food every day	51.5	53.29	chi2	No	0.3700
Wealth Index in Quartiles					
Low	30.15	21.8	z-test	Yes	0.0000
Mid-Low	23.94	24.63	z-test	No	0.6991
Mid-High	24.84	26.12	z-test	No	0.4804
High	21.06	27.45	z-test	Yes	0.0003

Source: CBE Cycle 4 Tracker Study Round 3.

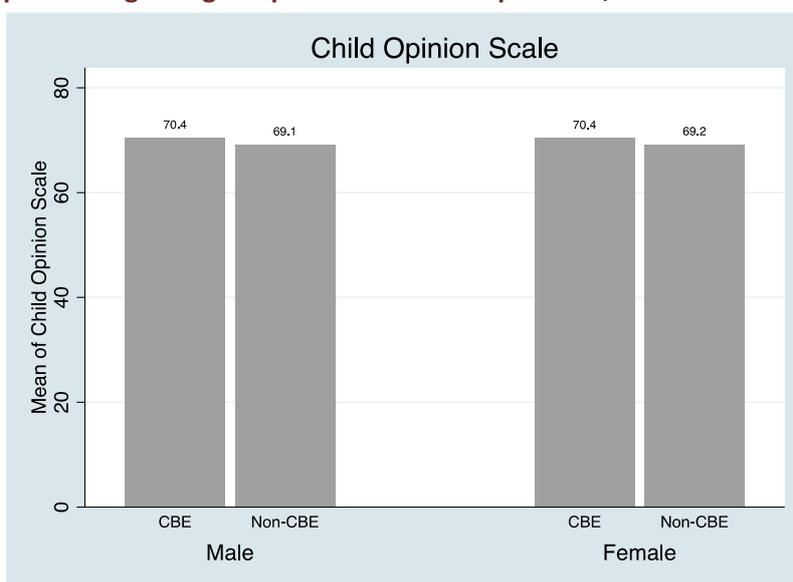
3.3 Child Opinions

Within the Child Survey, students were asked a series of questions concerning their opinions about school. These questions referred to the school experience from the previous year; i.e. CBE students reflected on their time in the CBE programme and non-CBE children thought about their school experience in the last academic year. These questions related to teacher and peer relationships, attitudes to learning, access to home learning support, experiences with language and general well-being at school. Students were asked to respond on a scale of 1-4 where; 1=Never; 2=Sometimes; 3=Most of the time; 4=All the time. Appendix B demonstrates the proportions of students (from both CBE and non-CBE groups) who answered for each category of this scale for all child opinion items.⁸ As can be seen from the table in Appendix B, the proportional differences between groups for each question are very modest throughout. The following section reports some of the major findings from this section of the survey. Please refer to Appendix B, however, for a more comprehensive overview of results.

⁸ In a number of cases, items were reversed coded for ease of comparability and interpretation.

For general well-being, the majority (over 70%) of students from CBE and non-CBE groups reported feeling safe, not tired and not hungry either most of the time, or all the time. Students also reported positive experiences with their teachers and peers with a very small proportion (less than 4%) of each group reporting experiences with being regularly beaten or spoken to harshly by their teacher or friends. In terms of home learning support, however, whilst over 80% reported having time to study most of the time or all of the time, asking family members for help was more challenging for students, with 80% from both groups reporting they could only sometimes, or never do this. In regard to language, over 80% of students reported they found language easy most of the time or all of the time and over 70% reported that learning was easier in their mother-tongue. The individual responses concerning school engagement were combined to generate a single indicator which was then standardized from 0-100 for ease of interpretation. As confirmed through the itemised analysis, minimal differences were observed on average between the CBE and non-CBE group (See Figure 2). In addition, gender differences for school engagement were not observed between and within groups.

Figure 2: Opinions regarding the previous school experience, CBE and non-CBE students



Source: CBE Cycle 4 Tracker Study Round 3.

3.4 Overall Summary

Overall, we find that there are no significant differences in age, gender, grade attended in public schools, language, district and implementing partner representation between CBE and non-CBE students. While this was purposely expected by design, it is important to confirm the results after the data was collected. We found some differences with respect to family status and household possessions, but these differences although statistically significant, were small. Perhaps the only significant difference to highlight was the fact that CBE children come from relatively poorer households as indicated by the wealth index. Finally, we found marginal differences in the opinions of children regarding their previous school experience with CBE students demonstrating slightly more positive attitudes to schooling. For CBE children, this referred to the CBE programme while for children in public schools this referred to the academic year 2016/17.

4. Learner Assessments for CBE and non-CBE Students

This chapter presents the results of the English literacy, local language literacy and numeracy assessments for CBE students who transitioned into public school and non-CBE students.⁹ This chapter compares the learning performance between students in relation to their subtask scores, zero scores, proficiency levels and overall scores. It also examines differences in terms of gender, language and region. Overall, the aim of this section is to assess whether there are systematic differences at the start of the academic year in public schools between CBE and non-CBE children in terms of basic academic abilities. Accounting for any differences is important as the research team will evaluate improvements over time in English, local language literacy and numeracy. As EGRA and EGMA instruments replaced the CBE assessments used in the Cycle 4 Baseline and Endline studies, there were a number of differences between the format as well as content of subtasks. In analyzing subtasks between assessments, for example, only a small selection were found to be comparable. These will be examined later within Chapter 4. These factors, along with the considerable time-frames between assessments, would have helped control the impact of practice effects upon results.

Table 5 demonstrates the mean percent scores of each subtask from the English literacy, local language literacy and numeracy assessments. For basic English literacy tasks, non-CBE students performed significantly better in oral vocabulary than CBE students. Whilst other basic tasks including letter sound identification and non-word reading revealed comparable results, non-CBE students demonstrated significantly higher scores for advanced tasks including oral reading, reading comprehension and listening comprehension. Within local language literacy tasks, however, CBE students' results exceeded the non-CBE group across all categories, with scores for letter sound identification, oral reading and reading comprehension reaching levels of high significance. Overall, students within both groups revealed stronger results for numeracy assessments than for literacy. With the exception of number identification, where CBE students showed stronger results than the non-CBE cohort, numeracy subtask scores did not yield any significant differences between groups.

⁹ For the CBE student group, assessments were not carried out for those who had dropped out of CBE or discontinued their education following the programme. This analysis therefore does not compare learning performance with students from this category.

Table 5: Differences in subtasks performance between CBE and non-CBE

Subtasks	CBE mean percent score (%)	Non-CBE mean percent score (%)	Statistic	Significance	P Value
English Literacy Subtasks					
Oral vocabulary	60.3	66.4	t-test	Yes	0.0000
Letter sound identification	32.0	30.4	t-test	No	0.1427
Non-word reading	17.5	16.3	t-test	No	0.2529
Oral reading	34.8	38.4	t-test	Yes	0.0171
Reading comprehension	24.6	27.3	t-test	Yes	0.0370
Listening comprehension	34.2	39.7	t-test	Yes	0.0024
Local Language Literacy Subtasks					
Letter sound identification	30.4	23.1	t-test	Yes	0.0000
Non-word reading	18.1	14.5	t-test	Yes	0.0012
Oral reading	34.3	25.7	t-test	Yes	0.0000
Reading comprehension	23.9	16.1	t-test	Yes	0.0000
Listening comprehension	46.0	42.3	t-test	Yes	0.0185
Numeracy Subtasks					
Number identification	46.6	44.1	t-test	Yes	0.0486
Number discrimination	58.9	56.9	t-test	No	0.1350
Missing number	42.8	42.5	t-test	No	0.8047
One-digit addition	45.2	44.8	t-test	No	0.7474
Two-digit addition	41.1	42.5	t-test	No	0.2908
One-digit subtraction	39.9	39.7	t-test	No	0.8977
Two-digit subtraction	35.9	36.2	t-test	No	0.8268
Numeracy word problems	51.4	48.9	t-test	No	0.0650

Source: CBE Cycle 4 Tracker Study Round 3.

4.1 Overview of Zero Scores

In addition to presenting the mean percent scores, Table 6 provides an overview of the subtask zero scores for learning assessments. These scores show the percentage of students who could not correctly answer a single item on the given subtask. This figure reflects those students performing at critically low levels within both CBE and public-school contexts and offers insight into the particular areas of educational instruction that require further attention and investigation.

Table 6: Differences in the percentage of non-performers between CBE and non-CBE

Subtasks	Percent of Non-Performers (Zero Scores)		Statistic	Significance	P Value
	CBE	Non-CBE			
English Literacy Subtasks					
Oral vocabulary	9.12	3.77	z-test	Yes	0.00000
Letter sound identification	16.69	18.79	z-test	No	0.16360
Non-word reading	52.2	56.43	z-test	Yes	0.03120
Oral reading	36.48	34.84	z-test	No	0.38500
Reading comprehension	57.25	50.3	z-test	Yes	0.00040
Listening comprehension	48.37	40.68	z-test	Yes	0.00010
Local Language Literacy Subtasks					
Letter sound identification	19.71	31.88	z-test	Yes	0.00000
Non-word reading	53.75	61.91	z-test	Yes	0.00000
Oral reading	40.88	52.14	z-test	Yes	0.00000
Reading comprehension	61.81	69.53	z-test	Yes	0.00000
Listening comprehension	36.64	39.5	z-test	No	0.13530
Numeracy Subtasks					
Number identification	10.02	7.62	z-test	Yes	0.03130
Number discrimination	10.02	9.84	z-test	No	0.87860
Missing number	13.19	11.91	z-test	No	0.32650
One-digit addition	8.88	7.03	z-test	No	0.08210
Two-digit addition	29.97	26.63	z-test	No	0.05980
One-digit subtraction	11.32	9.32	z-test	No	0.09470
Two-digit subtraction	36.24	34.32	z-test	No	0.30790
Numeracy word problems	18.81	21.08	z-test	No	0.15000

Source: CBE Cycle 4 Tracker Study Round 3.

In examining the results from English literacy subtasks, over half of students from both CBE and non-CBE could not answer a single question on non-word reading and reading comprehension tasks. Significantly more students had zero scores from the CBE group for reading comprehension (57.23%) and listening comprehension tasks (48.37%) than for non-CBE students (50.3%; 40.68%). Comparable results were found between groups with oral reading, where over a third of students classified as non-performers. A considerably lower proportion of students from both groups received zero scores for oral vocabulary and letter sound identification (CBE-9.12%; Non-CBE-3.77%) with significantly more CBE students categorised as non-performers for this task. In examining these results, it must be reiterated that the majority of CBE students had only been exposed to English language instruction within a formal school environment for 5-7 weeks (depending on the date of data collection) as the CBE programme is conducted in the local language. Moreover, within Ghana, lower primary grades (P1-P3) are taught in the local language of instruction with English becoming the main instructional language in the upper grades (P4-P6), with only a few weekly sessions in the local language. Bearing this in mind, there would have been a number of students across both CBE and non-CBE groups who had minimal exposure to learning English at school.

For local language literacy assessments, the lower proportion of CBE students receiving zero scores for subtasks compared with non-CBE students was statistically significant for all categories except listening comprehension. Particularly strong differences were observed for letter sound identification (CBE-19.71%;

Non-CBE-31.88%), oral reading (CBE-19.71%; Non-CBE-31.88%) and reading comprehension (CBE-61.81%; Non-CBE-69.53%) assessments. Overall, however, high levels of non-performers were found across groups for a number of English and local language literacy subtasks.

For numeracy subtasks, substantially less students in both groups were classified as non-performers compared with literacy subtasks. For basic tasks, there were slightly fewer students identified as non-performers from the non-CBE group with only number identification showing a statistically higher proportion of students for CBE (10.02%) than non-CBE (7.62%). Overall, less than 15% of students from both groups received zero scores across all basic numeracy tasks. For advanced tasks, two-digit addition and subtraction tasks had the highest percentage of zero scores with the latter proving the most challenging for students (CBE-36.24%; Non-CBE-34.32%). Less than a 3% difference was observed between groups, however for all advanced numeracy subtasks.¹⁰

4.2 Overall Scores and Proficiency Levels

Table 7 presents the mean percent of beginner, advanced and overall scores for English literacy, local language literacy and numeracy assessments. For Basic English, whilst the CBE group demonstrated a slightly higher mean percent score, this was found to be insignificant. For advanced English, the non-CBE group was found to significantly perform better than CBE students. When overall scores were calculated, however, no significant difference was found between scores. For local language literacy, CBE students outperformed non-CBE group students across levels with significance achieved for all scores. For numeracy, scores were comparable for basic, advanced and overall performance with no significant differences perceived.

Table 7: Differences in overall scores and proficiency levels between CBE and non-CBE students

Scores	CBE(%)	Non-CBE(%)	Statistic	Significance	P Value
English Literacy					
Basic score	24.38	22.97	t-test	No	0.1426
Advanced score	29.36	32.51	t-test	Yes	0.0162
Overall score	28.97	30.33	t-test	No	0.2052
Local language Literacy					
Basic score	24.10	18.74	t-test	Yes	0.0000
Advanced score	28.69	20.54	t-test	Yes	0.0000
Overall score	29.43	22.86	t-test	Yes	0.0000
Numeracy					
Basic score	46.19	45.21	t-test	No	0.3456
Advanced score	42.51	42.33	t-test	No	0.8807
Overall score	44.89	44.20	t-test	No	0.5144

Source: CBE Cycle 4 Tracker Study Round 3.

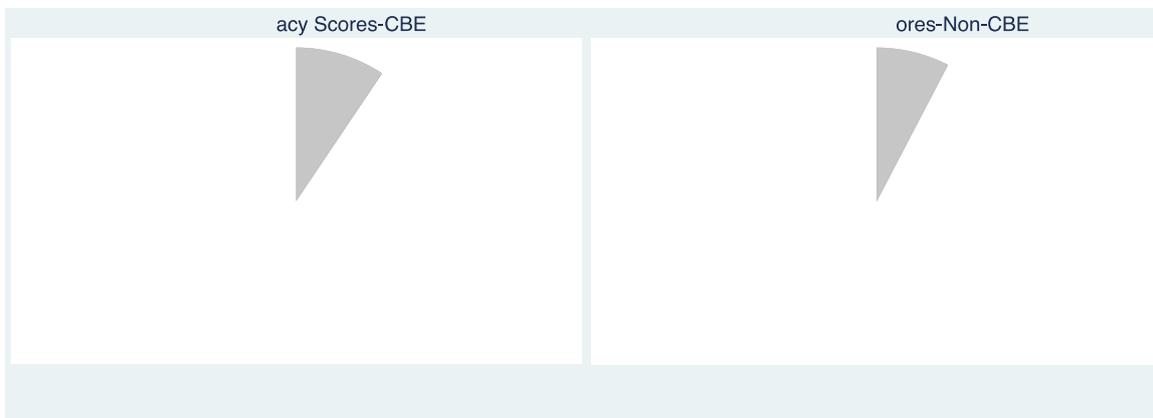
The proportion of students for each proficiency level for CBE and non-CBE groups for overall English results are shown in Figure 3.¹¹ For the four proficiency levels, modest proportional differences were observed between CBE and non-CBE. The largest of these discrepancies occurred with non-performer and approaching proficient categories, with non-CBE students having less students at the lowest end of the achievement spectrum and

¹⁰ For a breakdown of proficiency levels for all subtasks see Appendix C.

¹¹ For a breakdown of proficiency levels for basic and advanced categories for each assessment see Appendix D.

more students who attained grades between 50-80%. The highest proportion of students in both groups fell into the beginner category revealing that less than a quarter of all students in CBE and non-CBE attained a grade which exceeded 50%. A slightly larger proportion of CBE students fell into the highest performance category of approaching proficiency with 6.92% and 5.25% from the non-CBE group.

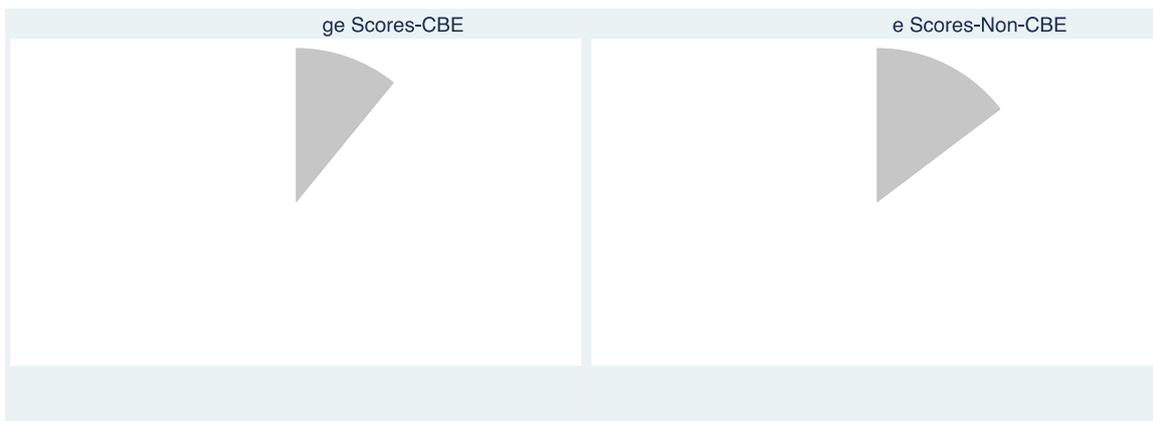
Figure 3: Differences in overall English literacy score between CBE and non-CBE by proficiency levels



Source: CBE Cycle 4 Tracker Study Round 3.

For overall local language literacy (See Figure 4), CBE students' stronger performance was reflected through the proportional differences in categories between groups. There were fewer students falling into the non-performer categories (CBE-10.8%; Non-CBE-14.8%) and a higher percentage of students reaching approaching proficient (CBE-21.5%; 16.7%-Non-CBE) and proficient levels (CBE-4.5%; Non-CBE-2.1%). As with English literacy, the highest proportion of students for both groups fell into the beginner category with modest differences between them (63.2%-CBE; 66.6%-Non-CBE).

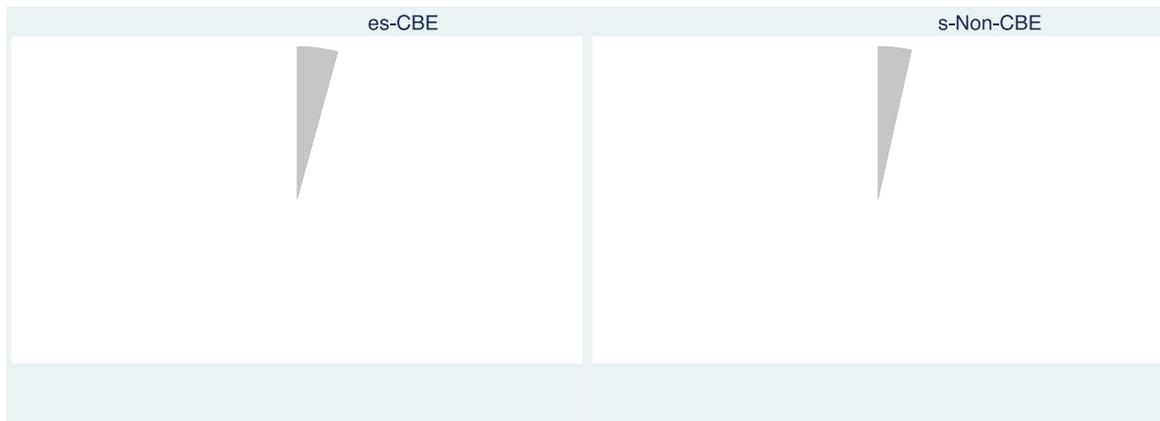
Figure 4: Differences in overall local language score between CBE and non-CBE by proficiency levels



Source: CBE Cycle 4 Tracker Study Round 3.

The overall results for the numeracy proficiency levels are shown in Figure 5. For both CBE and non-CBE, a very low proportion of students fell into the non-performers category with insignificant differences between these percentages (CBE-4.2%; Non-CBE-3.5%). Whilst approximately half of students were categorised as beginner, over 40% of students from both groups achieved either approaching proficient or proficient levels, a finding which further confirms the relative strength of students' numeracy performance compared with literacy.

Figure 5: Differences in overall numeracy score between CBE and non-CBE by proficiency levels

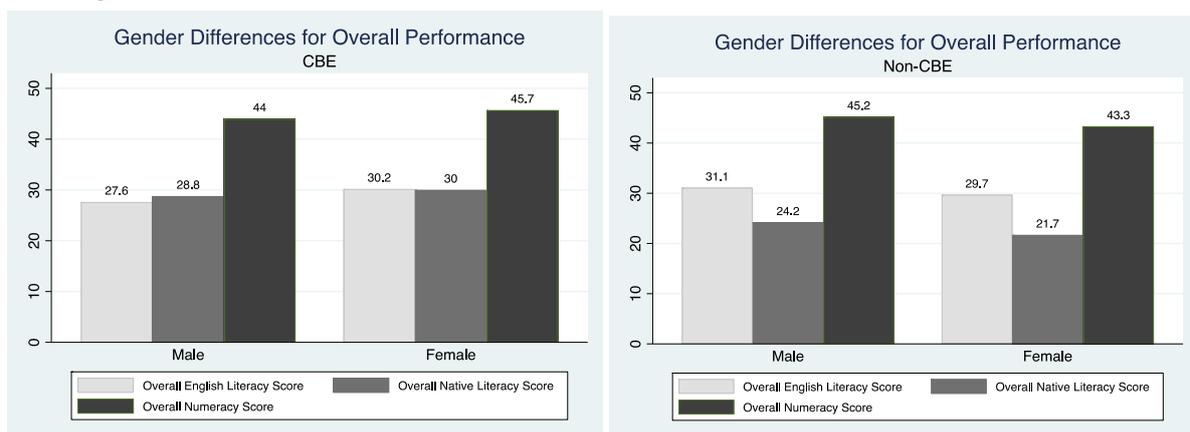


Source: CBE Cycle 4 Tracker Study Round 3.

4.3 Differences by Gender

This section considers gender differences within and between CBE and non-CBE groups. Figure 6 presents the overall scores for males and females across all three assessments of English literacy, local language literacy and numeracy. Though females slightly outperformed males across all assessments in the CBE group, no statistically significant differences were observed. For the non-CBE group, males showed modest gains over females. Between groups however, males achieved significantly higher scores in the non-CBE group for English literacy than for males within CBE. This trend was reversed within local language literacy however, with males from CBE attaining significantly higher results than males from the non-CBE cohort. In terms of between group female performance, the only statistically significant difference was with local language literacy assessments where female CBE students achieved on average 8.3% higher scores than their non-CBE counterparts. This was found to be the largest difference overall highlighting the stronger performance of females for local language literacy within CBE as opposed to public school environments.

Figure 6: Gender differences in assessments between CBE and non-CBE (overall scores)



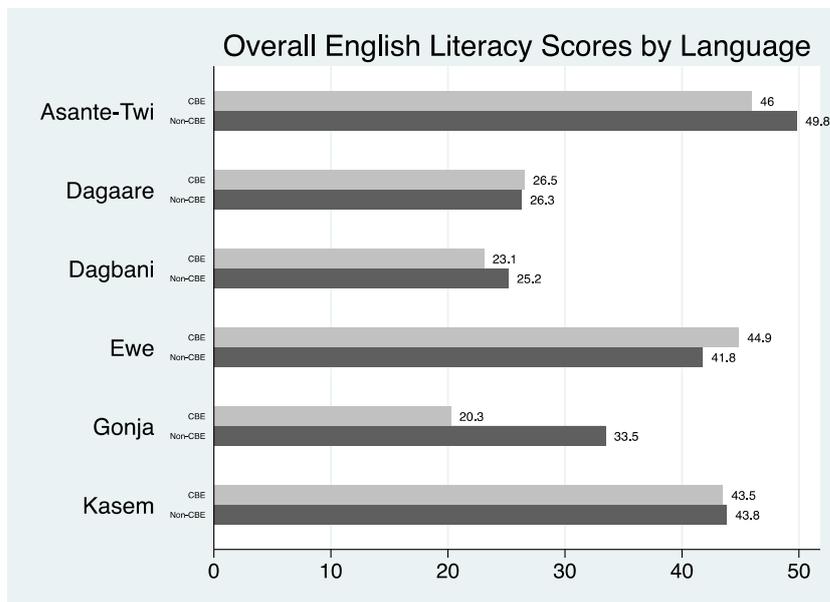
Source: CBE Cycle 4 Tracker Study Round 3.

4.4 Differences by Language

This section examines differences in performance between the Ghanaian languages that students were learning within their schools. It presents differences for overall scores in English literacy, local language literacy and numeracy. Figure 7 examines results for overall English. From this, it can be seen that Asante-Twi was the strongest performing language for both CBE and non-CBE groups with scores far exceeding the mean for overall English for both groups. Ewe and Kasem similarly demonstrated mean scores well above the average. The

largest discrepancy in results can be seen with Gonja, where non-CBE students significantly outperformed CBE students. Dagaare and Dagbani’s mean scores also fell below the overall averages both CBE and non-CBE.

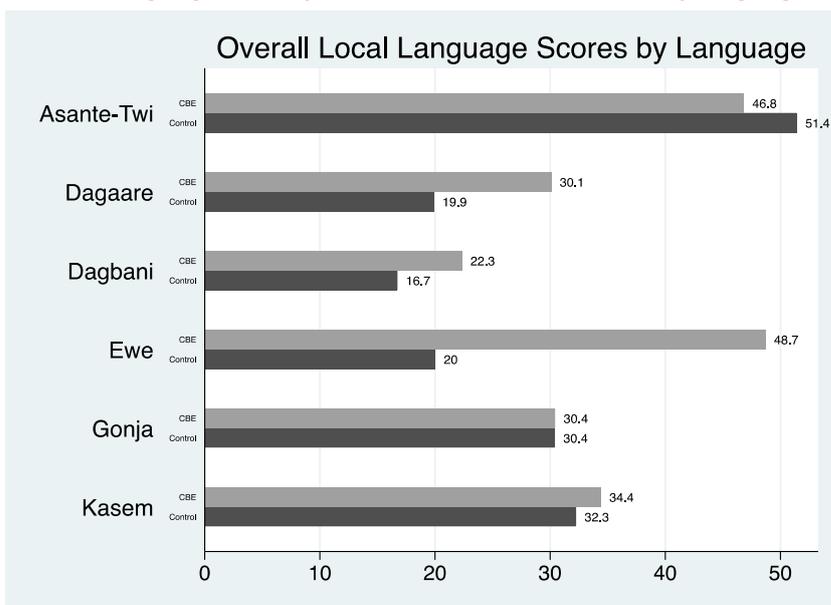
Figure 7: Differences in English literacy between CBE and non-CBE, by language (overall scores)



Source: CBE Cycle 4 Tracker Study Round 3.

For Local language (see Figure 8), Ewe’s results were the highest for any CBE group (48.7%). Interestingly, the Ewe non-CBE group scores were substantially lower; representing one of the weaker achieving non-CBE groups in local language after Dagbani and Dagaare. Asante-Twi achieved scores well above the average for both CBE (46.8%) and non-CBE (51.4%), with the latter group outperforming the former. Comparable scores were achieved for Gonja and Kasem with all figures exceeding the means for overall local language literacy for both groups (CBE-29.43%; Non-CBE-22.86%).

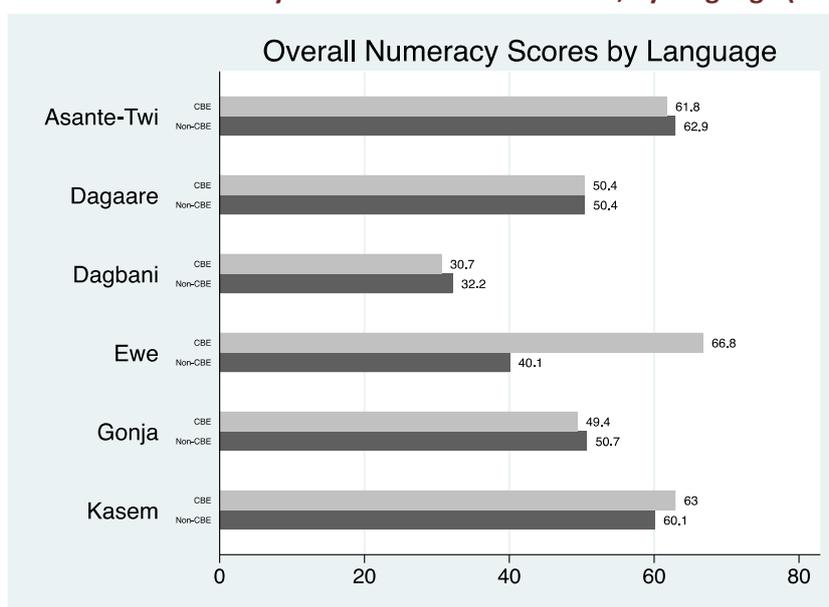
Figure 8: Differences in local language literacy between CBE and non-CBE, by language (overall scores)



Source: CBE Cycle 4 Tracker Study Round 3

For numeracy (see Figure 9), Ewe’s CBE scores (66.8%) were the highest of any language group. As with local language literacy, there was a considerable difference between this and Ewe’s non-CBE score (40.1%) which fell below the overall average. Asante-Twi, Kasem, Gonja Dagaare also achieved above average results for both groups with modest differences separating them. Dagbani was the lowest achieving language for both CBE (30.7%) and non-CBE (32.2%) with only minimal differences observed between mean scores.

Figure 9: Differences in numeracy between CBE and non-CBE, by language (overall scores)



Source: CBE Cycle 4 Tracker Study Round 3.

4.5 Differences by Region

In examining Table 8, Brong Ahafo stood out at the strongest performing region for three assessment scores. The CBE group achieved exceptionally high results in relation to the overall mean in each case, with numeracy results representing the highest mean score across all regions, treatment groups and assessments. The Upper East region also performed well across assessments with all scores exceeding the overall average for treatment and non-CBE. The Ashanti region was one of the lowest achieving regions, with CBE students achieving the lowest average grade for each overall assessment result. The non-CBE group performed significantly better in these regions, however scores still fell below the average. The Northern region also demonstrated scores which were lower than average by at least 5%.

Table 8: Differences in assessments between CBE and non-CBE, by region (overall scores)

Region	Overall Literacy		Overall Local Language Literacy		Overall Numeracy	
	CBE	Non-CBE	CBE	Non-CBE	CBE	Non-CBE
Ashanti	5.90	11.14	9.23	18.95	30.93	38.49
Brong Ahafo	58.60	57.79	59.66	48.77	73.45	61.22
Northern	22.39	24.47	24.01	17.85	35.17	36.77
Upper East	42.30	41.61	31.55	27.47	61.46	57.78
Upper West	28.50	30.37	35.50	24.75	54.40	53.42
Overall mean	28.97	30.33	29.43	22.86	44.89	44.20

Source: CBE Cycle 4 Tracker Study Round 3.

4.6 Learning Retention and Access to CBE Language Instruction

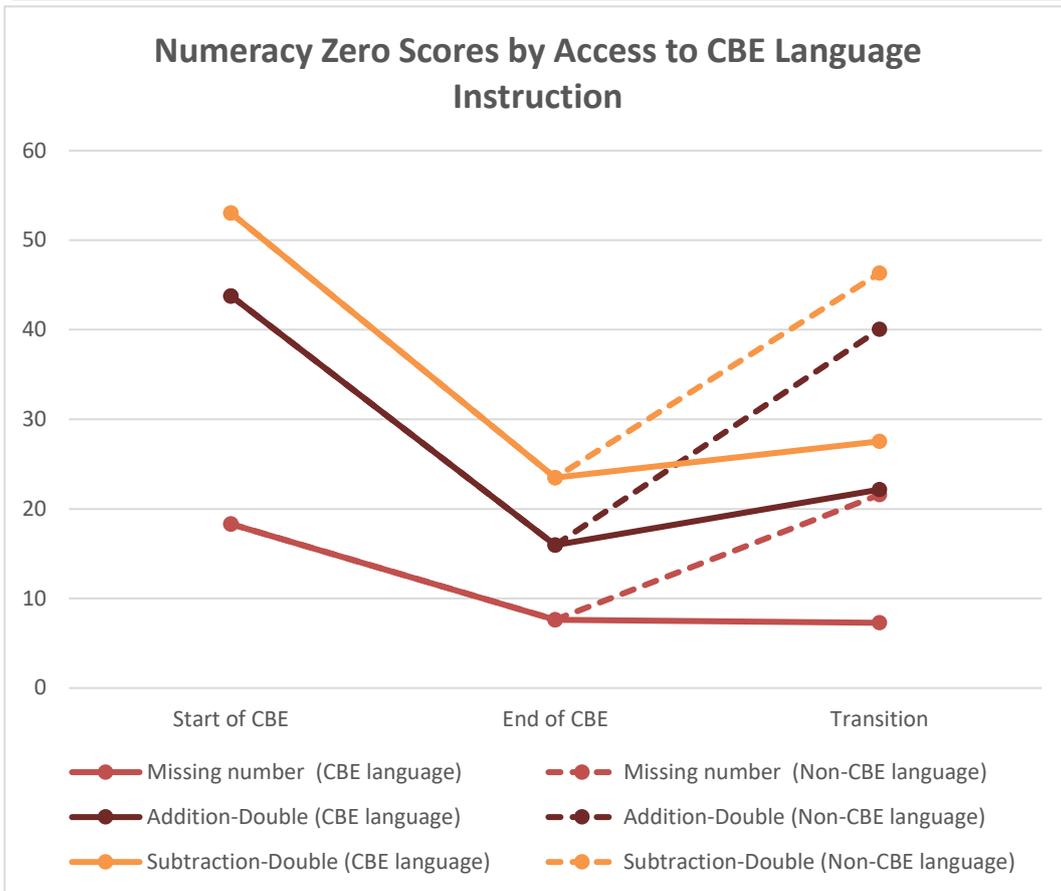
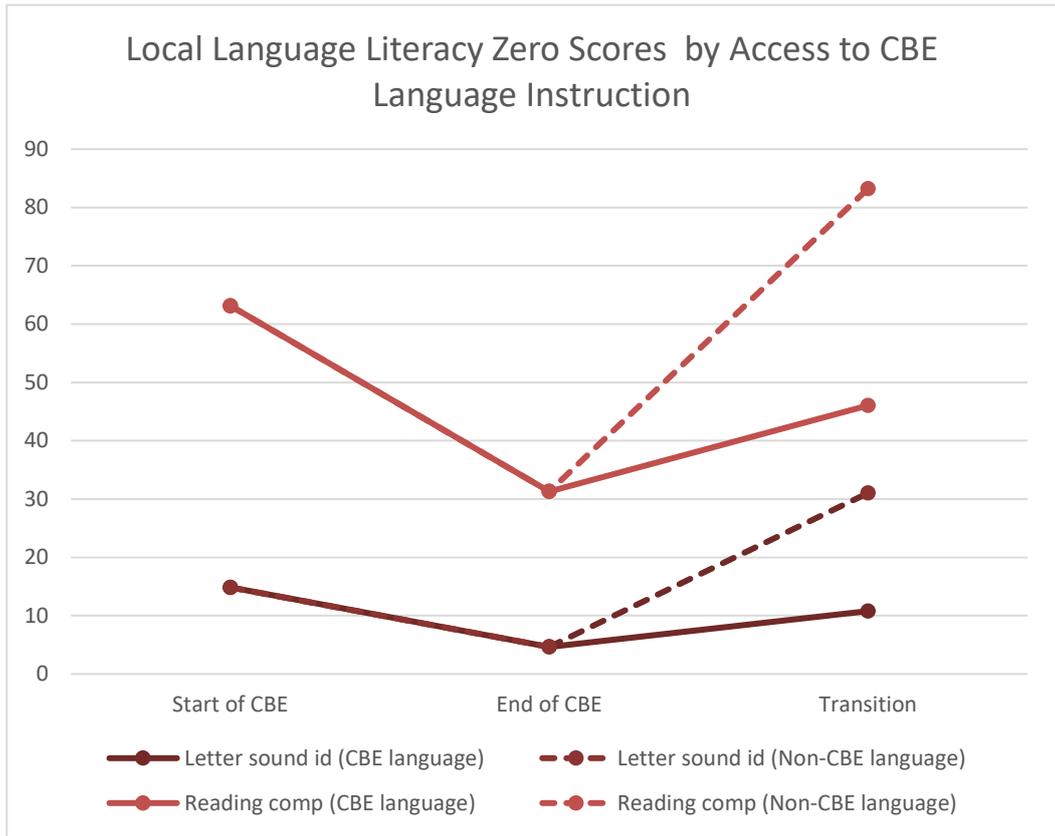
Whilst there were a number of differences in terms of content and format between EGRA/EGMA instruments and the previously adopted CBE assessments used for studies at the beginning and end of CBE Cycle 4, several subtasks were able to be compared. These included letter sound identification and reading comprehension for local language literacy, and missing number and two digit addition/subtraction subtasks for numeracy. This enabled some analysis to be carried out regarding the extent to which students were able to retain the knowledge and skills learnt during CBE. In undertaking this analysis, it was also important to differentiate between students who transitioned into the same language as that used within CBE and those who did not. Figure 10 demonstrates the percentage of students from both these groups who obtained zero scores for the afore mentioned literacy and numeracy subtasks. As can be seen from this Figure, greater proportions of zero scores were found for students who did not have access to their CBE language at their transition school across both local language literacy and numeracy subtasks.¹²

For students who did have access to their CBE language, expectedly, some knowledge loss was experienced from the end of the programme to the start of formal school. Zero scores for this group, however, were far closer to those at the end of CBE rather than at the beginning, revealing that much of the learning had been retained during these periods. For students who did not have access to their CBE language, zero score proportions exceeded those from even the beginning of CBE for local language literacy subtasks. For numeracy, there was also a higher percentage of non-performers for the missing number identification subtask at transition (22.15%) compared with the start of CBE (18.3%). For addition and subtraction subtasks, the percentage of zero scores also increased substantially from the end of CBE to figures that were only slightly lower than those at the start of the programme. In terms of gender differences between zero scores, marginal discrepancies (less than 5%) between males and female proportions were observed across the three time frames for subtasks.

Overall, these findings suggest the particular challenges that many CBE students may face as they move from instruction in their local language during CBE to another local language in the formal school. This change was shown to impact students' performance in both their local language literacy and numeracy assessments.

¹² It is important to note that numeracy assessments also required literacy skills as instructions were carried out in the local language that students had transitioned into.

Figure 10: Percentage of zero scores for local language literacy and numeracy



4.7 Overall Summary

Overall, results from this section show that CBE students outperform non-CBE students in local language literacy. This was shown by differences in all but one subtask (listening comprehension). It was also revealed through proportional differences of zero scores (non-performers) between CBE and non-CBE groups. In terms of English, there were some differences whereby non-CBE outperformed CBE students, but these differences were small and inconsistent across subtasks demonstrating comparable performance overall. For numeracy, we did not find differences between the proficiency of CBE and non-CBE students. Five important observations from the chapter are as follows:

First, we found no significant gender differences in assessment within CBE and non-CBE groups, although some small gender differences were apparent between groups.

Secondly, we also found some variation according to language of instruction, with the largest variations being found for Ewe (for literacy and numeracy, but not so much for English).

Third, there were regional variations in proficiency in local language. In all but one region CBE outperformed non-CBE. For the Ashanti region, however, CBE students' scores were substantially lower than those of the non-CBE group. This finding is consistent with that of language; for example, Asante-Twi is the main language spoken in the Ashanti region and this similarly represented the only language group where non-CBE students outperformed CBE students in local language literacy.

Fourth, in terms of CBE students' learning retention, whilst some knowledge loss was observed for those students who were able to transition into their CBE language in formal school, in general, zero score proportions at transition demonstrated that much of the learning had been retained for this group. For students who were not able to transition into their CBE language, however, zero score proportions showed a substantial increase from the end of the CBE programme, a finding which suggested the particular challenges these students may face as they move into less familiar language environments.

Finally, in examining the difference between CBE and non-CBE students' assessment results, it must be remembered that the majority of CBE students had only been exposed to English language instruction within a formal school environment for 5-7 weeks (depending on the date of data collection) as the CBE programme is conducted in the local language. They also had considerably less experience in a formal school environment with 77.3% having never attended school prior to CBE. Moreover, for local language assessments, 43% of CBE students were tested in a language that differed from that used in CBE. The comparable and, at times, superior performance of CBE students, therefore, needs to be contextualised and appreciated, with these challenges in mind.

5. Understanding sources of variation between CBE and non-CBE groups

5.1 Linear Regression Modelling

For this chapter, factors of interest were included in a set of multiple linear regression models in order to investigate their relative influence on CBE and non-CBE learning outcomes. This chapter reports the results of these models and their estimation of the association of independent variables on overall assessment scores, whilst holding all other factors constant.

Table 9 shows the results of six models which represent a regression with the same explanatory variables but different outcome variables. The outcome variables represent the overall scores for English literacy, local language literacy and numeracy for CBE and non-CBE separately. Whilst language, implementing partner and region were investigated individually within Chapters 3 and 4, only language has been incorporated into the current regression models due to the high correlations between these variables which makes it difficult to discern the independent influence of factors when combined

The figures displayed in table can be understood as follows. For continuous variables such as age and non-attendance, a one unit increase in the explanatory variable, is associated as an assessment score increase or decrease as indicated by the coefficient shown for each model (positive = increase; negative = decrease), holding all other variables constant. For binary (eg. female) and categorical variables (eg. grade and language) each coefficient can be understood as the assessment score impact in relation to the reference group. For example, in Model 1, female students were found to score on average 0.05 points lower than males, a finding which was insignificant. For language where the reference group was Asante-Twi, the highest performing language overall, students from the Dagaare group were found to score 9.07 points less than those from the reference group, a result which was of high significance.

Across models, whilst age did not significantly impact scores, grade was a highly significant factor. In every example, there was an increase in scores in relation to the reference category (Grade 2) for each grade. Overall these ranged from 1.72-37.65 points. All of these gains were found to be significant with the exception of Grade 3 in Model 4 (Non-CBE Local Language Literacy). Interestingly, when controlling for other variables, being female was found to be significant in two contexts; non-CBE Local Language literacy (-2.57) and non-CBE numeracy (-2.80). In both cases, being female resulted in slightly decreased scores. Being female was not found to be significant in any of the models examining CBE outcomes, a finding which supported the gender balanced performance of this group as described in Chapter 3.

Many of the language patterns observed in Chapter 4 were supported by the current findings. Across models for example, Dagaare and Dagbani underperformed in relation to Asante-Twi. For Dagaare, which represented the lowest achieving language overall, differences ranged from -24.81 (Non-CBE-Local Language Literacy-Model 4) to -3.57 (CBE Numeracy-Model 5). In all models with the exception of CBE numeracy, these results were found to be significant. Ewe's relatively strong performance in all CBE groups was also supported through the regression models with significant differences from Asante-Twi observed for CBE Local Language Literacy (Model 3) and Numeracy (Model 5). For the non-CBE group, however, their relatively lower performance was found to be significant for Local language Literacy (Model 4) and Numeracy (Model 6). Both Gonja and Kasem achieved significantly lower scores than Asante-Twi in several models. For Gonja, this included those with CBE-English Literacy (Model 1), Non-CBE-English Literacy (Model 2) and Non-CBE Local Language Literacy (Model 4) outcome variables. For Kasem, this was seen for both CBE and Non-CBE Local Language Literacy (Models 3 and 4).

For access to mother tongue language (i.e. the language which children grew up speaking and most commonly speak at home), there was considerable variation in results. For CBE groups, having access to mother tongue language in the transition school led to significant increases in scores for local language literacy and numeracy. For English, there was a modest negative association, but this was insignificant. For the non-CBE group, whilst access to mother tongue instruction increased local language assessment scores, it led to a significant decrease in English literacy (-8.02 points) and numeracy (-5.23) scores. The finding may point

to the fact that children in non-CBE groups who do not have access to mother tongue instruction may have increased exposure to English, hence their relatively stronger performance in these assessments. In any case, this is a finding that warrants further investigation and follow up at endline. Qualitative research may also provide additional insights into these results.

Across the majority of models, non-attendance was an insignificant factor. Household size was also found to have minimal effects on students' overall scores, with significance only reached for CBE local language literacy and numeracy. Students' home literacy activity, however, had a very large influence on results across all models with increases ranging from 8.92-14.32 points. For home numeracy activity, however, the impact was far less pronounced, with only two significant negative associations found with Model 1 (CBE-English) and Model 3 (CBE-Local language Literacy). Across all models, students who worked outside of home were found to achieve significantly lower scores than those who did not, with coefficients ranging from -10.21 to -2.59. After accounting for a number of predictor variables, the quartiled wealth index by district showed insignificant differences on assessment scores overall.¹³

¹³ It is important that the current findings with respect to the wealth index are considered with caution and that definitive conclusions regarding the impact of wealth are not drawn based upon the measurement used. A number of approaches were used to carry out consistency checks for the wealth index. This included decomposing each item of the index and examining its individual influence on assessments scores. In doing this, it was shown that having access to individual items did not consistently predict higher achievement. For example, whilst having access to a television showed higher scores, having a bicycle predicted lower scores. Overall, however, differences were marginal. These findings supported later regression analysis which revealed insignificant results for wealth quartiles by district across models, after accounting for a range of factors including language, grade etc. In addition, checks were carried out with household data collected from adults in relation to CBE students. Similarly, having access to individual items did not consistently impact scores. In conducting this further analysis issues were noted with the rate of agreement between adult and child responses, with children mostly over-reporting access to an item compared to adults. This finding suggests that questions may have been interpreted differently by participants. Despite these challenges, whether or not any of the different approaches to wealth are included does not alter the overall conclusion with respect to other variables in the model. As such, the results of the model more generally stand.

Table 9: Linear regression models predicting overall assessment scores

Explanatory Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 4
	CBE English Literacy	Non-CBE English Literacy	CBE Local Language Literacy	Non-CBE Local Language Literacy	CBE Numeracy	Non-CBE Numeracy
Age	-0.09	0.08	-0.10	0.52	-0.25	-0.24
Grade						
Grade 2 (Reference group)						
Grade 3	6.42**	4.56*	4.46*	1.72	10.53***	4.94*
Grade 4	15.58***	13.73***	10.09***	8.71***	22.05***	14.44***
Grade 5	27.43***	21.63***	17.45***	12.67***	29.75***	19.48***
Grade 6	37.65***	26.20***	27.10***	17.88***	34.54***	19.01***
Female	-0.05	-1.62	-1.21	-2.57*	0.11	-2.80*
Language						
Asante-Twi (Reference group)						
Dagaare	-9.07***	-17.62***	-9.33**	-24.81***	-3.57	-8.64**
Dagbani	-16.42***	-16.21***	-21.87***	-29.37***	-26.97***	-24.19***
Ewe	7.80	4.62	13.53*	-21.57***	13.18**	-9.29*
Gonja	-14.70***	-11.60***	-3.33	-15.22***	-0.12	-6.30
Kasem	-4.23	-5.58	-11.03***	-17.86***	0.73	-3.66
Mother tongue instruction	-1.97	-8.02***	8.09***	5.67***	3.62**	-5.23***
Non-attendance	-0.78	0.44	0.00	0.64	-0.02	1.35**
Household size	0.22	-0.07	0.72***	0.19	0.36**	0.00
Home literacy activity	10.78***	14.32***	9.79***	8.92***	13.61***	13.05***
Home numeracy activity	-4.94**	-2.58	-3.98*	-2.26	-1.86	-1.60
Work outside home	-6.75***	-6.79***	-10.21***	-7.19***	-4.83***	-2.59*
Wealth index						
Low (Reference group)						
Mid-Low	4.19*	-0.38	0.09	1.31	1.285	-0.36
Mid-High	2.37	-0.21	3.55	1.90	1.92	-0.22
High	0.06	-2.96	-1.12	-1.08	1.53	-2.22
Constant	20.70***	31.12***	21.78***	27.15***	29.44***	47.35***

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Source: CBE Cycle 4 Tracker Study Round 3.

5.2 Propensity Score Analysis

As expected, given the selection of comparable Non-CBE children to CBE cycle 4 children who made the transition, we found no differences in age, gender or grade attended, as this was part of the selection design. Nonetheless, the previous analysis has shown some systematic differences between CBE and non-CBE children, in particular with respect to some household characteristics, reading materials at home, school non-attendance, as well as results on mother tongue language literacy. In addition, differences between the number of years of schooling experience were also apparent. As noted, non-CBE students had attended, on average, 3.9 years of formal schooling prior to data collection. When the study was conducted, CBE students had only attended between 5-7 weeks of formal school with 77.3% of CBE students having never attended school prior to CBE. Of the 22.7% who had previously attended school, the average number of years of schooling experience was 2.2.

The first step in the propensity score methodology is to estimate a binary logit model which specifies the probability that a child belongs to the CBE group as a function of the observable factors obtained from the survey. (See Table 10). For this model, the same predictors used in previous linear regressions were applied. In addition, overall scores were included as explanatory variables within the logit model in order to determine the extent to which they distinguished students. The coefficients in this model are displayed as odds ratios. These represent the odds (or likelihood) of being a CBE student given a one-unit increase in the explanatory variable. Numbers greater than 1 demonstrate increased odds of being a CBE student, while values less than 1 indicate decreased odds. A coefficient of exactly 1 means that there was no difference in the odds for that variable. In summarising significant predictors, higher scores on local language literacy assessments were associated with CBE students. For example, the odds of being a CBE student increased by 3% for each point of a student's local language literacy score. Numeracy scores, however, did not differentiate student groups. Other factors which significantly distinguished CBE students included slightly lower scores (2%) for English literacy and a higher rate of non-attendance at school (e.g. the odds of being a CBE student increased by 14% for each day of absence). CBE students were also 25% more likely to engage in literacy activities at home. Compared to the low quartile wealth index, they were significantly less likely (by 47%) to be in the high quartile. The fact that grade, age, gender, language and household size did not differentiate student groups demonstrates the effectiveness of the sampling procedure which matched CBE and non-CBE against a range of potential covariates.

Table 10: Logit regression model predicting CBE student classification

Explanatory Variables	Odds Ratio
Overall English score	0.98***
Overall local language literacy score	1.03***
Overall numeracy score	1.00
Age	1.00
Grade	
Grade 2 (Reference group)	
Grade 3	0.91
Grade 4	1.03
Grade 5	0.98
Grade 6	0.89
Gender	0.94
Language	
Asante-Twi (Reference group)	
Dagaare	0.66
Dagbani	1.07
Ewe	0.71
Gonja	1.17
Kasem	1.13
Mother tongue instruction	1.00
Non-attendance	1.14***
Household size	1.01
Home literacy activity	1.25*
Home numeracy activity	1.11
Work outside home	0.95
Wealth Index	
Low (reference group)	
Mid-Low	1.06
Mid-High	0.88
High	0.53***
Constant	0.83

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Source: CBE Cycle 4 Tracker Study Round 3.

The logit model specification is then checked to test the equality of the mean and standard deviation of the observed characteristics across CBE and non-CBE children. This test is called the balancing propensity test (Rosenbaum and Rubin 1983; Heckman et al. 1997; Dehejia and Wahba, 2002). The balancing property is satisfied for CBE and non-CBE children. The number of children in each of the 11 blocks of the propensity score is shown in Table 11. As can be seen, for the lower bound of the propensity score, between 0 and 0.1 probability of being identified as a CBE child, we have 210 non-CBE children who are comparable to 188 CBE children. As the propensity score increases we demonstrate an inverse relationship, where the number of CBE relative to non-CBE is higher.

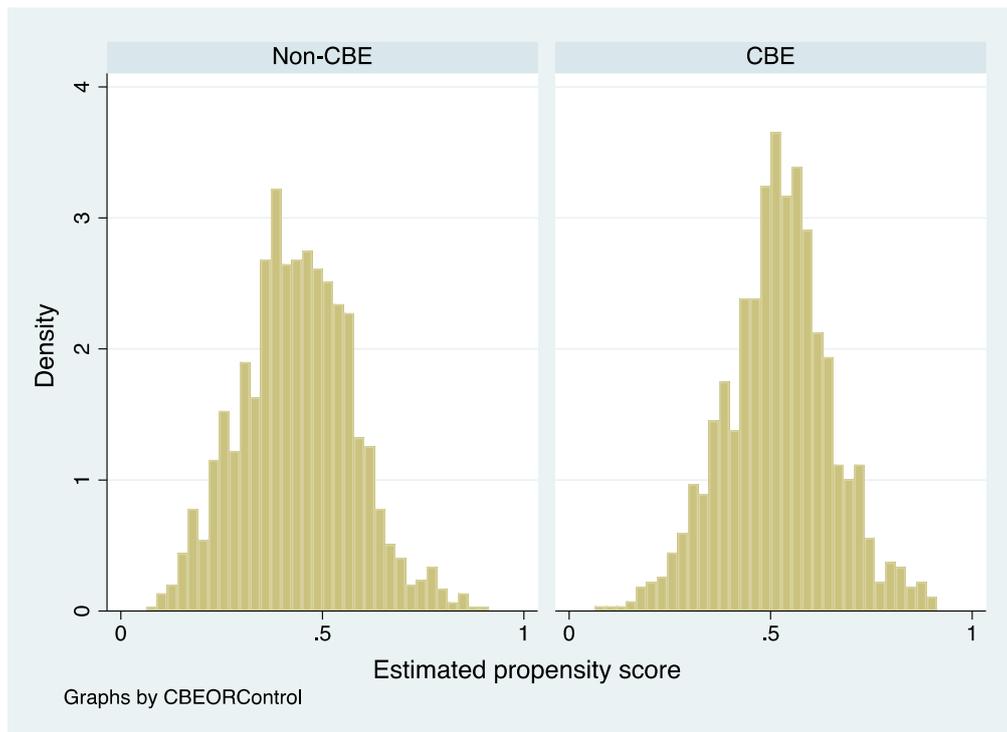
Table 11: Number of Blocks and Number of Matched CBE and non-CBE children

Number of Block	Inferior value of propensity score	Non-CBE	CBE	Total
1	0	210	188	398
2	0.1	48	9	57
3	0.2	134	44	178
4	0.3	272	126	398
5	0.4	185	121	306
6	0.45	142	156	298
7	0.5	229	321	550
8	0.6	88	170	258
9	0.7	31	66	97
10	0.8	13	24	37
11	0.9	0	3	3
Totals		1,352	1,228	2,580

Source: CBE Cycle 4 Tracker Study Round 3.

The above information is also confirmed by showing the distribution of the propensity score according to CBE and non-CBE children (see Figure 10). The distribution of the propensity score shows a common support which supports the finding that we have a sound comparable group (in statistical terms) for CBE Cycle 4.

Figure 10: Distribution of propensity score for CBE and non-CBE children



Source: CBE Cycle 4 Tracker Study Round 3.

5.3 Overall Summary

Overall, we find small differences in factors that predict proficiency between CBE and non-CBE students. Some of the differences were consistent with language spoken at home and availability of reading materials at home.

Importantly, the use of propensity score highlights that CBE students were likely to have gains in local language literacy, slightly lower scores in English literacy, lower attendance in the week preceding the survey and to come from relatively poorer households. As noted, these findings also need to be considered in light of the additional barriers faced by CBE students in terms of less schooling experience and exposure to English language instruction as well as challenges due to undertaking local language assessments in languages which differed from those taught within CBE. Finally, we found statistical evidence that differences between student groups could be accounted for and a common support for matching CBE and non-CBE according to the information collected could be achieved.

6. Conclusion

The aim of this study was to compare CBE students from the Cycle 4 endline study who had transitioned into public school, with non-CBE students. Tracked CBE students were matched with non-CBE students on a variety of variables including, age, grade, gender, language and region. As shown through logit regression modelling and propensity score matching, student groups were highly comparable across factors, demonstrating the effectiveness of the sampling approach.

Overall, this study showed that for English literacy, students attained similar mean scores. For non-CBE students, however, slightly higher gains were found when scores were examined within logit regression analysis. Considering that many CBE students would have been more limited in their exposure to English due to the programme being carried out in their local language of instruction and due to the more limited schooling experience of CBE students, this narrow discrepancy was expected. As shown in Chapter 3, differences were mainly apparent with advanced skills including oral reading and reading comprehension. For Basic English tasks such as word identification and non-word reading, however, overall differences were marginal

For local language literacy, CBE students demonstrated stronger performance across the majority of basic and advanced subtasks, despite 43% being assessed in a language that differed from that taught in the CBE programme. Further regression analysis supported this finding by showing that the odds of being a CBE student increased by 3% for each point on a student's reading score, when all other factors were held constant. For numeracy both groups displayed stronger overall means compared with literacy, with no distinguishable differences between them. For all overall assessment results, the fact that CBE scores were largely similar to those of the non-CBE group, stands as testament to the success of the programme in preparing students for the transition to public school, particularly when considering the challenges faced by this student group. In general, however, students across groups still appear to be underperforming in literacy compared with numeracy. For CBE students that transition into formal school environments, there are also apparent difficulties for those who are required to move into a language that differs from that applied in the CBE programme. This is an issue that qualitative case studies within formal schools will try to investigate further. Moreover, the fact that both CBE and non-CBE students are achieving higher results for advanced rather than basic English and local language literacy suggests the challenges that students are facing with rudimentary skills including phonemic awareness and decoding. This finding, however, may also point to the fact that students may be less familiar with reading words and sounds out of context. Understanding more about students' rudimentary literacy skills and the teaching that supports this, therefore, are key areas that warrant increased attention and monitoring within both CBE and public-school learning environments.

Within linear regression models investigating within group effects, gender did not significantly predict any overall scores for CBE. For non-CBE, gender was found to be a weakly significant factor for non-CBE local language literacy and numeracy scores, with females achieving scores between 2.44 and 2.55% lower. For

language and region, there was strong variability amongst categories. Asante-Twi was the highest performing language overall for English, local language literacy and numeracy assessments. Dagbani and Dagarre, on the other hand, represented the lowest achieving groups. Large between-group discrepancies were observed with Ewe, with the CBE group strongly outperforming non-CBE students, particularly for local language literacy and numeracy results. Gonja and Kasem presented mixed findings. Whilst for English assessments (CBE and non-CBE) and local language literacy (non-CBE), they represented one of the lowest achieving groups, for all other assessments their scores were relatively strong. For Kasem, substantial differences were also observed between results for local language literacy (CBE and non-CBE) where they received significantly lower scores by comparison, and English and Numeracy, where their performance was among the strongest of language groups. For region, the results were somewhat more consistent both within and between CBE and non-CBE groups. Brong Ahafo and Upper East regions revealed the strongest performance overall and the Ashanti and Northern region represented the weakest performance. As noted, however, the high correlation between language, region as well as implementing partner makes it difficult to ascertain which specific variable is most influential in terms of these differences.

When variables were combined in linear and logit regression models, it became clear that some factors had significant power in predicting scores as well as distinguishing CBE from non-CBE students. For example, grade and engagement in home literacy activities were consistent predictors of gains for all assessment results. Similarly, for those students who worked outside of home, significantly negative impacts were observed across linear regression models. Access to mother tongue instruction also presented an interesting mix of results in terms of its negative and positive predictive power. As noted previously, this is a variable that should receive careful follow up at endline and qualitative research could also provide more insight into what is influencing these differences. In addition to assessment score differences which have already been discussed in this chapter, slightly higher rates of absenteeism in the week preceding data collection and a greater likelihood to engage with literacy activities at home were other influential factors associated with CBE students in the logit regression model.

In summary, this baseline report has demonstrated the effectiveness of the CBE programme in academically preparing students for the initial transition into public school due to the high degree of comparability across a range of factors. The next round of the Cycle 4 Tracker study will be invaluable for shedding light on the longer-term impact of the CBE programme for school readiness. This study will also allow for greater clarification on the role that variables such as mother tongue instruction and home learning support play in students' learning development.

Appendix A: Percentage of CBE and Non-CBE students by district

District	CBE	Non-CBE
Bawku	8.55	6.8
Bongo	2.52	3.48
Daffiamah	2.36	3.62
Gushegu	9.85	10.21
Karaga	5.94	4.07
Kasena-Nankana	3.58	3.18
Lawra	3.34	3.33
Mamprugu-Moaduri	5.05	4.22
Nanumba South	6.92	6.8
Nkoranza	2.52	3.85
North Gonja	2.77	1.92
Pru	3.09	3.25
STK	9.36	12.06
Sekyere Afram Plains	3.01	2.44
Sissala West	2.36	2
Tain	3.66	1.48
Talensi	0.16	1.48
Tolon	0.65	1.18
Wa West	5.29	4.66
West Gonja	4.32	3.4
West Mamprusi	3.34	3.25
Yendi	11.32	13.31
Total	100	100

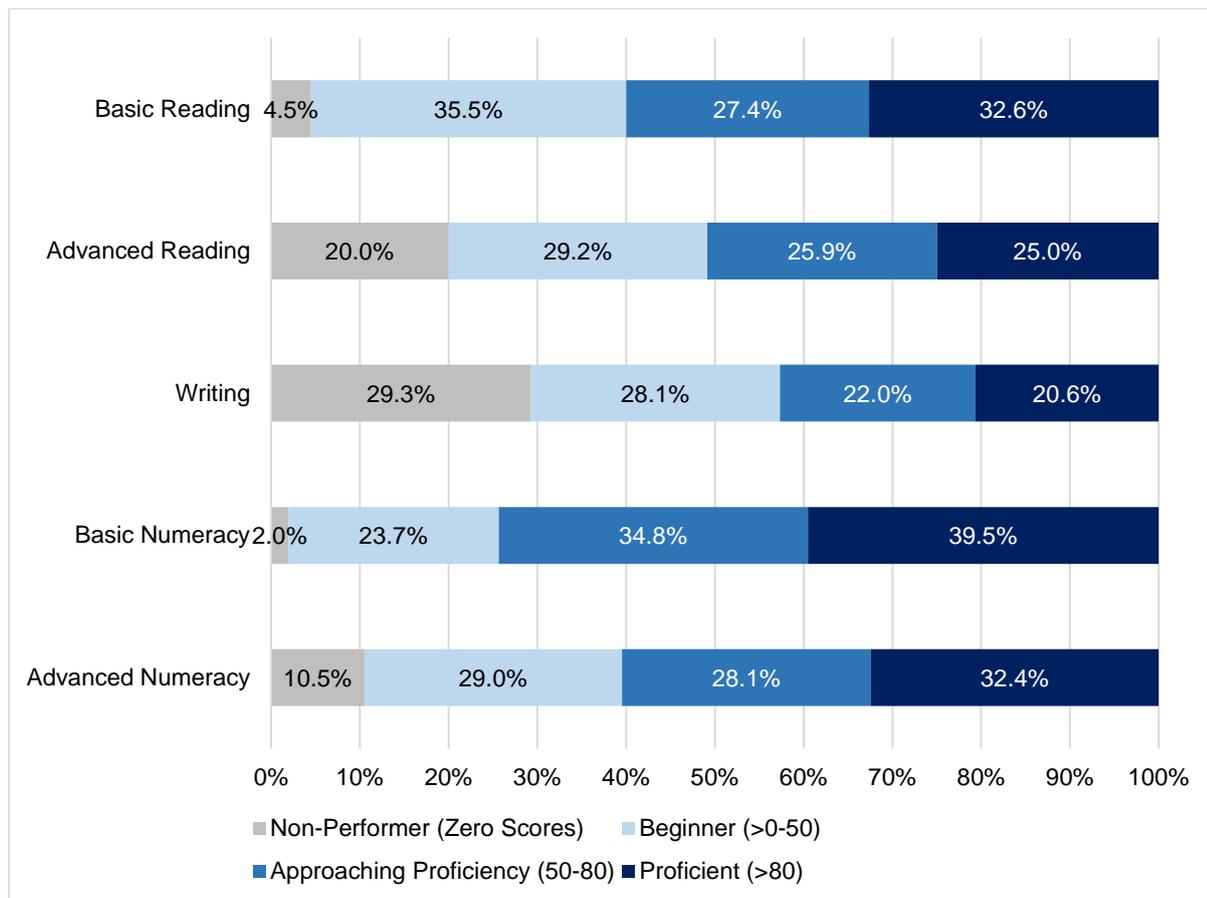
Appendix B: Child opinions

	CBE (Percent)			
	Never (1)	Sometimes (2)	Most of the time (3)	All of the time (4)
Not tired	1.39	9.96	59.59	29.06
Likes school	3.1	4.57	31.1	61.22
Lessons interesting	5.47	8.57	41.88	44.08
Not hungry	1.55	11.76	70.61	16.08
Not beaten by teacher	0.41	2.37	48.65	48.57
Not beaten/mockd by friends	0.41	2.12	31.02	66.45
Learning language was easy	2.04	13.96	64.73	19.27
Not spoken to harshly by teacher	1.06	0.9	36.24	61.8
Given time to study at home	4.98	12.65	50.86	31.51
Happy	2.53	26.53	34.53	36.41
Language used was easily understood	10.29	43.59	26.86	19.27
Teacher used own language	26.94	28.16	22.86	22.04
Felt safe	2.2	18.12	37.22	42.45
Lessons easy	8.65	55.59	26.2	9.55
Good at mathematics	15.1	55.67	22.37	6.86
Learning easier in mother tongue	3.43	17.31	37.96	41.31
Asks teacher for help with learning	11.35	47.18	24.16	17.31
Asks mother/female adult for help with learning	43.1	42.04	10.86	4
Asks father/male adult for help with learning	48.73	39.1	9.63	2.53
Asks siblings for help with learning	25.88	45.96	21.39	6.78
Tries hard	7.1	39.84	34.61	18.45

Appendix C: Percentage of students for each proficiency level for subtask

	CBE			
	Non Performer Zero Scores	Beginner (>0-50)	Approaching Proficiency (50-80)	Proficient (>80)
English Literacy Subtasks				
Oral vocab	9.12	22.07	33.31	35.5
Letter sound	16.69	55.54	18.65	9.12
Invent word	52.2	33.31	10.1	4.4
Oral reading	36.48	26.63	13.36	23.53
Reading comp	57.25	19	9.36	14.58
Listening comp	48.37	15.88	19.38	16.37
Local language Literacy Subtasks				
Letter sound	19.71	55.62	15.72	8.96
Invent word	53.75	30.29	8.06	7.9
Oral reading	40.88	23.53	11.07	24.51
Reading comp	61.81	13.52	7.9	16.78
Listening comp	36.64	14.01	24.02	25.33
Numeracy Subtasks				
Number id	10.02	37.79	26.14	26.06
Quant comp	10.02	24.35	27.2	38.44
Missing number	13.19	42.26	26.06	18.49
Add single	8.88	44.71	26.14	20.28
Add double	29.97	30.37	15.8	23.86
Subtract single	11.32	50.98	21.58	16.12
Subtract double	36.24	28.91	14.5	20.36
Numeracy word problems	18.81	20.85	29.97	30.37

Appendix D: Percentage of students for each proficiency level for basic and advanced assessment categories



	Non-Performer (Zero Scores)	Beginner (>0-50)	Approaching Proficiency (50-80)	Proficient (>80)
Basic English Literacy				
CBE	15.64	67.83	12.38	4.15
Non-CBE	17.31	66.86	13.02	2.81
Advanced English Literacy				
CBE	34.04	36.24	18.16	11.56
Non-CBE	32.17	36.09	18.64	13.09
Basic Local language Literacy				
CBE	18.73	65.07	9.53	6.68
Non-CBE	30.4	56.88	7.17	5.55
Advanced Local language Literacy				
CBE	37.62	36.4	13.93	12.05
Non-CBE	47.78	36.32	9.02	6.88
Basic Numeracy				
CBE	4.23	50.16	32.17	13.44
Non-CBE	3.62	53.62	31.95	10.8
Advanced Numeracy				
CBE	13.93	43.24	28.09	14.74
Non-CBE	13.24	45.71	28.62	12.43



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