EdData II

Pupil Performance, Pedagogic Practice, and School Management:
An SSME Pilot in Zambia

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An SSME Pilot in Zambia

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Abbreviations

clpm	correct letter sounds per minute
cwpm	correct words per minute
DFID	British Department for International Development
EFA	Education for All
EGMA	Early Grade Mathematics Assessment
EGRA	Early Grade Reading Assessment
MDG	Millennium Development Goal
MOE	Ministry of Education
NDP	National Development Plan
PRP	Primary Reading Programme
PTA	parent-teacher association
RTI	RTI International (trade name of Research Triangle Institute)
SACMEQ	Southern African Consortium for Monitoring Educational Quality
SES	socioeconomic status
SSME	Snapshot of School Management Effectiveness
TIMSS	Trends in International Mathematics and Science Study
UNESCO	United Nations Educational, Scientific, and Cultural Organization
USAID	United States Agency for International Development

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Executive Summary

Policy Background

In 1995 Zambia conducted a series of reviews and policy dialogues arising from a number of assessments that had revealed very low levels of primary school pupils' reading abilities. The following year, the government produced a comprehensive policy statement called Educating our Future, which stated that educators would teach initial literacy and numeracy using a language familiar to the pupils, while maintaining English as the medium of instruction. Guided by this policy initiative and with support from the British Department for International Development (DFID), the Ministry of Education (MOE) designed and implemented a seven-year project called the Primary Reading Program.

Despite the success that the Primary Reading Program enjoyed,[1] the 2006 National Assessment found that less than 30% of fifth-grade pupils were reading in English at a minimum level of performance, and less than half of the pupils performed at a minimum level in mathematics. This was not much different from the results of the assessment carried out in 1995 by the Southern African Consortium for Monitoring Educational Quality (SACMEQ). The 2011 Millennium Development Goals (MDGs) Progress Report has demonstrated that Zambia, while very successful in reaching 100% enrollment rates, should shift its emphasis from access to the quality of education. A first step is to develop a clear understanding of how children are learning to read and think mathematically in the primary grades.

Purpose and Design of the Assessment

Assessments of pupil learning in the primary grades, such as the Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGMA), offer an opportunity to determine whether children are developing the fundamental skills upon which all other literacy and mathematical skills build, and, if not, where efforts might be best directed. This is vital information for countries that are working to improve the quality of education in their schools. Indeed, further evidence of growing international concern for learning outcomes, as opposed to attendance or completion rates, is the fact that EGRA and EGMA have been adapted and used around the world, including EGRA implementations in over 40 countries.

When measuring the quality or effectiveness of an education system, we can pose some basic questions: Are children learning to read? Are they learning basic math skills? Are they acquiring those skills early enough in primary school to secure the foundation for further learning? In addition to measuring pupil performance, it is essential to understand why some schools are better able to perform than others. The Snapshot of School Management Effectiveness (SSME) provides a multifaceted view

[1] Evaluations indicated that PRP had made a significant and positive impact on pupils' ability to read with fluency and understanding, while also improving all-around learning, teacher motivation, growing enrollments, and reduced absenteeism and dropout. Shay Linehan. (2004). Language of instruction and the quality of basic education in Zambia. Paper commissioned for the *EFA Global Monitoring Report 2005, The Quality Imperative*, p. 3. Available from http://unesdoc.unesco.org/images/0014/001466/146659e.pdf

of school conditions and practices that are historically linked to pupil performance. Through the SSME we are able to answer important questions such as: Do pupils and teachers have the materials they need? Do pupils and teachers spend enough time engaged in activities that support learning? What instructional practices are teachers using?

To answer these questions about learning and the factors influencing it in Zambia, the Education Data for Decision Making (EdData II) project, funded by the U.S. Agency for International Development (USAID), partnered with USAID/Zambia, the MOE, and the Examinations Council of Zambia to conduct a study of early grade reading and math skills, and the learning environments that support them, in a sample of Bemba-speaking schools. Pupil assessment and school survey protocols developed under the EdData II project were tailored to the Zambian context during an adaptation workshop with MOE and Examination Council Staff.

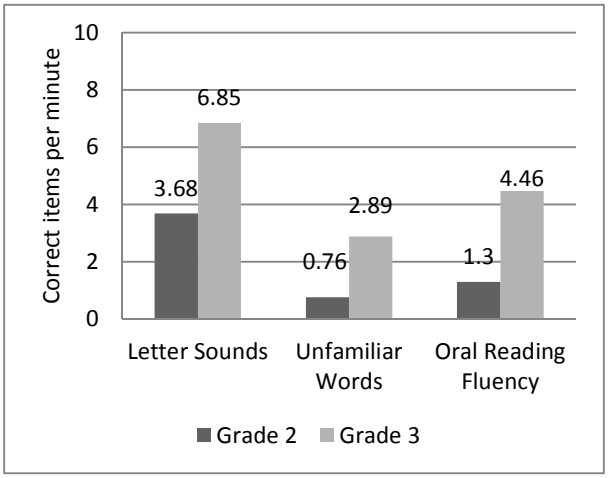
Reading and math assessments (EGRA/EGMA) were administered to a total of 800 grade 2 and grade 3 pupils randomly selected from within 40 schools. The 40 participating schools had been randomly selected from within the Bemba-speaking regions of Zambia (Central, Copperbelt, Luapula, and Northern regions). In addition to pupil assessments, researchers interviewed Headteachers, teachers, pupils, and parents; conducted classroom and school inventories; and observed reading and math lessons. The fieldwork was carried out by trained data collection teams in July 2011, midway through the school year.

How Well Are Pupils Learning to Read In Bemba?

As was previously mentioned, the **Early Grade Reading Assessment (EGRA)** was applied to a sample of grade 2 and grade 3 pupils. The EGRA, which was administered orally in Bemba, consisted of five subtasks: letter sound knowledge, unfamiliar word reading fluency, connected text oral reading fluency, reading comprehension, and listening comprehension. Letter sound knowledge and the ability to read unfamiliar single-syllable words are foundational skills needed for fluent reading and comprehension. All subtasks except for reading comprehension and listening comprehension were timed to assess whether pupils had achieved a desired level of automaticity in these skill areas.

For the oral reading fluency task, pupils were asked to read a short narrative story for one minute. A majority (91%) of grade 2 pupils and 78% of grade 3 pupils were unable to read a single word in this passage. For those grade 3 pupils who read more than one word, the average number of words read was about 21 words per minute. This performance is not surprising given weak performance in both letter naming tasks (50% of grade 2 and 42% of grade 3 pupils were unable to name a single letter sound) and decoding tasks (88% of grade 2 and 75% of grade 3 pupils were unable to read a single unfamiliar word). Pupils' performance on these foundational skills was strongly correlated with reading fluency.[2] These findings show that pupils' limited

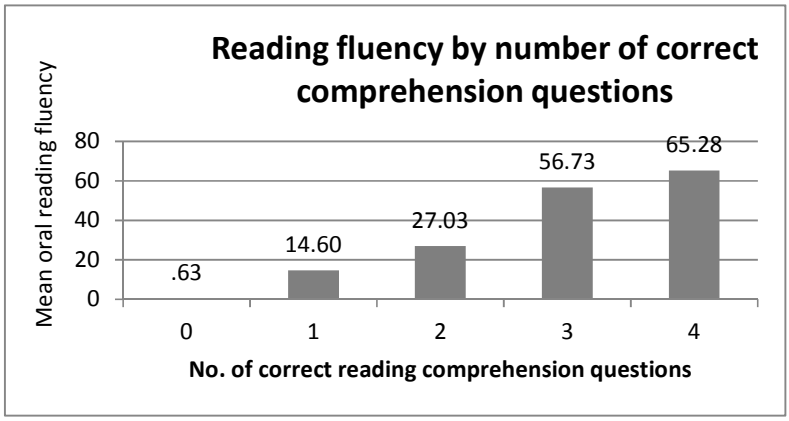
[2] Correlation between oral reading fluency and letter sound: $r = 0.5$, $p = 0$. Correlation between reading fluency and decoding skills as measured by the unfamiliar word task: $r = 0.9$, $p = 0$.



knowledge of letter sounds and weak decoding skills must be addressed to improve their oral reading fluency.

Pupils who were able to read at least one word correctly were asked five questions about the story. As would be expected, overall, very few pupils were able to answer the questions; 92% of grade 2 and 85% of grade 3 pupils were unable to answer a single question correctly.

Research has consistently demonstrated a strong relationship between reading fluency and reading comprehension. International research has shown that a reading speed of between 45 and 60 words per minute is considered the minimum required to ensure reading comprehension.[3] Although this varies by language, the observed comprehension scores in Zambia substantiate this finding. Mean oral reading fluency scores among pupils able to answer four out of the five comprehension questions correctly were 65.28 correct words per minute. Conversely, average reading scores among pupils who were only able to answer one of the five comprehension questions correctly was 14.60 correct words per minute.



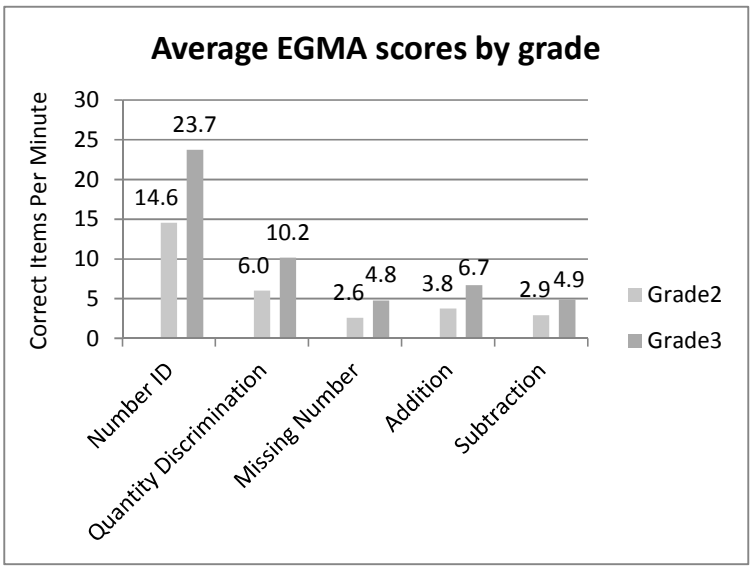
A final assessment of pupils' language skills was the EGRA listening comprehension task, in which the assessor read a short narrative story to the pupils, followed by three questions about that story. This was purely a listening task, as the pupils were not given a copy of the story as a reference when answering the questions. The listening comprehension task assessed a range of language and cognitive skills, such as attention, vocabulary knowledge, comprehension of text, and generation of appropriate replies. Most (70%) of the pupils in grade 2 answered one or more questions correctly, and approximately 90% of pupils in grade 3 did so. Thus, it appears that pupils' oral language skills were strong enough, generally, to

[3] Jan Hasbrouck and Gerald A. Tindal. (2006, April). Oral reading fluency norms: A valuable assessment tool for reading teachers," *The Reading Teacher, 59*(7): 636–644. doi:10.1598/RT.59.7.3. Recent neuro-cognitive research has demonstrated that children must read at a speed greater than one word or sound per second in order to ensure automaticity of reading. Automatic processing of text frees up short-term memory and allows the brain to comprehend what is being read.

comprehend grade-level text. Their difficulty is, rather, in weak decoding skills preventing them from quickly and accurately recognizing the words of the text.

How Well Are Pupils Learning to Do Basic Mathematics?

Pupils' understanding of foundational math skills was orally evaluated using the **Early Grade Mathematics Assessment (EGMA),** which consisted of five subtasks: number identification, quantity comparison, missing number (number patterns), addition, and subtraction. For each subtask, pupils were asked to complete as many items as they could in one minute. As with EGRA, by timing how quickly pupils perform these tasks, EGMA evaluates whether pupils have achieved a desired level of automaticity in these skill areas.



The number identification subtask targeted pupils' knowledge and identification of one- and two-digit numbers (e.g., 12, 2, 17, 93, 9). Grade 2 pupils were able to correctly identify 14.6 numbers in one minute, while grade 3 pupils were able to correctly identify an average of 23.7 numbers in a minute. There were very few zero scores on this subtask (5%). Pupils had more difficulty with numbers over 20.Quantity discrimination measures pupils' ability to make judgments about differences by comparing quantities. Pupils were asked to compare single- and double-digit numbers, and to say which was the larger of the two numbers. For example, in comparing 15 and 20, the correct response was 20. In grade 2, 18% of pupils were unable to answer a single item, while in grade 3, fewer than 12% could produce a correct response. On average, grade 2 pupils responded correctly 50% of the time and grade 3 pupils responded correctly 68% of the time. As with the number identification subtask, pupils had most difficulty with items involving numbers greater than 20, with grade 2 pupils unable to respond correctly at all.

The missing-number subtask assesses pupils' ability to discern and complete number patterns. For Zambia, each item in this subtask consisted of three to four numbers in a number sequence and a placeholder (a blank line) for a next or missing number. The child was asked to name the missing number. Forty percent of grade 2 and 27% of grade 3 pupils were unable to answer a single missing-number item correctly, including items that were simply counting by one. On average, grade 2 pupils responded correctly 28% of the time and grade 3 pupils responded correctly 44% of the time. Pupils had the least problems with sequences of numbers under 20 where the pattern was a simple count-by-one pattern (such as 6, 7, __, 9). Overall, pupils in both

grade 2 and grade 3 appeared to struggle with recognizing or counting in patterns. Pupils had not mastered this competency by the end of grade 3, and were falling well below the expectations laid out in the local curriculum. This could make it difficult for them to master multiplication and other, more complex, problem solving later on.

The addition and subtraction subtasks assess pupils' procedural competency in basic operations. For the Zambia EGMA, pupils were presented with and asked to solve simple addition problems using numbers up to 20, with no regrouping. These two subtasks showed significant growth across grades. In grade 2, 21% of pupils could not answer a single addition problem correctly and 26% could not answer any subtraction problems. In grade 3, these figures were significantly better, with only 9% scoring zero on the addition subtask and 9% scoring zero on subtraction. While these pupils were answering problems with a fair degree of accuracy, almost 50% managed to correctly answer only four problems in a minute, and slightly over 50% could answer only four subtraction problems, indicating that they had not achieved automaticity on these problems.

When pupils have not gained procedural fluency on simple addition and subtraction problems, they will be likely to use inefficient strategies and will have increasing difficulty as numbers get larger and operations get more complicated.

How Well Are Zambian Schools Being Managed?

What factors could help to explain why pupils are having difficulty mastering these foundational skills? In what follows, we briefly highlight some of the more salient and actionable factors as revealed by the **Snapshot for School Management Effectiveness (SSME)**.

Pedagogic materials are essential for both pupils and teachers to ensure that they are covering the needed curriculum content properly and efficiently. The availability of resources to Zambian teachers and pupils is low. For example, only 8% of schools reported receiving the appropriate number of textbooks for their pupils. We noted that on average, only 20% of pupils had textbooks and the distribution of these books was inequitable, with half of classrooms having books for 10% or fewer of their pupils. A small fraction (less than 7%) of classrooms had textbooks for the majority (75–100%) of their pupils. Similarly, slightly more than half (56%) of teachers had reference guides. Non-textbook reading materials, essential for the acquisition of fluency, were rare; 63% of classrooms had none. Availability of reading materials at home was also low (36%).

Having time to practice nascent reading skills is a requirement for their mastery. Pupils who had access to books at home, read out loud at home, and/or had someone read to them at home all fared better on reading subtasks. Ensuring that children have access to an ample supply of appropriate reading materials and ensuring that reading time both at school and at home become engrained habits will do much to improve pupil fluency and consequently comprehension. Teacher feedback, another essential part of effective instruction and a proxy for the level of teacher engagement, was observed in most pupils' exercise books but with varying frequency. Slightly over

half (52%) of exercise books had comments on some pages whereas 14% had teacher comments on all pages and 12% had no comments at all. As could be expected, pupils who receive more comments tend to fare better.[4] Encouraging all teachers to provide routine feedback to their pupils will give pupils information they need to help them succeed.

Teaching content, another key determinant in pupil performance, was evaluated during observations of second-grade reading and mathematics lessons. Because the EGRA and EGMA results indicated that most pupils had not yet achieved automaticity in their foundational skills, teaching content should be more heavily focused on mastery of these basic skills. Although a substantial amount of time during the reading lessons was spent on foundational skills such as letters/sounds and reading single words (20.7% and 26.4%), teachers at the primary level had not received training in how to teach letter sounds or phonemics during their pre-service training. The instruction they were providing does not appear to have been effective. With mathematics lessons, the majority of time was spent on multiplication (29.5%), addition (21.6%), subtraction (21.5%), and division (16.3%). Less than 1% of the lesson time was spent on foundational skills such as number identification and one-digit addition. More focused time should be spent on both reading and math foundational skills. Similarly, pre-service and in-service training for primary school teachers should focus on the instruction of these skills.

Quality of instruction and availability must be coupled with sufficient learning time for pupils. However, double- and triple-shift schedules necessitated by a lack of resources have reduced the average school day to 4 hours for pupils. This short school day is further eroded by teacher and pupil absenteeism and late arrival as well as school breaks. The previously mentioned lack of pedagogic materials reduces the effectiveness of this teaching time.[5] If one takes into account all the time that is lost due to factors listed above, the 4-hour school day results in less than 65 hours of on-task reading instruction during the entire year. To achieve reading fluency, studies have shown that a minimum of 250 hours of focused reading instruction and practice time with appropriate texts is required.[6]

Lastly, parental engagement has been proven time and time again to have a positive impact on pupil performance. As previously mentioned, pupils that reported reading out loud at home and/or had someone who read to them performed better at school[7].

[4] Student performance on all EGMA sub-tasks was positively and significantly correlated with frequency of teacher comments. Again given the greater variance among EGMA scores, the correlations between frequency of teacher comments and student performance are more marked in the Maths scores than on the Bemba scores. Yet frequency of teacher comments was positively and significantly correlated with student performance on the Letter naming and reading passage sub-tasks of the EGRA.

[5] Helen Abadzi pointed out that in classrooms where textbooks were missing, pupils spent extensive periods of time copying down textbook information into notebooks. Helen Abadzi. (2007). *Absenteeism and beyond: Instructional time loss and consequences.* (2007, October). World Bank Policy Research Working Paper Series, pp. 29, 34, 42. Washington, DC: World Bank.

[6] John Comings. (1995). Literacy skill retention in adult pupils in developing countries. *International Journal of Educational Development, 15*(1), 37–46.

[7] Students who reported reading out loud at home performed significantly better with letter naming, reading passage, and addition sub tests. Students who reported that someone at home read to them performed better on letter name, reading passage, and listening comprehension sub-tasks.

Similarly, grade 2 pupils who reported receiving help with their homework from their parents performed better than their peers who reported receiving no help with homework.

Conclusions and recommendations

- The pilot EGRA/EGMA and SSME, as adapted from international applications for Zambia, demonstrated that early grade assessments can provide critically important information for the review of education sector program and policy. Although the results revealed disturbingly low pupil performance, they are consistent with assessments of reading and mathematics performance by the periodic National Assessments and SACMEQ at grades 5 and 6.
- The EGRA/EGMA should now be further developed into versions in English and the other six Zambian languages used in schools. The English version of EGRA and EGMA should be used, along with the Zambian language, in grade 3.
- Use of EGRA/EGMA should be expanded by incorporating them into the set of instruments within the Zambian regularly scheduled National Assessments. The results of grade 2 and grade 3 reading (in Zambian languages and English) and mathematics performance would then be reported as a part of the overall Zambian education sector performance.

Policy and Program Implications

The results of the EGRA/EGMA and SSME indicate a critical and timely need to review national policies and their implementation related to early grade language and literacy. These include the design of the curriculum for early grade literacy; the extension of Zambian language reading through grade 3; the determination of an appropriate Zambian language for each school; a restructuring of the school timetable to increase time for reading; a priority on providing appropriate and sufficient instructional and reading materials; assignment of teachers to schools based on Zambian language competence; reform to reduce teacher absences; teacher training reformed to include teaching pupils to read; and increased community and parental engagement to support early grade reading and mathematics.

1. Background

Although Zambia is considered a lower-middle income country by the World Bank, 2006 statistics showed that nearly 60% of the total population lives below the poverty line, and rural poverty is at 77%.[8] The country's most recent National Development Plan (NDP), to span years 2011 through 2015, is focused on "sustained economic growth and poverty reduction."[9] The NDP notes that while Zambia has experienced some economic growth in recent years, it "has not translated into significant reductions in poverty and improved general living conditions of the majority of the Zambians."[10] Five reasons are given for this lack of progress, one being "low quality of human capital."[11] Zambian youth are simply not being equipped to become productive, skilled adults who are able to contribute to the improvement of their country. The NDP outlines the government's intent to address pervasive poor health, especially among the rural population, by focusing on water and sanitation infrastructure, the availability of which is still highly insufficient. Additionally, there will be a focus on access to higher education as well as expanded access to nutrition in schools.

Since 1991 when Zambia began its transition from a single-party to a multi-party political state—a change accompanied by upheavals across government sectors—the education system has received a fair amount of attention from educators and policy makers within the country and internationally. Emphasis on education is particularly important, given that 46% of Zambia's population is under 15 years of age.[12] In 1990 Zambia joined dozens of countries around the world in adopting the United Nations Educational, Scientific, and Cultural Organization's (UNESCO's) Education for All (EFA) goals.

Zambia has been relatively successful in meeting the first goal of EFA—to "expand early childhood care and education"—by constructing new schools, removing school fees, and adopting and implementing new policies to increase access to education. Indeed, the net enrollment rate of children in primary education increased from 80% in 1990 to 102% in 2009 and primary school completion rates dramatically increased from 64% in 1990 to 91.7% in 2009, according to the Millennium Development Goals (MDG) 2011 Progress Report for Zambia. Zambia has also welcomed several education initiatives aimed at improving learning outcomes.

For 30 years following Zambia's independence from British colonial rule, primary schools continued to teach reading in English. While English is the nation's official language, it is not the first language of pupils, and children were not learning to read. Abysmal literacy rates became evident in a 1995 study of sixth-grade pupils sponsored by Zambia's Ministry of Education (MOE) and conducted by the Southern African Consortium for Monitoring Educational Quality (SACMEQ). Only a quarter of pupils were able to read minimally. Language of instruction was identified as a

[8] Sixth National Development Plan, Republic of Zambia, 2011, p. 23.
[9] Ibid., p. i.
[10] Ibid., p. 19.
[11] Ibid., p. 20.
[12] Ibid., p. 19.

major factor contributing to poor learning outcomes, combined with the external realities of poverty and sickness.[13]

The SACMEQ study results led to the formation of a National Reading Committee, which convened stakeholders both nationally and internationally to discuss solutions. It was decided that pupils should begin the path to literacy in a familiar language, beginning at the start of their primary school education. English instruction would follow, and, it was hypothesized, be more successful once pupils were literate in their own first language. These and a host of other policy changes contributed to the development of the Primary Reading Programme (PRP), which was first implemented in 1999 and used an adapted version of the Breakthrough to Literacy curriculum, a mother-tongue literacy course. The PRP included both written and oral literacy components and required that over an hour of each school day be devoted to reading instruction in both English and one of seven official Zambian languages of education.[14] The PRP involved curricular changes for grades 1–7. Major funding for the PRP came from Britain's Department for International Development (DFID) and was provided through 2005.[15]

National assessments administered to randomly selected fifth-grade pupils in 1999, 2001, and 2003 in both English and the appropriate Zambian language showed significant improvement among pupils in one of the four provinces tested (Western province) compared to those who had not been learning under the new PRP curriculum—results that were lauded by both DFID[16] and UNESCO.[17] In the other three provinces results were not favorable to the PRP, however, and a 2007 self-evaluation by the Examination Council of Zambia revealed that while there was indeed some measured improvement as of the 2006 national assessment, less than 30% of fifth-grade pupils were reading in English at the minimum level of performance set by the test developers.[18] In mathematics, less than half were performing at minimum levels. Recall that the SACMEQ assessment in 1995 found that only a quarter of pupils were able to read at minimum levels. The Examination Council further wrote that Zambian education officials have not been successful at linking assessment results with actual interventions in schools.[19]

Although, as mentioned above, Zambia has made great strides to ensure children have access to education, the reality is that simple school attendance is not a guarantee that adequate learning is taking place. This is becoming increasingly clear in the international community. The Center for Global Development asserts that "even in countries meeting the MDG of primary completion, the majority of youth are not even

[13] Shay Linehan, (2004). "Language of instruction and the quality of basic education in Zambia," paper commissioned for the *EFA Global Monitoring Report 2005, The Quality Imperative*, p. 3.
[14] Ibid., pp. 5-6.
[15] Terry Allsop, et al., (2005). "Primary Reading Programme: Final Evaluation," DFID, p. 11.
[16] Ibid., pp. 17-18.
[17] Linehan, (2004). p. 11.
[18] Chekani T. Sakala and Michael M. Chilala, (2007). "The Role of the Zambia National Assessment Programme in Evaluating the Attainment of Educational Goals," Examinations Council of Zambia, p. 12.
[19] Ibid., p. 13.

meeting *minimal* competency levels, let alone the competencies demanded in a globalized environment."[20]

2. Evaluation Approach

2.1 Research Questions and Assessment Design

The MDG Progress Report demonstrated that Zambia should shift its emphasis from issues of access to the quality of education. The first step to effect such change is to develop a clear understanding of how children are learning to read and think mathematically in the primary grades. Assessments of pupil learning in the primary grades, such as the Early Grade Reading Assessment (EGRA) and Early Grade Mathematics Assessment (EGMA), offer an opportunity to determine whether children are developing the fundamental skills upon which all other literacy and mathematical skills build, and, if not, where efforts might be best directed. This is vital information for countries that are working to improve the quality of education in their schools. Indeed, further evidence of growing international concern for learning outcomes, as opposed to attendance or completion rates, is the fact that EGRA and EGMA have been adapted and used around the world, including EGRA implementations in over 40 countries. However, the absence of language about primary education or quality of learning in the NDP may indicate that high rates of school access are perceived as indicators that primary education is not a factor in Zambia's slower-than-desired progress.

A closer evaluation of pupils' understanding of foundational reading and math skills, combined with a sense of basic but crucial school, classroom, and teaching characteristics would provide Zambia's MOE with additional understanding of why learning outcomes have not improved as much as would be desired. It may also yield insights into how to make schools more effective, particularly in the early grades. For these reasons USAID and the MOE tasked RTI International and their Zambian partner, Family Health Trust, with the pilot implementation of the Snapshot of School Management Effectiveness (SSME). The data collection took place in July 2011, or halfway through the school year.

2.2 Overview of SSME

The Snapshot of School Management Effectiveness, or SSME, is an instrument that yields a quick but rigorous and multifaceted picture of school management and pedagogic practice in a country or region. The SSME was designed to capture "best" indicators of effective schools that, past research has shown, affect pupil learning. The resulting data are designed to let school, district, provincial, or national administrators and donors learn what is currently going on in their schools and classrooms and to assess how to make their schools more effective.

Building off of the framework for the analysis of effective schools described in the effective schools literature,[21] the SSME collects information on (1) basic school

[20] D. Filmer, A. Hasan, and L. Pritchett, (2006). "A Millennium Learning Goal: Measuring Real Progress in Education," a Working Paper for the Center for Global Development, p. 1.

inputs such as: school infrastructure, pedagogical materials, teacher and Headteacher characteristics, pupil characteristics, and parental and community involvement; (2) classroom teaching and learning processes, including use of material, instructional content, pupil teacher interaction, time on task, assessment techniques, and administrative oversight; and (3) learning outcomes data, via the application of core portions of two other instruments: the Early Grade Reading Assessment and Early Grade Mathematics Assessment (see Section 2.3). These brief but thorough oral assessments are administered individually to randomly selected pupils, and add to the information about school management effectiveness by accurately evaluating pupils' knowledge of foundational reading and math skills.

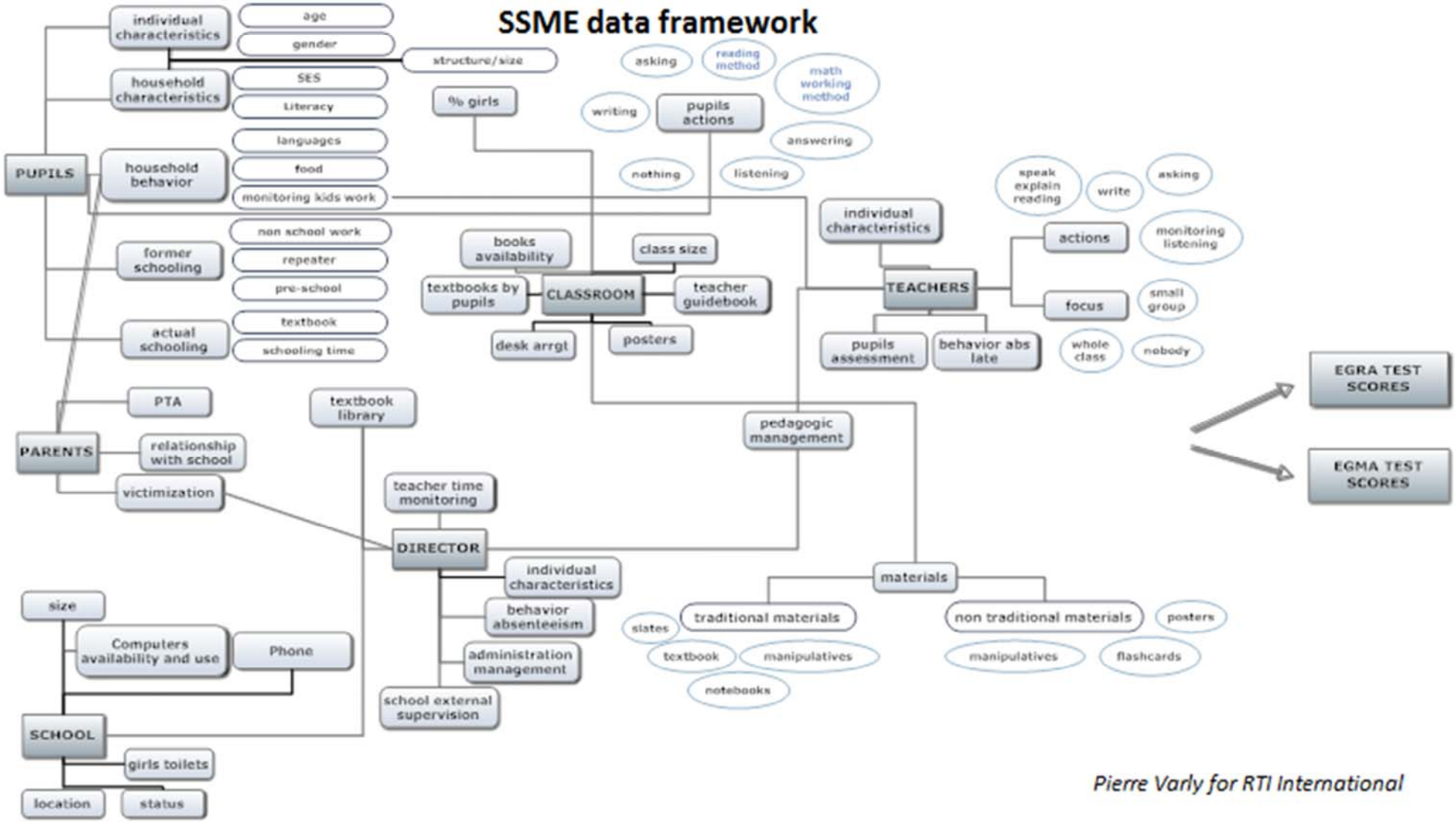
The SSME is administered during one school day by a four-person team. Each of the components of the SSME is designed to supply information from a different perspective. The SSME design aims to balance the need to include a broad mix of variables—in order that potentially impactful characteristics can be identified—with the competing need to create a tool that is as undisruptive to the school day as possible. When combined as a whole, these instruments produce a multifaceted and comprehensive picture of a school's learning environment, and when the results from multiple schools in a region are compared, it becomes possible to account for differences in school performance. Following is a listing of the SSME components; ***Annex A*** contains further descriptions.

1. Headteacher Questionnaire – administered to the Headteacher in each school visited;
2. Teacher Questionnaire – administered to the two teachers whose pupils are selected for assessment;
3. Parent Questionnaire – administered to a parent of a child in each grade being assessed (2 total);
4. Pupil Questionnaire – administered to each pupil randomly selected for assessment;
5. Mini-EGRA and Mini-EGMA – administered to a random sample of pupils in grades 2 and 3 (see Sections 2.3 and 4);
6. School Observation – administered at each school visited;
7. Classroom Inventory – administered in each of the two sampled classes;
8. Classroom Observation (reading) – administered during the reading lesson in the lower grade classroom (grade 2 in the case of Zambia); and
9. Classroom Observation (mathematics) – administered during the mathematics lesson in the lower grade classroom (grade 2).

In addition to this list of components, see ***Figure 1*** for a diagram illustrating the SSME.

[21] This framework for the analysis of school effectiveness is based on research reported by H. Craig and W. Heneveld, (1996). *Schools Count: World Bank Project Designs and the Quality of Primary Education in Sub-Saharan Africa.* World Bank Technical Paper Number 303 (Africa Technical Department Series). Washington DC: World Bank; and Carasco, J. C Munene, D. Kasente and M. Odada, (1996). *Factors affecting school effectiveness in Uganda: A Baseline study*. Kampala: UNEB.

Figure 1. Diagram of SSME



2.3 Overview of EGRA

Because the purpose and activities of the EGRA and EGMA are somewhat less intuitive than for the SSME, the next two subsections present additional background before explaining the specific components of these two instruments.

2.3.1 Why test early grade reading?

The ability to read and understand a simple text is one of the most fundamental skills a child can learn. Without basic literacy there is little chance that a child can escape the intergenerational cycle of poverty. Yet in many countries, pupils enrolled in school for as many as six years are unable to read and understand a simple text. Recent evidence indicates that learning to read both *early* and at a sufficient *rate* are essential for learning to read well. Acquiring literacy becomes more difficult as pupils grow older; children who do not learn to read in the first few grades are more likely to repeat and eventually drop out, while the gap between early readers and nonreaders increases over time.

Before one can assess early reading, one must understand the component skills involved in skilled reading. A powerful and influential model of the component processes involved in reading comprehension is the "Simple View of Reading."[22] According to this model, reading comprehension could be predicted by the formula *Reading Comprehension = Decoding × Listening Comprehension*. Thus, children who lack decoding skills (the ability to read words) would be classified as nonreaders.

A seminal model that captures the growth of decoding, linguistic comprehension and reading comprehension was proposed by Jeanne Chall in 1983.[23] Since the original publication of Chall's *Stages of Reading Development*, several studies have confirmed Chall's model, and have made the phases "Learning to Read" and "Reading to Learn" well known among researchers and practitioners. When children are learning to read, they must learn the letters of the alphabet, learn the sounds associated with each letter, and apply this knowledge to decode (or "sound out") new words, in addition to building a set of high-frequency sight words (such as "the" or "to" in English) that they can recognize instantly. By the end of this phase, children develop sufficient speed and accuracy in decoding and word recognition that they can read with fluency. When children read with fluency, they can read orally with the same speed and expression that they use in speech.

Recent evidence indicates that learning to read both early and at a sufficient rate, with comprehension, is essential for learning to read well. A substantial body of research documents the fact that children can learn to read by the end of grade 2, and indeed need to be able to read to be successful in school. Importantly, children who do not

[22] P.B. Gough and W.E Tunmer, (1986). Decoding, reading and reading disability. *Remedial and Special Education*, 7, 6-10. See also W.A Hoover and P.B. Gough, (1990). The simple view of reading. *Reading and Writing: An Interdisciplinary Journal*, 2, 127-160.
[23] Jeanne Chall, (1983). *Stages of Reading Development*. New York: McGraw-Hill.

learn to read in the early grades (grades 1–3) are likely to fall behind in reading and other subjects, to repeat grades, and eventually to drop out.

2.3.2 Purpose of EGRA

Historically, there has been very little information regarding pupil learning in the early grades in low-income countries. EGRA was developed to provide a way to measure a child's initial reading skills. More specifically, it was constructed to assess the reading and language skills identified to be critical for becoming fluent readers who comprehend what they read. By assessing pupils' knowledge of the alphabetic principle, decoding skills, oral reading fluency, and comprehension of written text and oral language, EGRA may inform ministries of education, donors, teachers, and parents about primary pupils' reading skills. Because of its direct links with the skills critical for successful reading achievement, EGRA may assist education systems in setting standards and curricular planning to best meet children's needs in learning to read.

EGRA, in Zambia as elsewhere, is not intended to be a high-stakes accountability measure to determine whether a pupil should move up to the next grade, nor should it be used to evaluate individual teachers. Rather, the subtasks included in EGRA can be adapted for teacher use as formative assessments. As a formative assessment, teachers can either use EGRA in its entirety, or select subtasks to monitor classroom progress as a whole, determine trends in pupil performance, and adapt instruction to meet the classroom needs.

2.3.4 What EGRA measures

The EGRA instrument is composed of a variety of subtasks designed to assess foundational reading skills crucial to becoming a fluent reader. EGRA is designed to be a method-independent approach to assessment—that is, the instrument does not reflect a particular method of reading instruction (i.e., "whole language" or "phonics-based" approach). Rather, EGRA measures basic skills that a child must have to eventually be able to read fluently and with comprehension—the ultimate goal of reading. The EGRA subtasks are based on research regarding a comprehensive approach to reading acquisition across languages. These skills are described below:

- **The alphabetic principle** is considered essential for learning to read an alphabetic language. The alphabetic principle refers to the recognition and understanding of how the speech sounds of a language relate to units of print (or letters, in Bemba). Mastering the alphabetic principle is critical for decoding, or sounding out, new and unfamiliar words.
- **Fluency** is often defined as the ability to orally read connected text with speed, accuracy, and proper expression. Reading fluency is considered critical for comprehension, as rapid, effortless word-identification processes enable the reader to focus on the text and its meaning rather than decoding, or sounding out the words.[24]

[24] National Institute of Child Health and Human Development. (2000). *Report of the National Reading Panel. Teaching children to read: An evidence-based assessment of the scientific research literature on reading and its*

- **Reading comprehension**, considered the goal of reading, refers to the ability to actively engage with, and construct meaning from, the texts that are read.
- **Listening comprehension** refers to one's ability to make sense of oral language in the absence of print. Listening comprehension taps many skills and sources of knowledge, such as vocabulary knowledge, facility with grammar, and general background knowledge. Although pupils whose language of instruction differs from their home language have been found to learn to read words at the same rate as those who are learning in their home languages, nonnative speakers have been found to show greater difficulties in listening comprehension.[25]

EGRA measures each of the above abilities/components to assess the foundational reading skills. The skills are tested in individual subtasks and presented in order of increased level of difficulty (i.e., letter sound identification, then word reading, etc.). Because the first few subtasks are easier, EGRA can therefore measure a range of reading abilities for beginning readers. The subtasks included in the EGRA Zambia instrument are described in the Section 4.3.

2.3.5 Instrument adaptation process for Zambia: EGRA, EGMA, and SSME

An adaptation workshop was held April 18–29, 2011, in Lusaka to adapt the mini-EGRA, mini-EGMA, and SSME instruments to the Zambian context. The workshop was led by Dr. David Chard, Dean of the School of Education at Southern Methodist University, Texas, USA; and Abhijit Nimbalkar, project manager, RTI International.

Adaptation of the mini-EGRA instrument was facilitated by Bupe Mwansa, Senior Bemba curriculum expert from the Ministry of Education, who specifically assisted with the creation of the letter frequency lists, taken from Ministry-sanctioned grade 2 Bemba curriculum textbooks; nonsense words; and the reading and listening comprehension passages. Mwansa also assisted with the translation of the EGMA and SSME instruments into Bemba.

The workshop was attended by representatives from the Examinations Council of Zambia, the Ministry of Education, USAID/Zambia, and the Family Health Trust (implementing subcontractor to RTI). The adaptation workshop included a day visit to two primary schools in Kapiri Mposhi, where participants were able to practice administering the mini-EGRA and mini-EGMA instruments.

A pilot session was conducted at Kabwe during a training workshop June 14–22, 2011, and preliminary results from the pilot were then shared with Tracy Kline, Senior Psychometrician at RTI. Kline carried out rigorous item-level psychometric

implications for reading instruction (NIH Publication No. 00-4769). Washington, DC: U.S. Government Printing Office. See also C.A. Perfetti, (1992). The representation problem in reading acquisition. In P.B. Gough, L.C. Ehri, & R. Treiman (Eds.), *Reading acquisition* (pp. 145-174). Hillsdale, NJ: Erlbaum.

[25] E. Geva and Z. Yaghoub Zadeh, (2006). Reading Efficiency in Native English-Speaking and English-as-a-Second-Language Children: The Role of Oral Proficiency and Underlying Cognitive-Linguistic Processes, *Scientific Studies of Reading*, 10, 31-58. See also T. Quiroga, Z. Lemos-Britton, E. Mostafapour, R.D. Abbott, and V.W. Berninger, (2002). Phonological awareness and beginning reading in Spanish-speaking ESL first graders: Research into practice. *Journal of School Psychology*, 40, 85–111.

analyses (specifically Rasch measurement) to evaluate the mini-EGRA instrument, and provided feedback for instrument modifications needed before the full data collection.

2.3.6 The EGRA instrument for Zambia

The EGRA, as adapted for Zambia, is an individually and orally administered standardized assessment of beginning reading and reading related skills in Bemba. Administering the instrument takes approximately 10-15 minutes with each pupil.

The EGRA instrument designed for Zambia consisted of the following five sections:

1. *Letter sound knowledge* assessed children's knowledge of the letter-sound relationships critical for sounding out new words. In this timed task, children were shown a chart containing 10 rows of 10 random letters. Instead of providing the letter names, children were asked to tell the assessor the sound of as many letters as they could within 1 minute, yielding a score of correct letter sounds per minute (clpm).
2. *Unfamiliar word oral reading fluency* assessed children's skill at applying letter-sound correspondence rules to decode unfamiliar words. To ensure that children were sounding out the words, rather than recognizing them, a chart of 50 pronounceable made-up words that followed legal spelling patterns in Bemba was shown to children. Children were asked to sound out as many invented words as they could within one minute, yielding a score of correct words per minute (cwpm).
3. *Connected-text oral reading fluency:* The ability to read passages fluently is considered a necessary component for reading comprehension. In this task, children were given a story of 71 words in length, and were asked to read it aloud in one minute. The passage was written to be appropriate for pupils in grade 2. The score for this task was the number of correct words read per minute (cwpm).
4. *Reading comprehension*: After the children finished the passage, or the minute ended, the passage was removed. Children were orally asked five questions that required them to recall basic facts from the passage. Pupils who were unable to read a single word of the passage were not asked any questions and were assigned a score of zero. The reading comprehension score was the number of questions answered correctly, with a maximum score of 5.
5. *Listening comprehension*, in addition to word reading, another skill considered to be critical for reading comprehension, is the ability to make sense of oral language, or listening comprehension. In this task, the examiner read a short passage to children. Children were then orally asked three questions about that passage. Listening comprehension scores were calculated as the number of correct answers, with a maximum score of 3.

All EGRA administrations also include a "stop" rule, which requires assessors to discontinue the administration of a subtask if a pupil is unable to respond correctly to any of the items in the first line (in the case of Zambia, the first 10 letters, the first five words, or the first line of the oral reading fluency story). This rule was

established to avoid frustrating pupils who do not understand the task or lack the skills to respond. If a subtask needs to be discontinued, the EGRA administrator marks a box indicating that the subtask was discontinued because the child had no correct answers in the first line. Before administering the EGRA test, administrators were required to read to children explicit information about the test and how it would be used. Pupils were asked to provide oral assent to participate in the assessment.

2.4 Overview of EGMA

2.4.1 Why test early grade mathematics?

A strong foundation in mathematics during the early grades is crucial for success in mathematics in the later years. Mathematics is a skill very much in demand in today's economy, as has been demonstrated by various economists. Most competitive jobs require some level of mathematics skill. It has also been noted that the problem-solving skills and mental agility and flexibility that children develop through mathematics transfer to other areas of life and work. Furthermore, countries' rankings on mathematics skills are becoming a matter of political currency, because of international assessments such as Trends in International Mathematics and Science Study (TIMSS). Most countries' mathematics curricula for the early grades now coincide in terms of the skills children should have. For example, goals such as knowing and using number names, learning and understanding the values of numbers, knowing key symbols, and comparing and ordering sets of objects, are skills found in many curricula, including curricula in developing countries.

2.4.2 Purpose of EGMA

The Early Grade Mathematics Assessment was designed to provide information about basic competencies—those competencies which should typically be mastered in the very early grades, and without which pupils will struggle, or potentially drop out. Subtasks selected for EGMA were drawn from extensive research on early mathematics learning and assessment and were constructed by a panel of experts on mathematics education and cognition. The conceptual framework for mathematical development is grounded in extensive research that has been conducted over the past 60 years.[26] To develop the EGMA protocol, developers systematically sampled early numeracy skills, particularly those underlying number sense. These abilities and skills are key in the progression toward the ability to solve more advanced problems and the acquisition of more advanced mathematics skills.[27]

[26] E.g., A. J. Baroody, M.-L. Lai, and K. S. Mix, (2006). The development of number and operation sense in early childhood. In O. Saracho & B. Spodek (Eds.) *Handbook of research on the education of young children* (pp. 187–221). Mahwah, NJ: Erlbaum; D. J. Chard, B. Clarke, S. Baker, J. Otterstedt, D. Braun, and R. Katz, (2005). Using measures of number sense to screen for difficulties in mathematics: Preliminary findings. *Assessment forEffective Intervention, 30(2),* 3-14; and D. Clements, and J. Samara, (2007). Early Childhood mathematics learning. In F.K. Lester, Jr. (Ed.), *Second handbook on mathematics teaching and learning* (pp.461-555). Charlotte, NC: Information Age.

[27] E.g., Baroody, et. al. (2006); Clements and Samara (2007); and A. Foegen, C. Jiban, and S. Deno, (2007). Progress monitoring measures in mathematics: A review of literature. *The Journal of Special Education, 41*(2), 121–139.

2.4.3 What EGMA measures

A number of criteria were defined for subtasks to be included in the instrument, in order to support the goal of providing stakeholders, from ministries of education to aid agencies to local education officials, with the information essential to making informed changes in teacher education and support, curriculum development, and implementation:

- Represent skills that developing country and developed country curricula have determined should be acquired in early grades;
- reflect those skills that are most predictive of future performance, according to available research and scientific advice;
- represent a progression of skills that lead toward proficiency in mathematics;
- target both conceptual and computational skills; and
- represent skills and tasks that can be improved through instruction.

The EGMA is an individually administered oral test, which allows for the targeted skills to be assessed without confounding by problems with language or writing that might otherwise impede their performance. By administering the test orally, administrators can better ensure that pupils understand instructions provided in a language they know.

2.4.4 The EGMA instrument for Zambia

The EGMA designed for Zambia consisted of the following five sections:

All items on the test were presented orally to pupils in the language they would best understand. Administering the EGMA took approximately 10-15 minutes per pupil. The EGMA in Zambia included the following core subtasks:

1. *Number identification* assessed pupils' knowledge and ability to identify written symbols. Here, pupils orally identified printed number symbols presented in a grid and were asked to identify as many numbers as they could in one minute. Numbers ranged from 1 to 93. <u>The score for this section was the number of correct identifications made per minute.</u>
2. *Quantity discrimination* assessed the pupils' ability to make judgments about differences by comparing quantities, represented by numbers. Each item presented to children consisted of two numbers. The children were asked to identify the larger number (e.g., "Which one is bigger?"). Numbers used ranged from 1 to 97. <u>The score for quantity discrimination was the number of items completed correctly per minute.</u>
3. *Missing number (number patterns)* assessed pupils' ability to discern and complete number patterns. Each item in this subtask consisted of three to four numbers in a number sequence and a placeholder for a next or missing number. The child was asked to name the missing number. Numbers used ranged from 1 to 400, with 16 of the 20 items involving numbers below 100. <u>Missing number scores were the number of items completed correctly per minute.</u>

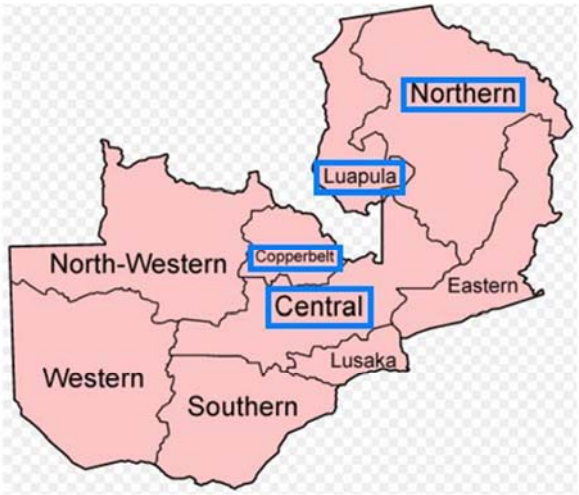
4. *Addition* assessed pupils' procedural competency in the basic operation of addition. For this subtask, children were presented with addition items, with sums up to 20, and asked to solve them. The score for this section was the number of addition problems completed correctly per minute.
5. *Subtraction* assessed pupils' procedural competency in the basic operation of subtraction. For this subtask, children were presented with subtraction items, with numbers up to 20, and asked to solve them. The score for this section was the number of subtraction problems completed correctly per minute.

In the Zambian instrument, all sections were timed for one minute in order to manage test length, such that, in each subtask, pupils were asked to complete as many items as they could in one minute. This approach enabled the research team to examine both automaticity (measured in number of correct items per minute) and accuracy (measured in percent correct out of number attempted).

2.5 Sample

Because the SSME pilot assessment was designed to be conducted in one language, USAID and the MOE suggested conducting the test in Bemba as this is one of the most widespread languages among the seven official languages of instruction in Zambia. The pilot assessment was, therefore, conducted in Central, Copperbelt, Luapula, and Northern regions (see map, ***Figure2***) as the use of Bemba in schools is most widespread there.

Figure 2. Provinces selected for pilot assessment



In addition, these regions represent a good mix of prosperity levels with Copperbelt being more well-resourced (see ***Table 1***). A total of 16 districts from within these 4 regions were randomly selected ***(Table 2).***[28]

[28] Some districts were excluded from the sampling frame as they were too remote and/or travel in these districts would have been too difficult for the limited implementation period.

Table 1. Poverty rates, by province and year

Province	Incidence of Poverty			
	1996	1998	2004	2006
Central	**74**	**77**	**76**	**72**
Copperbelt	**56**	**65**	**56**	**42**
Eastern	82	79	70	79
Luapula	**78**	**82**	**79**	**73**
Lusaka	38	53	48	29
Northern	**84**	**81**	**74**	**78**
North Western	80	77	76	72
Southern	76	75	69	73
Western	84	89	83	84

Table 2. Enrollment in the four selected regions

Region	No. of Districts	No. of Boys	No. of Girls	Enrollment Rates (%)	
				Grade 2	Grade 3
Central	3	106	94	100	100
Copperbelt	5	99	101	100	100
Luapula	4	107	93	100	100
Northern	4	100	100	100	100
Total	**16**	**412**	**388**	**400**	**400**

Ten schools that had at least 20 grade 2 and 20 grade 3 pupils were randomly selected from each of the four regions' sampled districts.[29] Within each sampled school, one second-grade and one third-grade teacher was selected. From within each of these sampled teachers' classrooms, 10 pupils were selected. The resulting total sample size was 80 teachers and 800 pupils. In addition, the school Headteacher and two parents were interviewed at each school. Total target sample numbers are presented in ***Table 3. Annex B*** presents additional information about the sample design.

[29] The number of schools selected per district depended on the number of sampled districts per region.

Table 3. Sample sizes

Unit	No. in Sample
Schools	40
Headteachers	40
Parents	80
Teachers/Classrooms	80
Pupils	800

Throughout the report, results are given both for the entire sample and for each subgroup of interest. The results of the sample analysis are representative of the sample population. Estimations, including means and regressions, allow for interpretation of results for the entire population of pupils from the four selected regions. The following section describes the pupil assessment instruments applied as part of the SSME.

3. SSME Findings

3.1 Basic School Inputs

3.1.1 School infrastructure

School infrastructure impacts the safety and comfort of pupils and teachers. It also serves as an indicator of resource allocations across schools and an indicator of school management. By far, most (81%) schools did not have a library. The majority (89%) of schools were found to have playgrounds. Conversely, 81% of schools did not have electricity and only 15% had functioning electricity on the day of the visit. Very few (3%) schools had a landline telephone but 82% of Headteachers had mobile phones. All but 7% of schools had a clean water source, 82% of those getting water from a hand pump, 12% from a tap, and 4% from a well. On average, there was one toilet for every 97 pupils. The maximum pupil-to-toilet ratio was 302.

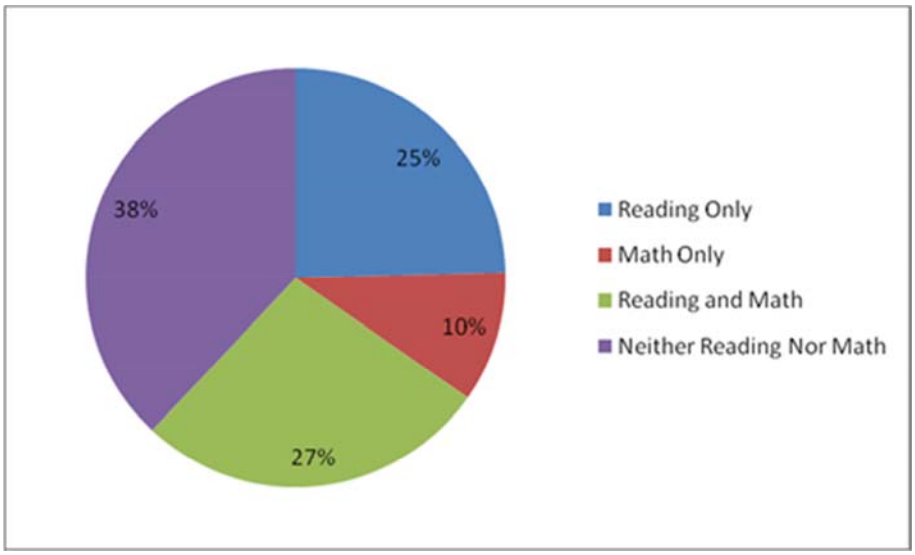
Sixty-one percent (61%) of schools were found in need of major repairs, and 50% of the Headteachers felt that problems with the school buildings posed a safety threat. Examples of problems listed by the Headteachers included dilapidated buildings, cracked walls, broken or missing windows, and a damaged or missing roof. When asked if they felt safe at their school, the majority (69%) of Headteachers felt safe, although 31% reported feeling unsafe because of lack of security or police, theft, isolated school building, distance from medical clinic, and unsafe building conditions.

3.1.2 Teachers and Headteachers

Of the teachers interviewed, 67% were women, and 97% had received pre-service teacher training. However, a smaller proportion had received in-service training in reading and math. While 27% had received training in both reading and math, 38%

had received neither. ***Figure 3*** presents the proportion of teachers who had received in-service training.

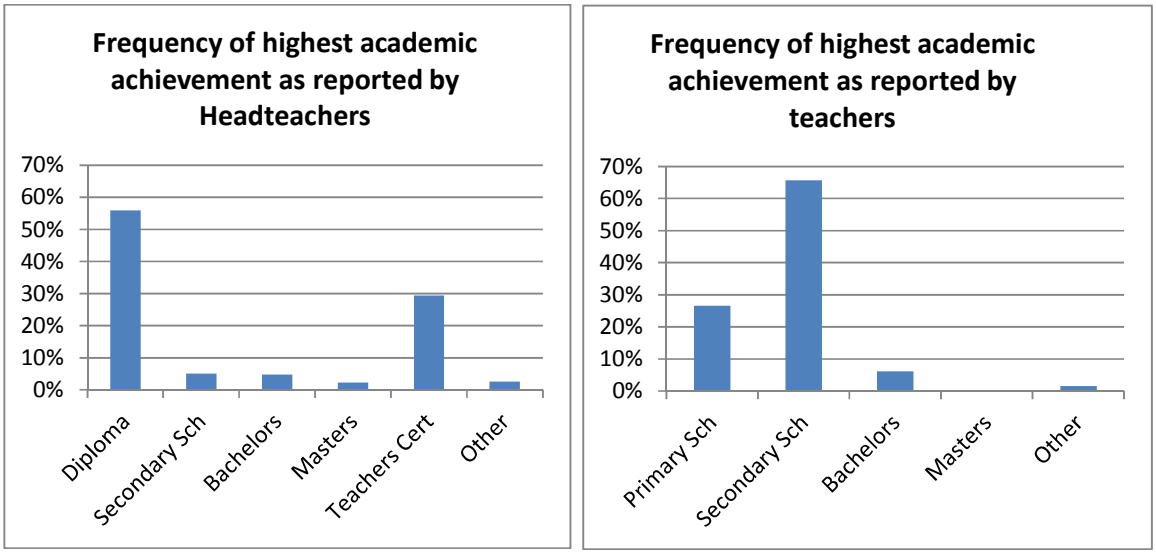
Figure 3. Proportion of teachers who received in-service training



In contrast, Headteachers were overwhelmingly men (80%). Of the Headteachers in the sampled schools, 48% had held the title for less than 5 years, and 75% for less than 10 years. Slightly more than half (54%) reported having received management training. Of these, 31% claimed to use their training "always," and 51% said they used their training "often."

Among Headteachers, 56% reported that their highest level of qualification was a diploma and 29% reported a teacher's certificate. Among teachers, 66% reported that their highest level of qualification was secondary school (see ***Figure43***).

Figure 4. Academic achievement levels



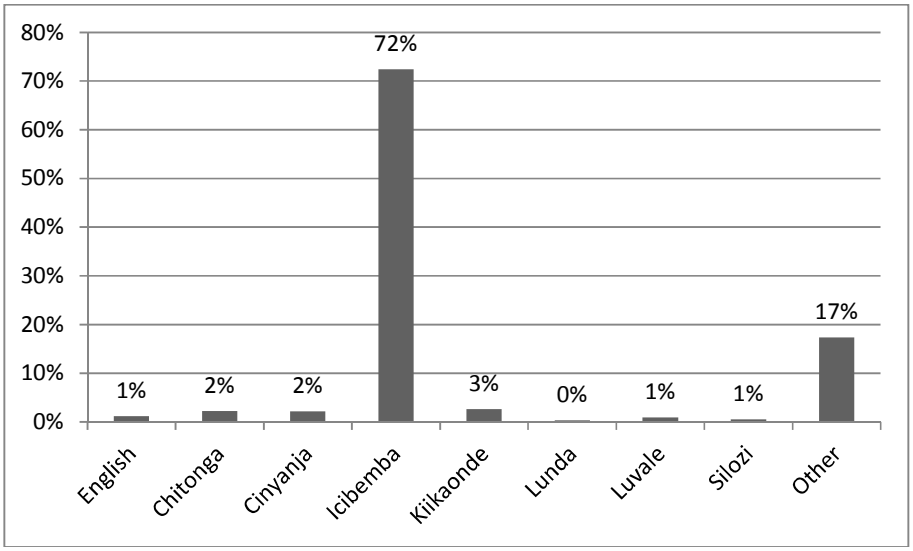
3.1.3 Enrollment, class size, class composition

The average enrollment in each school sampled was 572 pupils (ranging from 176 to 1600) with slightly more boys than girls (1.12 boys for every 1 girl). The pupil-teacher ratio reported at the school level by the Headteachers ranged from 22 to 179 and overall average ratio of pupils to teachers in the sampled schools was 50. In the evaluated classrooms the pupil-teacher ratio was 53. Research indicates that in order for effective teaching to take place, the pupil-teacher ratio should be 50 pupils or lower. While the average pupil-teacher ratio was 50, in 40% of schools the pupil-teacher ratio was greater than 50. Most schools have multiple shifts and 29% of evaluated classrooms were multi-grade classrooms.

3.1.4 Pupil characteristics

The majority of pupils (72%) spoke Bemba at home. The percentage of native Bemba speakers varied by region with virtually all pupils (96%) in Luapula, 78% in Northern, 63% in Copperbelt, and 60% in Central speaking Bemba at home (see ***Figure 5***).

Figure 5. Home languages and proportion of pupils speaking each



Average pupil ages for grades 2 and 3 were 9 and 10, with the oldest pupils being 16 and 17 years old respectively for grades 2 and 3. Sampled teachers reported that 10% of their male pupils and 8% of their female pupils were repeating the grade. Among the sampled pupils, 4% of boys and 4% of girls reported that they were enrolled in the same grade the year before. In the area of pre-primary education, 35.4% of pupils reported attending preschool.

3.1.5 Parental and community support (parents and parent-teacher associations [PTAs])

Parental involvement can play a very important role in pupils' performance. Unfortunately, in many countries, parental involvement is lacking. Pupils were asked who helps them with homework when they need it, and 48% responded that a parent helps them, 43% said they get help from a sibling, and only 12% claimed to receive no help at home. Sixty-three percent of teachers reported that "some" parents review their child's homework and 31% reported that no parents review homework. The majority of pupils (78%) reported that their parents are aware when they receive a good grade at school and that 66% of these parents celebrate this achievement. However, when asked if they were satisfied with parental involvement, only 31% of Headteachers and 21% of teachers reported satisfaction.

All Zambian schools have a PTA. The Headteachers reported fairly active PTAs, with 67.5% reporting that the PTAs meet every 2–3 months and another 27.8% reporting that they meet monthly. Headteachers reported that PTAs engaged in a number of activities ***(Table 4),*** from reviewing school improvement efforts to discussing pupil problems and solutions.

Table 4. PTA responsibilities, as reported by Headteachers

PTA responsibility	%
Discuss school management problems	81%
Discuss pupils' problems and solutions	84%
Review progress of school improvement efforts	74%
Review financial situation (budgets) of the school	77%
Approve school policy	70%
Manage school infrastructure and equipment	78%
Discuss school curriculum	32%
Raise funds	59%
Manage procurement or distribution of textbooks	22%

Fifty-eight percent of Headteachers said they were satisfied with the support of the PTA. Most parents interviewed (80%) claimed that the PTA had had a positive influence on pupil learning and school attendance during the past year, and 62% were able to provide examples.

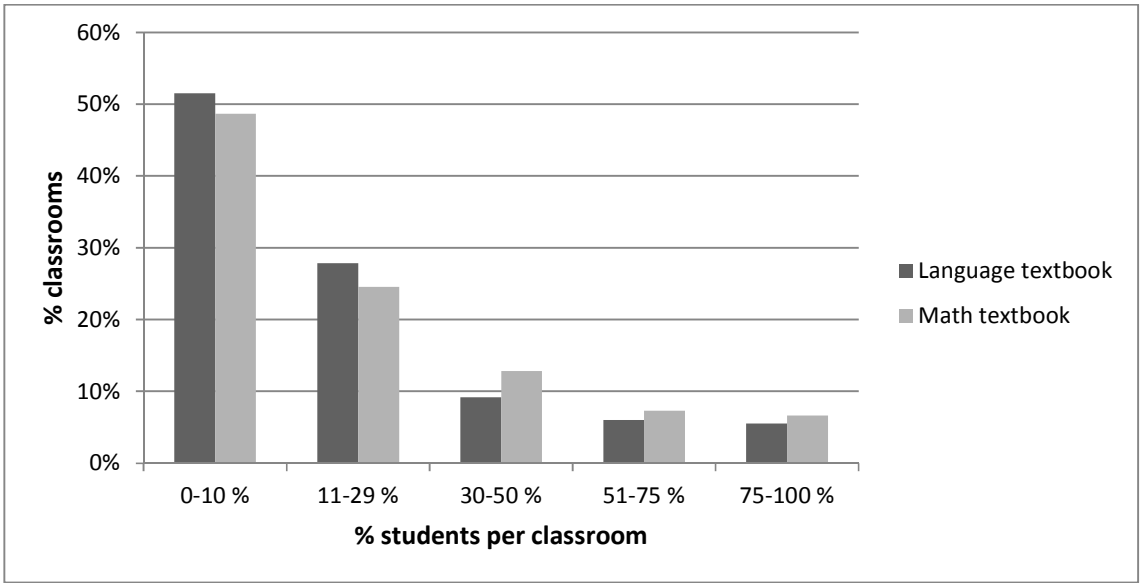
3.1.6 Availability and use of pedagogic materials

Pedagogic materials are essential for both pupils and teachers. Teachers need textbooks and reference materials to help them properly follow the ministry curriculum. Teaching instruments such as blackboards, chalk, writing materials, and pupil registers are fundamental teaching tools. Similarly, pupils need to have access to textbooks, reading books, exercise books or slates, math manipulatives,[30] and writing utensils.

The availability of resources to Zambian teachers and pupils is low. Headteachers reports revealed that only 8% of schools had received the appropriate number of textbooks for their pupil body at the start of the school year, and all who reported beginning the year without enough books claimed to have never received the missing materials as the school year progressed. On average, 20% of pupils had a language textbook and 23% had a math textbook. The ranges in availability of pupil materials by classrooms are displayed in ***Figures 6 and 7.*** As is indicated below, the majority of classrooms (51% and 49% for language and math respectively) had textbooks for 10% or less of their pupils. Less than 7% of classrooms had textbooks for 75-100% of their pupils. While the Zambian education system expects pupils to share textbooks, only 12% of classrooms had enough textbooks for half or more of their pupils.

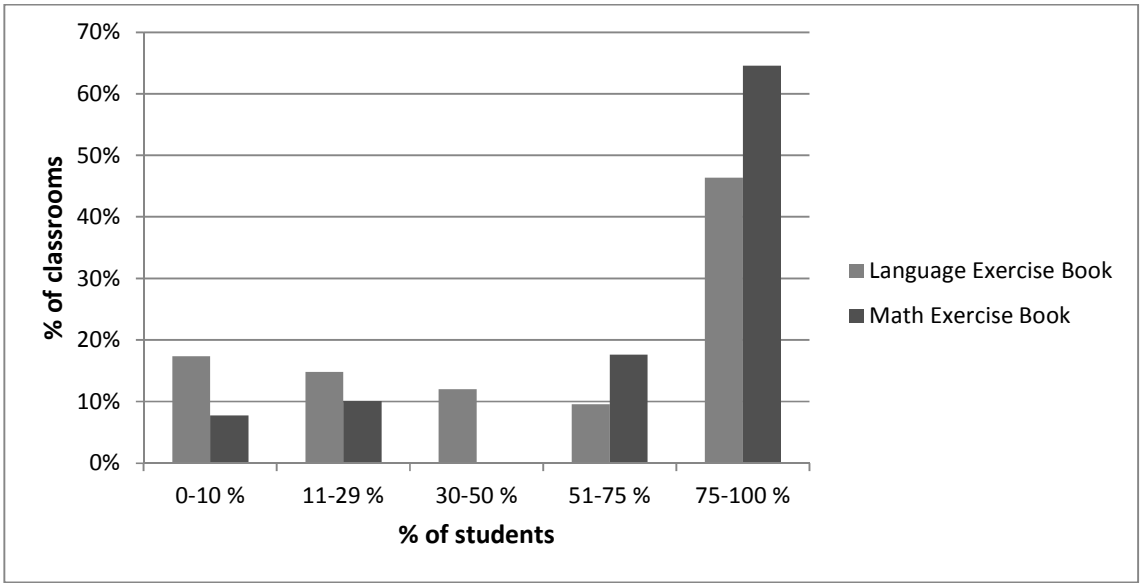
[30] Manipulatives for counting refers to the use of small objects, such as stones or sticks that teachers may use with pupils in order to help them master rational counting and/or to understand and solve simple addition or subtraction problems.

Figure 6. Percentage of classrooms by percentage of pupils with textbooks



Exercise books should, ideally, be available to each pupil individually. Classroom inventories revealed that pupils had better access to exercise books than to textbooks, but availability was still far from 100%. On average, 60% of pupils had language arts exercise books and 80% had math exercise books (see ***Figure 6***). Writing materials were readily available for pupils in the majority of classes. On average, 90% of pupils had writing materials.

Figure 7. Percentage of classrooms by percentage of pupils with exercise books

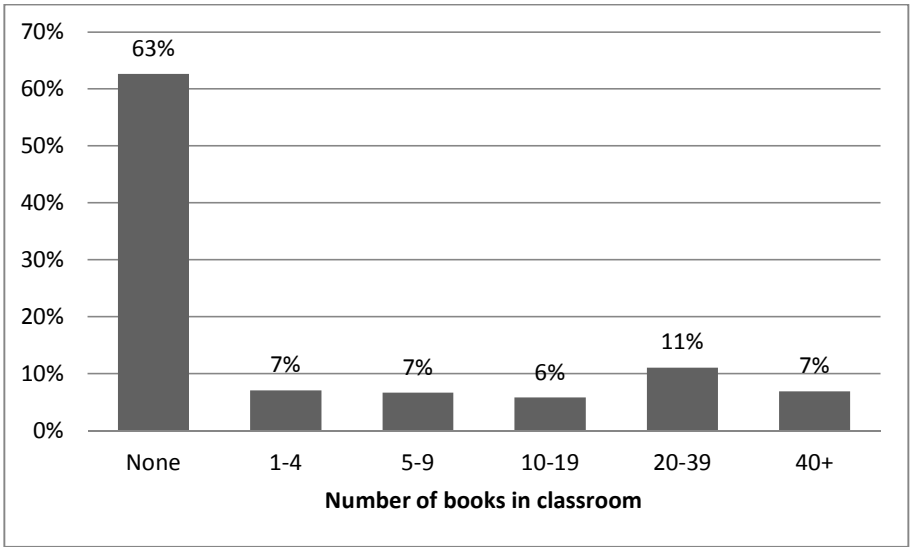


On average, teachers were well equipped with basic teaching tools, having at their disposal a blackboard (95%), chalk (99%), and pen or pencil (97%) in the classroom. Reference materials were not as prevalent; just over half had a language reference book (57%), math reference book (55%), or notebook (55%) in the classroom. As previously noted, lack of reference materials can make it challenging for teachers to follow the curriculum.

3.1.7 Reading materials available

Having ready access to a variety of reading materials is essential for nascent readers. Without this access, pupils miss opportunities to develop and practice reading skills. Reading materials can range from posters and booklets of short stories in classrooms to readers and books at home. Availability of reading materials in Zambian schools and homes was found to be sparse (see ***Figure 8***). As noted earlier, a large majority of schools (81%) did not have a library and only 13% appeared to have libraries that were being used by pupils on the day of the visit. Headteachers of schools with libraries all said that pupils could access the library books on either a weekly basis (89%) or a daily basis (11%). Pupils were allowed to read the books in the library (60%), in their classrooms (49%) or at home (40%). As for reading materials in the classroom, 63% of the classrooms had no books other than textbooks (Figure 7) and only 4.4% had magazines available for pupils to read. Posters, which contribute to a literate class environment, were observed on the walls in 27% of classrooms.

Figure 8. Percentage of classrooms with books/booklets other than textbooks



3.2 Classroom Teaching and Learning Process

3.2.1 Use of reading materials in the classroom

Table 5 presents the materials used during the classroom observations. It is commendable that teachers are using books and other materials in reading classes, as well as math manipulatives for learning basic numeracy skills in mathematics. Such materials, if used well, can provide guided practice for pupils, an important contribution to learning both reading and mathematics. Materials used most often in reading classrooms were the blackboard (63%), textbooks (30%), and pupil notebooks (21.7%). Teachers reporting using ministry textbooks quite frequently, with 74.3% stating that they use the textbook all the time and another 22% stating that they use it most of the time.

Table 5. Proportion of classrooms using various types of reading instructional materials

Materials Used	Reading
Blackboard	63.0%
Textbook	30.0%
Other book	0.6%
Papers (worksheets or photocopies)	3.0%
Flashcards	3.2%
Posters/Wall charts	3.3%
Slates	0.3%
Pupil notebooks	21.7%
Other	8.6%

3.2.2 Use of math materials in the classroom

In math classes, the blackboard was used 82% of the time, pupil notebooks were used 49%, and manipulatives for counting[31] were used 23% (see ***Table 6***).

[31] Manipulatives for counting refers to the use of small objects, such as stones or sticks that teachers may use with pupils to help them master rational counting and/or to understand and solve simple addition or subtraction problems.

Table 6. Proportions of classrooms using various types of mathematics instructional materials

Materials Used	%
Blackboard	81.6%
Textbook	5.5%
Workbook/Worksheet/Copies	4.2%
Flashcards	1.5%
Posters/Wall charts	2.0%
Manipulatives: Counting	22.8%
Manipulatives: Geometry	0.0%
Manipulatives: Fractions	0.0%
Slates	2.0%
Pupil notebooks	48.6%
Other	11.5%

3.2.3 Lesson content

The content of the lesson is also an essential factor contributing to what pupils learn. During reading lessons, the three most frequent approaches were reading isolated words (26.4%), letter/sounds (20.7%), and reading sentences (15.3%). A good deal of the targeted content included areas that are important for teaching pupils how to read. Given the low EGRA scores that will be discussed below, however, it may be that teachers are insufficiently prepared to deliver this content effectively. ***Table 7*** presents averages of the content being taught across the 40 second-grade reading lessons observed.

Table 7. Proportions of classrooms exhibiting various types of content instruction in reading

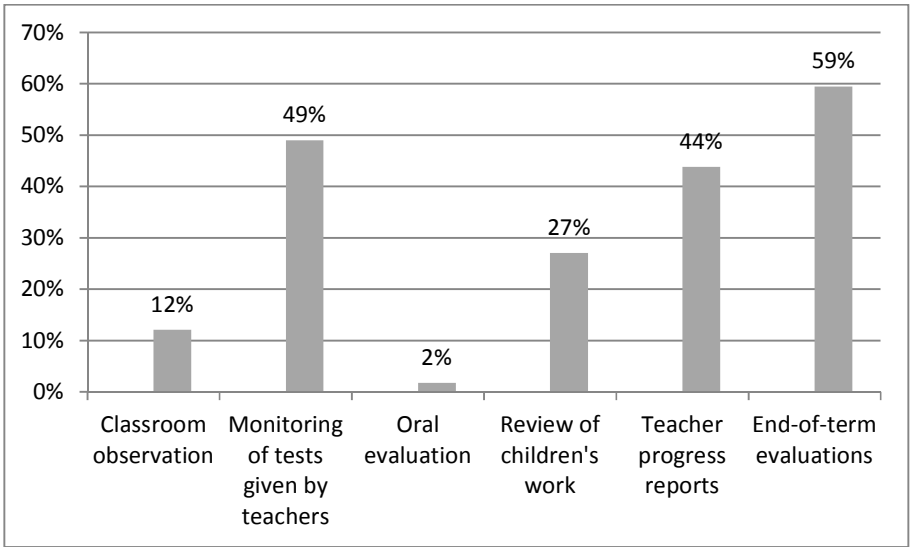
Instructional Content	%
Sounds without print	5.5%
Letters/sounds	20.7%
Reading isolated words	26.4%
Reading sentences	15.3%
Vocabulary (word meanings)	0.4%
Writing/dictation	5.5%
Reading texts	3.2%
Reading comprehension – text	5.2%
Writing – creating texts	11.5%
Other or don't know	7.6%

During math lessons, teachers spent the most time teaching multiplication (29.5%), addition (21.6%), subtraction (21.5%), and division (16.3%). Other topics included money (3%), counting (2.2%), and algebra (1.4%). Topics not covered at all included comparing sets, decimals and percentages, time, standard measurement tools, working with data (graphs and others) and geometry. Topics covered less than 1% of the time included reciting number words, number identification, one digit addition, and fractions.

3.2.4 Assessment approaches

Headteachers reported applying a number of direct and indirect approaches to evaluate how pupils were doing ***(Figure 9).*** Approaches included direct observation and questioning of pupils, as well as reliance on teacher reports and assessment results, and review of pupils' assignments.

Figure 9. Evaluation approaches reported by Headteachers



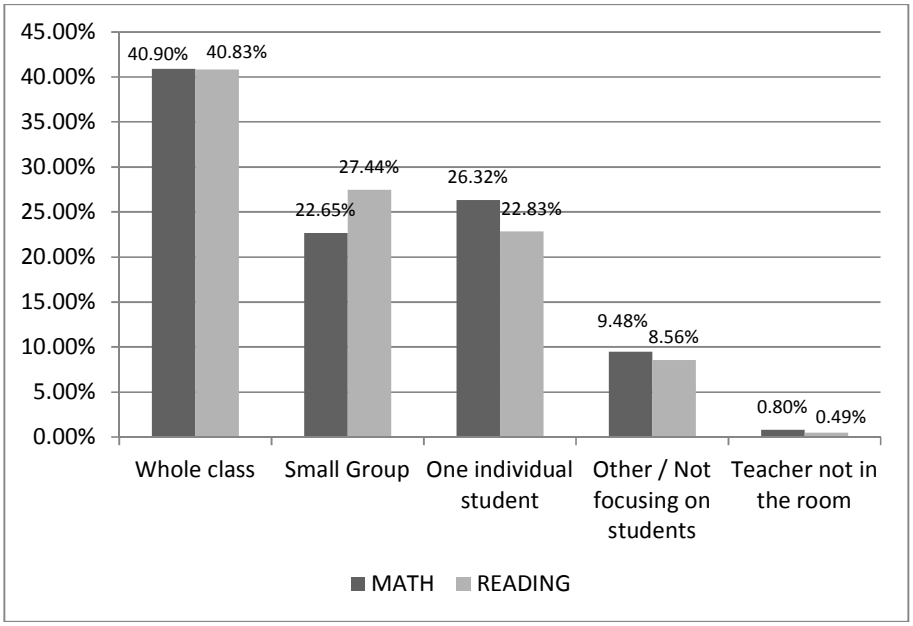
Virtually all teachers (97.2%) said they rely on written tests to assess their pupils' knowledge and abilities. Another 40% stated that they rely on end-of-term tests, and 33% on pupil homework. Only 17.7% rely on oral evaluations.

3.2.5 Teacher interaction with pupils

Several questions were designed to capture information regarding the interaction between teachers and their pupils, as the type and frequency of interaction impacts pupil performance. For example, teachers who are more engaged—that is, spend more time teaching and focused on pupils, assign homework, and routinely provide constructive feedback—would tend to have pupils that are more successful than less engaged teachers. The researchers asked pupils and parents about teacher interaction, examined pupil exercise books, and observed second-grade teachers during reading and math lessons.

Figure 10 presents the observations made during reading and math lessons in the schools where pupils were assessed. During the teacher observations, typically the largest part of the lesson consisted of interaction between the teacher and the entire class (41%), followed by interaction with small groups and individual pupils.

Figure 10. Teachers' points of focus during classroom observation of math and reading instruction



Pupils in both subjects spent more than half of the time listening to or watching the teacher. While some presentation and explanation from the teacher is useful and to be expected, when pupils are spending over half of the lesson period listening to the teacher, this may indicate that they are not having sufficient opportunity to practice or to engage in discussion.

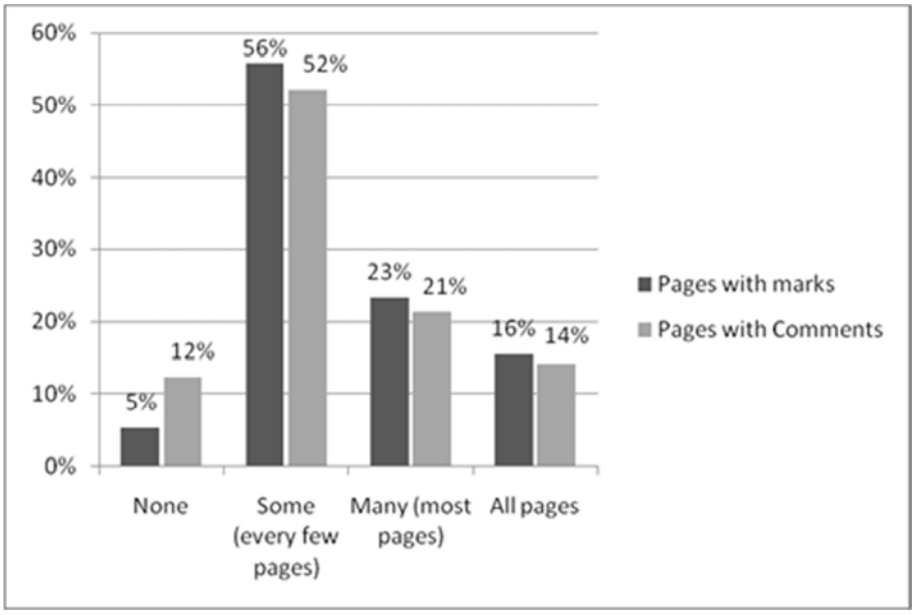
3.2.6 Homework

The majority (72%) of pupils reported receiving homework in the preceding week. The frequency with which homework was assigned varied, with 60% of pupils stating that they had received homework 1–3 times and another 12% reporting that they had received homework 4–5 times in the week.

3.2.7 Feedback

Teacher feedback facilitates pupils' ongoing improvement and better ensures that they will achieve curricular goals. The majority of teachers observed did provide pupils with feedback, based on pupil reports and observation. For example, 58% of the pupils who received homework stated that their teachers had checked their homework. Fifty-three percent (53%) of sampled pupils had their exercise books with them on the day of the visit. The majority of exercise books examined had marks and/or comments (see ***Figure 11***). As with homework, the frequency of comments and marks varied, with over half of the exercise books having some comments and 14–16% having comments and marks on every page. As could be expected, the frequency of marks and comments does matter. Pupils who receive more comments tend to fare better.

Figure 11. Frequency of marks and comments in exercise books



3.2.8 Learning environment

Creating a positive learning environment can help pupils to flourish as they feel encouraged to succeed and are comfortable asking questions without fear of reprisal. The feedback pupils reported receiving tended to be positive. All but 11% of pupils said that when they do well on an exam, they are praised or rewarded by their teachers. The majority of pupils also reported that when they were unable to answer a question correctly, their teachers rephrased the question, moved on to another pupil, or corrected or encouraged the pupil. However, another 36% of pupils reported being punished (sent from the room or scolded); some also reported being booed by their classmates or teachers. During math and reading lessons, pupils spent a fair amount of time responding to teacher questions (17 and 13% respectively). Pupil questions occupied very little time (less than 2%) during the lessons, which may indicate reluctance on the part of the pupils to ask questions.

3.3 Time on Task

Even when good teaching techniques are applied, pupils cannot succeed if they are not given sufficient learning time at school. Time on task is, therefore, an important indicator in determining school effectiveness. Time on task in the classroom includes such teacher activities as oral instruction, lecturing, and leading a discussion or group activity. Classroom management and discipline are not on-task activities. Pupils are spending time on task when they are reading aloud or silently, engaging in a

discussion or debate, practicing a skill, or doing seatwork. They are off task if they are interacting socially or are otherwise disengaged.[32]

Several SSME questions are designed to provide information from which to calculate time on task, such as when the school day starts, the length of the school day, the number of days during the school year that the school is closed, absenteeism, and the amount of time set aside for assembly and breaks. Additionally, the classroom observation instrument (previously mentioned) provides crucial insight into how lesson time is spent. Thus, rather than relying on self-reporting by teachers regarding time on task, researchers were able to make direct observations in the classroom. The following highlights significant findings from schools in Zambia.

3.3.1 Length of the school year

The official school year in Zambia lasts 190 days. Headteachers reports conveyed that the maximum number of days that a sampled school was closed without there being a school holiday was three. School closings appear to be a rare occurrence, with a total of only three schools reporting to have been closed on a non-holiday during the previous year.

3.3.2 Length of the school day

Primary schools in Zambia typically have two streams or shifts for early grades. However, some schools have up to three streams. Shifts at schools with two streams typically last up to 4 hours each. Shifts at schools with three streams typically last 3.5 to 4 hours each. As reported by Headteachers, the length of the school day in Zambia ranged from 4 hours (presumably single-shift schools) to 11 hours (multiple-shift schools) with an average of 8.96 hours per school day. Schools that took lunch breaks reported an average lunch break of 50 minutes. Schools that had an overall school day duration of 7 hours or less did not have a lunch break; presumably these were single-shift schools. Headteachers reported an average break time of 15.6 minutes and an average school assembly duration of 17.72 minutes. All Headteachers reported average times for assembly and breaks. The two breaks comprise just over half an hour (32.8 minutes). Although objectively, this is not a huge amount of time, assuming a shift is only 3.5 or 4 hours long, half an hour is a significant amount of time. Assuming an average shift of 4 hours, and then subtracting a half hour of that time to cover breaks and assembly, pupils are left with 3.5 hours. Multiplying 3.5 hours by the 190-day school year, we come up with a total of 665 hours during the school year. This figure falls well short of the 850–1000 hours of minimal annual instructional time recommended by the World Bank and UNESCO through the EFA initiative.[33] As discussed below, shift time spent on non-instructional activities, teacher and pupil absenteeism, and tardiness all work to further erode annual instructional hours.

[32] Time-on-task activities derived from Joseph DeStefano et al., *Using Opportunity to Learn and Early Grade Reading Fluency to Measure School Effectiveness in Ethiopia, Guatemala, Honduras, and Nepal,* USAID EQUIP2 Working Paper, 2010, p. 17.
[33] EFA Global Monitoring Report, 2005, p. 149.

3.3.3 Teaching time during observed lessons

Observed reading and math lessons were largely focused on learning. During the reading lesson, 8.5% of the time was spent on non-instructional issues such as behavior management, while 4.3% of math lessons was spent on non-teaching activities. Observed teachers were reported as being outside of the classroom less than 1% of the time for both reading and math lessons.

3.3.4 Absenteeism

Pupil absenteeism can have an obvious correlation with low performance. All sampled teachers claimed to keep attendance records and 97% were verified by the assessment team to have a record. The average absenteeism rate as reported by teachers on the day of assessment was 25%. The average absenteeism rate as observed by researchers on the day of assessment was 26%. Among pupils who reported having been absent within the previous week, the majority (81%) claimed sickness as the reason. Other reasons for absence mentioned by pupils included waking up late, caring for family members, not having a uniform, or being treated badly by peers or teachers.[34]

Attendance records are key, as they keep teachers and the school administration informed and aware of absenteeism issues. Pupil attendance records are kept centrally as well as in the classrooms, but the frequency with which these numbers are collected varies substantially. Twenty-nine percent of Headteachers reported that they record pupil attendance centrally on a daily basis; another 29% record this information every month. A small number of schools (8%) noted that they record it just once a year and 4% never record it.

As with pupil absenteeism, teacher absenteeism has been shown to be a major factor in school ineffectiveness and low pupil performance. Surveys in several countries have shown that schools are routinely missing a quarter of their staff, with rural schools faring even worse.[35] Few countries can afford to hire substitute teachers, and Zambia is no exception.

The average teacher absenteeism rate reported by Headteachers for the day before the assessment ranged from 3% to 50% and averaged 11%. While 85% of Headteachers claimed to keep a teacher attendance record, only 67% produced the record on the day of assessment. Of these, an average of two days had passed since attendance was last taken. Although some Headteachers were keeping these attendance records, in the majority of cases, deputy head teachers were responsible for this task. The majority (78%) of Headteachers reported that when a teacher is absent, they allocate the class to another teacher. If we include the average absenteeism rates of both teachers (11%) and pupils (26%), in our estimate of the number instructional hours available during the year (see Section 3.3.2) the estimated hours are reduced from 665 to 419.[36]

[34] These reasons came to 4% or less of the pupils interviewed.
[35] Helen Abadzi, 2007, Absenteeism and Beyond: Instructional Time Loss and Consequences (October 1, 2007). World Bank Policy Research Working Paper Series,. p. v.
[36] 665 – (665*.26 average pupil absenteeism)- (665*.11 average teacher absenteeism) =
665 – 172.9 – 73.15 = 419.

3.3.5 Late arrival

Late arrival undermines pupils' learning time, and recurrent late arrival is associated with lower performance. The impact of late arrival is particularly strong in cases where the length of the school day or shift is short. Teachers in Zambia reported average pupil tardiness rates ranging from 2% to 50% per class, with an average rate of 15.2%. Pupils gave several reasons for arriving late to school during the previous week, ranging from sickness (22%) and waking up late (22%) to having no transport or late transport (9%), or having other work to do at home (7%). The average reported tardy rate for teachers was just 3.4%; 70% of the schools reported no tardy teachers on the previous school day. Those that did report tardy teachers indicated that between 2% and 40% of teachers had arrived at school at least 15 minutes after the start of classes.

3.3.6 Curriculum coverage

Time on task will impact the amount of material a teacher is able to cover during the school year. In order to estimate how much material was covered during the school year, researchers examined the language textbooks and asked the teachers how many chapters they had covered so far during the year. As noted at the beginning of this report, the data collection took place in July, which was halfway through the school year. On average, teachers reported having covered 50% of the textbook's content. As discussed in Section 4, pupil performance measures may indicate that although teachers had covered 50% of the material, the pupils did not seem to have mastered it.

3.3.7 Reading practice

As previously mentioned, having time to practice reading is essential for new readers. Seventy percent (70%) of pupils reported having reading time in school. Observed second-grade reading lessons indicated that the majority (62%) of the lesson was spent reading letters, individual words, and sentences, while just 8.4% was spent reading texts. No silent individual reading by pupils was observed during the reading lessons, although individual pupils were observed reading out loud (6.79%), and a small amount of time was dedicated to choral reading (2.4%). The previously identified lack of reading materials would make individual reading time challenging in most classrooms. To achieve reading fluency, studies have shown that a minimum of 250 hours of focused reading instruction and practice time with appropriate texts is required.[37] If we assume that approximately one quarter of the day's instruction is spent on Bemba, then available reading instruction is reduced from 419 hours per year to approximately 105 hours per year. If we take into account the scarce availability of reading materials (on average, only 20% of the children have access to Bemba textbooks) this time becomes reduced considerably. This rough approximation provides an example of how little ideal reading instruction time may be available to pupils.

[37] Comings, J. (1995). Literacy skill retention in adult pupils in developing countries. *International Journal of Educational Development*, 15(1).

Reading outside of school appears to be uncommon. An estimated 36% of pupils reported having books at home other than school books, and only 33% said they took books home from school. Thirty-seven percent (37%) of pupils reported that they "never" read out loud at home, while just 6% reported reading aloud at home every day. Pupils also benefit from having stories read to them, as this increases their reading comprehension and vocabulary and models for them what fluent reading sounds like (including intonation). In addition, having a fluent reader read an interesting story to a pupil can help motivate the pupil to want to read. A few parents (12%) reported reading to their children multiple times per week, while another 12% reported never reading to their children[38] ***(Table 8).***

Table 8. Pupils' and parents' responses on reading at home

Frequency	Child reads out loud at home (pupil report)	Someone reads to child at home (parent report)
Never	37%	12%
Sometimes	27%	50%
Once a week	10%	18%
2–3 times per week	20%	12%
Every day	6%	6%

3.4 Pedagogic Oversight

The extent to which Headteachers are or are not involved with the day-to-day work of their teaching staff can be indicative of the management and oversight capabilities of Headteachers, the level of accountability felt by teachers, and the working atmosphere for staff.

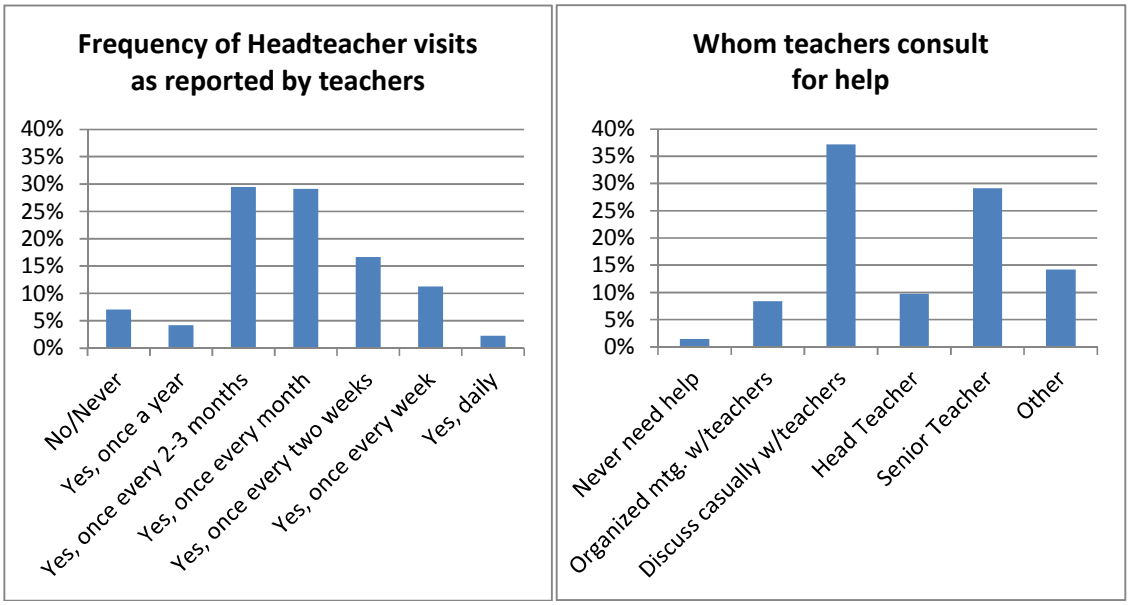
Forty-four percent of Headteachers reported checking teachers' lesson plans once a week and 31% claimed to do so daily. These reports correlated closely with teachers' accounts of Headteachers oversight of their lesson planning. Head teachers said that they checked teacher lesson plans in order to ensure that teachers were prepared, that they were following the syllabus, that what they were teaching was correct, and that they were teaching effectively. The reviews also made Headteachers aware of teachers who needed help, and made it feasible to prepare for teacher absence.

When the researchers asked about the frequency of Headteacher visits to the classroom, teacher responses indicated that such visits were infrequent, with the majority of responses reporting visits once a month or every 2–3 months. Among teachers, 37% reported that when they need assistance, they discuss the issue casually with other teachers. Another 29% said they seek help from a senior teacher, and 10% said they go to the Head Teacher (see ***Figure 12***). Thus, while teachers were receiving

[38] Given that so few pupils report having books at home, we could assume that the pupils' and parents' reports of reading at home may be somewhat inflated.

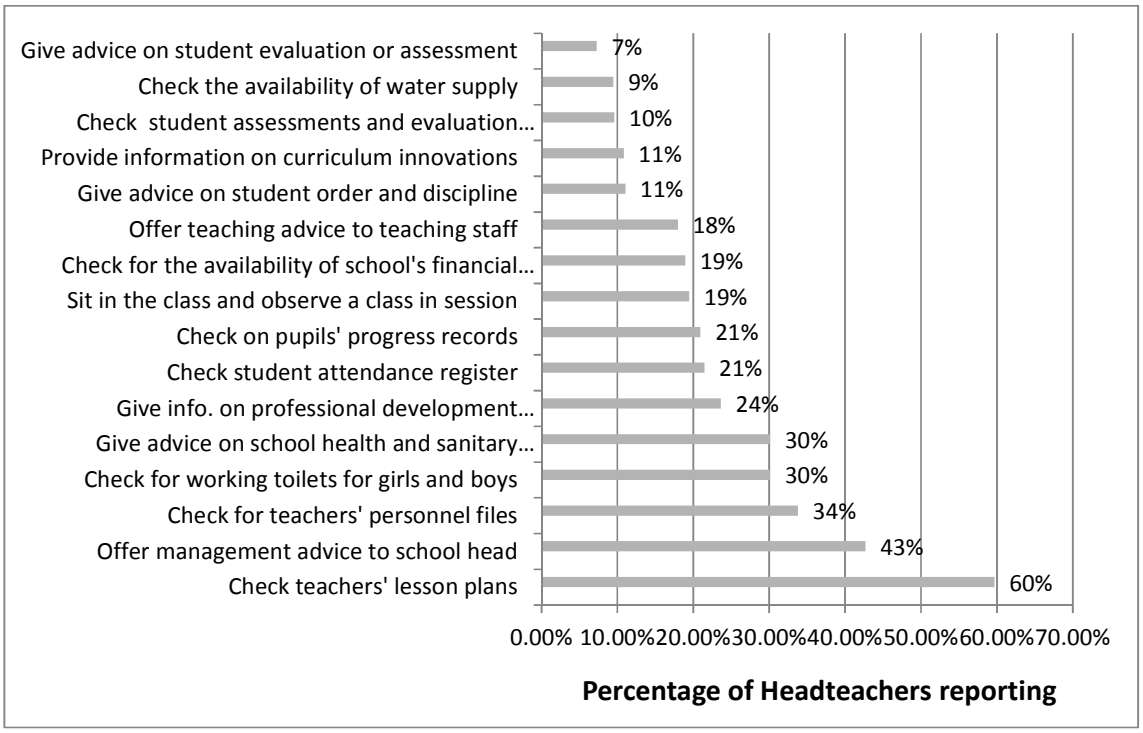
lesson planning oversight from the Headteachers on a somewhat regular basis, they were reluctant or did not feel the need to seek assistance from the same source.

Figure 12. Pedagogic oversight as reported by teachers



Assessors also asked Headteachers and teachers about oversight from the MOE in the form of visits from district education inspectors. There were some discrepancies between the two groups of respondents regarding the frequency of such visits, with most (68%) Headteachers reporting to have been visited once, contrasted with only 16% of teachers reporting the same. Another 26% of Headteachers and 45% of teachers said they had never been visited by an inspector, and 27% of teachers reported visits every 2-3 months, while no Headteachers reported the same.

When inspectors did visit schools, assessors asked what they did while there. See ***Figure 13*** for the responses from Headteachers. Teachers' responses to the same question revealed that the most common inspector activity (91%) was giving advice on student assessments or evaluations, followed by offering teaching advice (86%), offering advice about order and discipline (78%), and responding to teacher questions (72%).



4. EGRA and EGMA Findings

4.1 Summary of EGRA and EGMA Scores

This section presents summary statistics for all 10 subtasks in the combined EGRA and EGMA in Zambia, beginning with ***Table 9.*** Analyses of results for the specific subtasks are presented in Section 4.2.

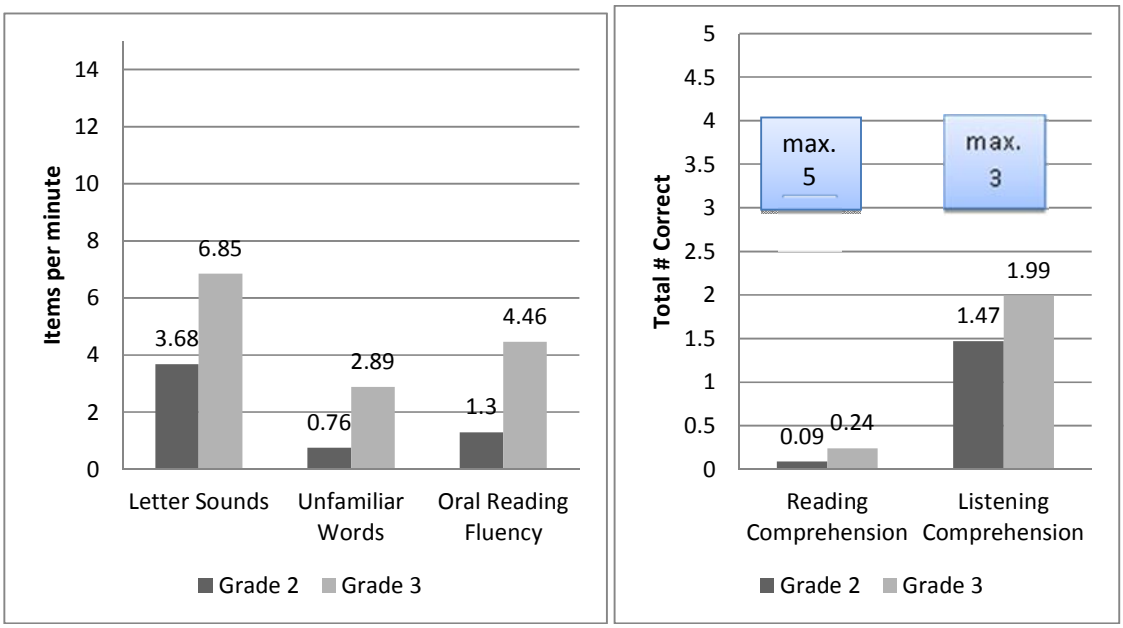
In general, boys tended to show stronger performance than girls, and as expected, those in grade 3 performed better than those in grade 2.

Table 9. Summary scores for all EGRA and EGMA subtasks

	Task	Overall % Pupils with 0 Scores	Grade 2			Grade 3			Total
			Total	Female	Male	Total	Female	Male	
EGRA	Letter sound	46.12	3.68	3.00	4.35	6.85	6.72	6.98	**5.26**
	Unfamiliar words	81.60	0.76	0.67	0.85	2.89	2.71	3.07	**1.83**
	Oral reading fluency	84.52	1.30	1.06	1.54	4.46	4.51	4.41	**2.88**
	Reading Comprehension	88.60	.0.09	0.07	3.0.11	0.24	0.26	0.23	**0.17**
	Listening Comprehension	20.22	1.47	1.41	1.53	1.99	1.97	2.00	**1.73**
EGMA	**Number identification**	0.05	14.58	13.02	16.12	23.74	23.69	23.78	**19.16**
	Quantity discrimination	15.15	6.02	5.39	6.65	10.16	9.92	10.39	**8.09**
	Missing number	33.58	2.60	2.07	3.12	4.80	4.94	4.66	**3.70**
	Addition	15.09	3.75	3.26	4.23	6.71	6.57	6.85	**5.23**
	Subtraction	17.48	2.93	2.69	3.16	4.89	4.91	4.86	**3.91**

Producing the sounds associated with each letter can be a challenging task for beginning readers, as it requires children to both identify the letters and recall the sounds that are paired with those letters. This is an unnatural task, as children tend to find it easier to identify objects by their names (such as letters or animals) rather than their associated sounds or features. Pupils in grade 2 could produce the sounds of almost 4 letters per minute but could read fewer than 1 unfamiliar word, while their peers in grade 3 could correctly produce the sounds of 6.85 letters and read 2.89 unfamiliar words per minute ***(Figure 13).*** When pupils were reading familiar words in the form of a meaningful passage, their reading levels were weak, averaging slightly more than one correct word per minute (cwpm) in grade 2, and less than 5 cwpm in grade 3. As a result, pupils' reading comprehension scores were low, with 1.7% in grade 2 and 4.9% in grade 3. In contrast, listening comprehension scores were much higher, with an average of 49.0% in grade 2 and 66.3% (two out of the three answers correct) in grade 3.

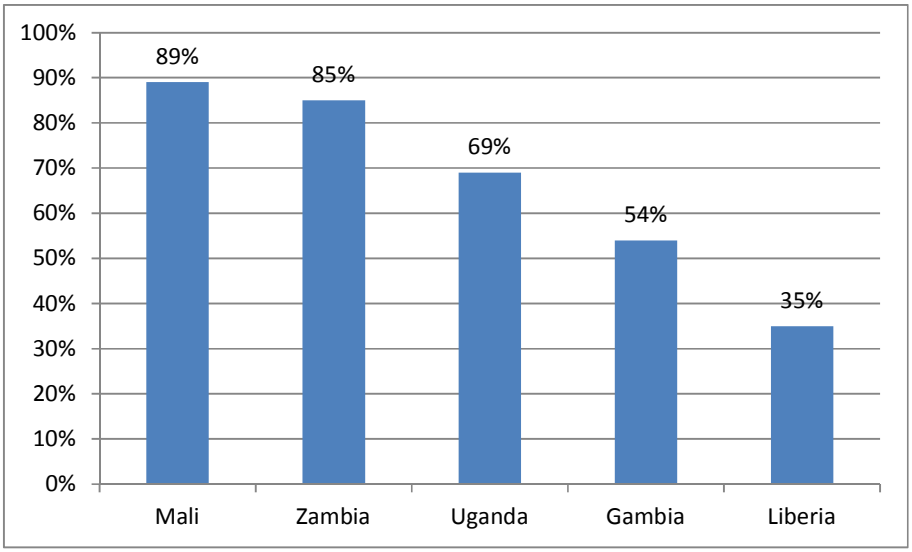
Figure 13. Summary of all EGRA scores (including zero scores)



Regarding the math subtasks, overall, pupils performed best on number identification, where they were able to correctly identify 14.6 numbers per minute in grade 2 and 23.7 numbers per minute in grade 3. This was to be expected, since this was the most basic of all competencies assessed. Pupils struggled the most with the missing number subtask. They were able to complete 2.6 items per minute in grade 2 and 4.8 per minute in grade 3. There was a clear progression from grade 2 to grade 3, with the scores of grade 3 pupils almost double those of grade 2. No significant difference in performance was found between girls and boys across the majority of pupils (only addition saw a very slight difference in favor of boys).

A large number of pupils received a zero score on EGRA subtasks, which is common in the region. ***Figure 14*** shows the average percentage of pupils in several other countries where EGRA has been implemented between 2008 and 2009, with Zambia's average of 85% also included.

Figure 14. Percentage of pupils who could not read a single word, 2008-2009 (plus Zambia 2011)



Because so many pupils in Zambia received zero scores, an analysis of averages of those *able* to identify letters or words is pertinent. Excluding zero scores may produce a clearer picture of the reading performance of pupils who can complete the tasks, as the zero scores may lead to underestimates of the letter- and word identification skills of these pupils. ***Table 10*** presents the mean scores for pupils who were able to identify at least one letter, invented word, or word correctly, excluding pupils with zero scores. The table also presents the EGMA means for children able to identify at least one number, quantity, and missing number, and to compute one addition or subtraction problem.

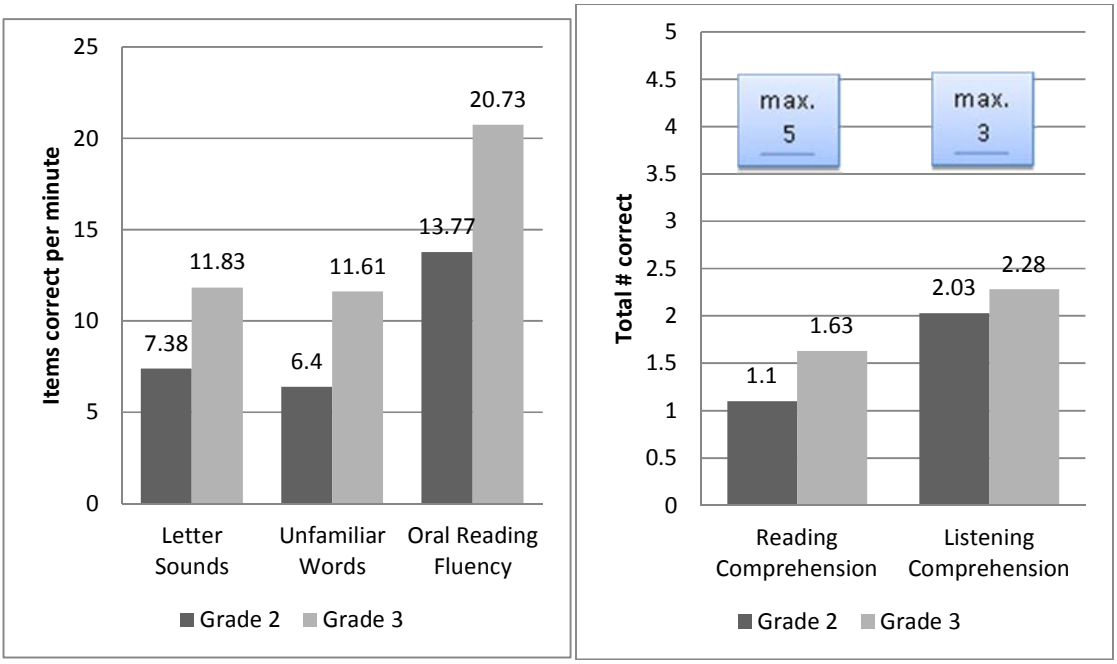
Table 10. Summary of EGRA and EGMA scores with zero scores excluded

		Grade 2			Grade 3			
	Task	Total	Female	Male	Total	Female	Male	Total
EGRA	Letter sound	7.38	6.70	7.93	11.83	11.77	11.88	**9.77**
	Unfamiliar words	6.40	6.59	6.26	11.61	11.24	11.95	**9.93**
	Oral reading fluency	13.77	18.59	11.72	20.73	21.46	20.04	**18.60**
	Reading comprehension	1.10	1.25	1.03	1.63	1.74	1.52	**1.45**
	Listening comprehension	2.03	2.03	2.03	2.28	2.36	2.21	**2.17**
EGMA	Number identification	15.32	13.75	16.87	25.02	25.31	24.74	**20.16**
	Quantity discrimination	7.34	6.82	7.81	11.60	11.42	11.77	**9.54**
	Missing number	4.33	3.85	4.71	6.59	6.78	6.40	**5.57**

	Task	Grade 2			Grade 3			Total
		Total	Female	Male	Total	Female	Male	
	Addition	4.76	4.36	5.15	7.35	7.25	7.44	**6.16**
	Subtraction	3.96	3.71	4.21	5.36	5.37	5.35	**4.73**

As can be seen in ***Figure 15,*** the differences in EGRA scores in particular are very important once zero scores are removed. Pupils able to identify letter sounds could identify close to 10 letter sounds per minute, and those able to read at least one word could read on average close to 19 wpm in connected text. In other words, average scores in producing letter sounds more than doubled. At the word-reading level, scores in reading invented words and familiar words in a passage increased by more than a factor of 4.

Figure 15. Summary of EGRA scores with zero scores excluded



In contrast, the difference in EGMA scores is not so distinct. The average score for number identification increased from 19.2 to 20.2, addition from 5.5 to 6.2 per minute, and subtraction from 4.0 to 4.7 per minute.

Another way to analyze EGRA and EGMA scores is to compare the scores to the number of items attempted on the subtask, which allows for an examination of accuracy. Fluency scores alone do not shed light on whether a pupil obtaining a relatively low score simply tackled the items at a slower pace, but responded correctly; or answered rapidly, but had many incorrect answers. Thus, comparing scores to the number of items attempted on the subtask provides further insight into pupils' mastery of early reading and mathematics skills. ***Table 11*** presents the average score of the pupil population, the average number of items attempted for the subtasks, and the average percentage of correct attempts.

Table 11. Attempted vs. correct for total sample, EGRA and EGMA subtasks (including zero scores)

	Task	Score[a]	Attempted	Percent Correct
EGRA	Letter sound	5.20	14.73	25.1%
	Unfamiliar words	1.78	6.38	12.0%
	Oral reading fluency	2.87	10.88	12.4%
	Reading comprehension	0.17	0.25	68.0%
	Listening comprehension	1.73	3.00	57.7%
EGMA	Number identification	16.49	20.82	69.3%
	Quantity discrimination	8.09	11.64	58.5%
	Missing number	3.70	8.07	36.4%
	Addition	5.17	6.82	70.5%
	Subtraction	3.89	5.67	66.6%

[a] The scores for letter sounds, unfamiliar words, oral reading fluency, number identification, addition, and subtraction are scores per minute. The scores for quantity discrimination and missing number represent the number of correct answers.

Table 11 shows that pupils attempted to identify on average close to 15 letter sounds, but were only able to identify one quarter (5.2) of them correctly. Similarly, pupils only identified 12% of unfamiliar words and words in the text passage correctly. This shows that the challenge is most likely the ability to identify letter sounds, decode unfamiliar words, and recognize known words, rather than speed in doing so.

In contrast, pupils were much more successful with the EGMA subtasks. With the exception of missing numbers, pupils correctly identified or computed the majority of items attempted. In fact, they were successful in two-thirds of attempts on number identification, subtraction, and addition. Clearly, pupils were struggling more in reading than mathematics. However, achieving scores of 60%–70% cannot be considered mastery on tests of basic competencies.

Once again, because most pupils received scores of zero on the EGRA subtasks, we compared the accuracy on each of the subtasks to the number of items attempted on those subtasks after excluding zero-scores. ***Table 12*** presents the mean scores for pupils who were able to identify at least one letter, invented word, or word correctly, and the mean number of items attempted. The table also presents parallel EGMA analyses.

Table 12. Attempted vs. correct on EGRA and EGMA subtasks, excluding zero scores

	Task	Score[a]	Attempted	Percent Correct
EGRA	Letter sound	9.66	18.79	46.6%
	Unfamiliar words	9.69	12.65	63.3%
	Oral reading fluency	18.45	20.96	79.6%
	Reading comprehension	1.45	1.98	73.2%
	Listening comprehension	2.17	3.00	72.3%
EGMA	Number identification	17.33	21.64	72.9%
	Quantity discrimination	9.54	12.82	69.0%
	Missing number	5.57	9.65	54.9%
	Addition	6.09	7.14	83.0%
	Subtraction	4.72	5.82	80.7%

[a] The scores for letter sounds, unfamiliar words, oral reading fluency, number identification, addition, and subtraction are scores per minute. The scores for quantity discrimination and missing number represent the number of correct answers.

Again, the differences in EGRA scores are very striking once zero scores are removed. Pupils able to identify letter sounds could identify the sounds for close to half the letters they had attempted, and those able to read at least one word could read between 63% and 80% of the words that they attempted.

4.2 Subtask Analysis

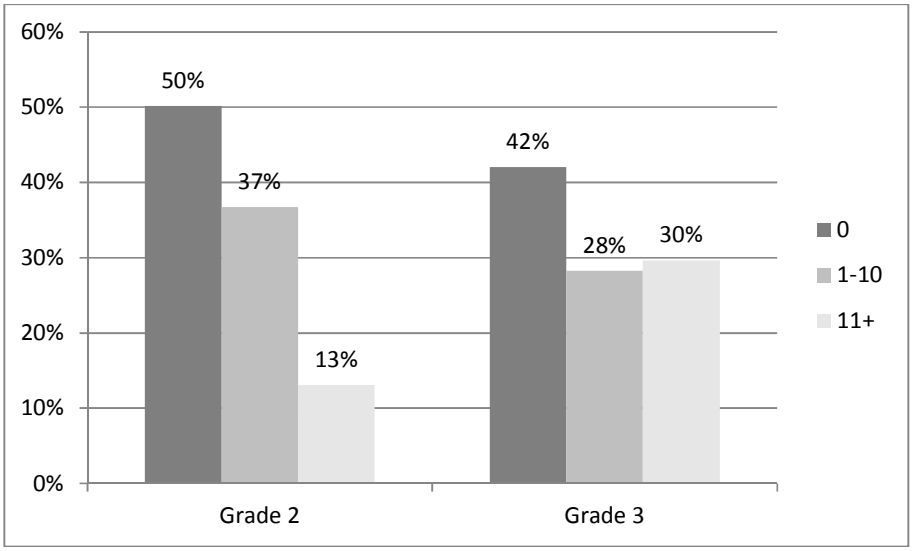
The subsections that follow present each subtask individually, with a look at the proportion of pupils who scored zero on that subtask, and comparisons between groups.

4.2.1 Letter sound knowledge

On the letter sound knowledge subtask, pupils were presented a chart with 100 random letters, and were asked to generate the sounds of as many letters as they could within one minute. Knowledge of the letter-sound correspondences is critical for beginning reading, as this skill enables pupils to decode, or sound out, new and unfamiliar words. Scores for this task were the number of letter sounds the pupil could correctly generate within one minute (correct letters per minute). This is a challenging task for pupils, as they may be more accustomed to producing the names of letters, rather than their sounds, when asked. Further, pupils might have been unfamiliar with the testing situation, which could have interfered with their performance.

Figure 16 presents the fluency of pupils in identifying letter sounds in grades 2 and 3. As can be seen, the majority of the pupils in grade 2 could not identify a single letter sound. Those in grade 3 performed slightly better. Although boys tended to be more successful in producing letter sounds in grade 2, by grade 3 boys and girls showed similar patterns of performance. These results, coupled with pupils' low accuracy in producing the sounds of letters that were attempted (about 25%), suggest that pupils would benefit from greater instruction in the letters and their sounds.

Figure 16. Percentage of pupils reading 0, 1–10, and 11+ correct letter sounds per minute (clpm) in grades 2 and 3

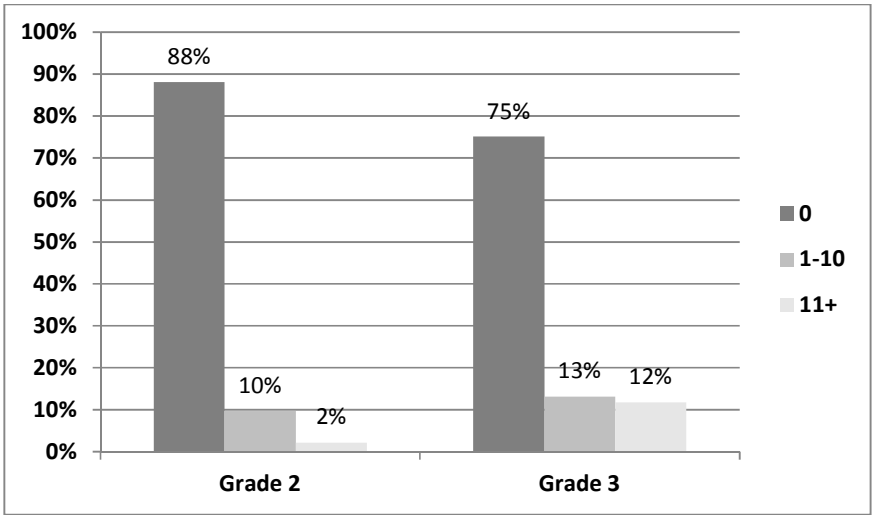


4.2.2 Unfamiliar word reading

Recall that for the unfamiliar word subtask, pupils were presented a chart with 50 invented (or nonsense) words, and were asked to pronounce as many of the words as they could within one minute. Skill at reading invented or nonsense words may be considered a purer measure of decoding than using real words, as pupils cannot recognize the words by sight. Although this task would not assess pupils' recognition of words that have been taught to them, decoding is considered a self-teaching skill that enables pupils to figure out how to pronounce new and unfamiliar words. This is typically a very challenging task for children, and even pupils who *can* decode the invented words may become confused once they recognize that the words are not real. Scores for this task were the number of words the pupil could correctly read within one minute (correct words per minute).

The results summarized in ***Figure 17*** show that the vast majority of pupils in both grades could not sound out a single invented word. Indeed, close to 90% of pupils in grade 2 were unable to read a single word. These numbers decreased by grade 3, but 75% of third-grade pupils were unable to decode any of the invented words. Although boys showed slightly stronger performance in reading unfamiliar words, these gender differences were very small. Pupils were successful in decoding 12% of the unfamiliar words that they attempted (see ***Table 11***). Thus, these findings, combined with those from the letter sound knowledge subtask, suggest that pupils need greater instruction in the letter sounds and strategies for decoding new words.

Figure 17. Percentage of pupils reading 0, 1–10, and 11+ unfamiliar words per minute (cwpm) in grades 2 and 3



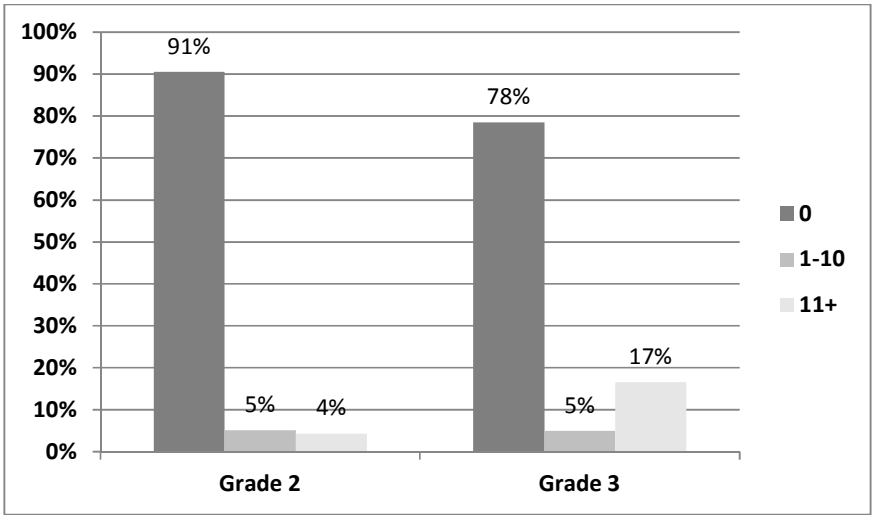
4.2.3 Oral reading fluency

For the oral reading fluency subtask, pupils were asked to read a narrative passage of local relevance within one minute. Oral reading fluency may be considered an important index of reading competence, as it taps into the skill and speed with which pupils translate letters into sounds, decode unfamiliar words, recognize known words, and make sense of the text's meaning simultaneously. Weakness in any one of these processes can slow or disrupt pupils' reading fluency. The score for this task was the number of words from the passage pupils accurately read in one minute (correct words per minute, or cwpm).

Figure 18 shows that over 90% of the pupils in grade 2 and over three quarters of their peers in grade 3 could not read a single word. As a result, the average was around 2 cwpm in grade 2, and about 5 cwpm in grade 3. Among pupils who could read at least one word, pupils in grade 2 read on average 14 cwpm, and pupils in grade 3 read about 21 cwpm. Pupils accurately read approximately 12% of the words they attempted (see ***Table 11***). Furthermore, although boys had slightly stronger oral reading fluency scores, gender differences were quite small.

Correlational analyses suggest that pupils' weak oral reading performance may be attributable to their limited knowledge of the letter sounds (with a moderate to large correlation of 0.50) and weak decoding skills (with a large correlation of 0.90). Taken together, these findings show that pupils' limited knowledge of the letter sounds and weak decoding skills must be addressed to improve their oral reading fluency.

Figure 18. Percentage of pupils reading 0, 1–10, and 11+ words of text per minute (cwpm) in grades 2 and 3

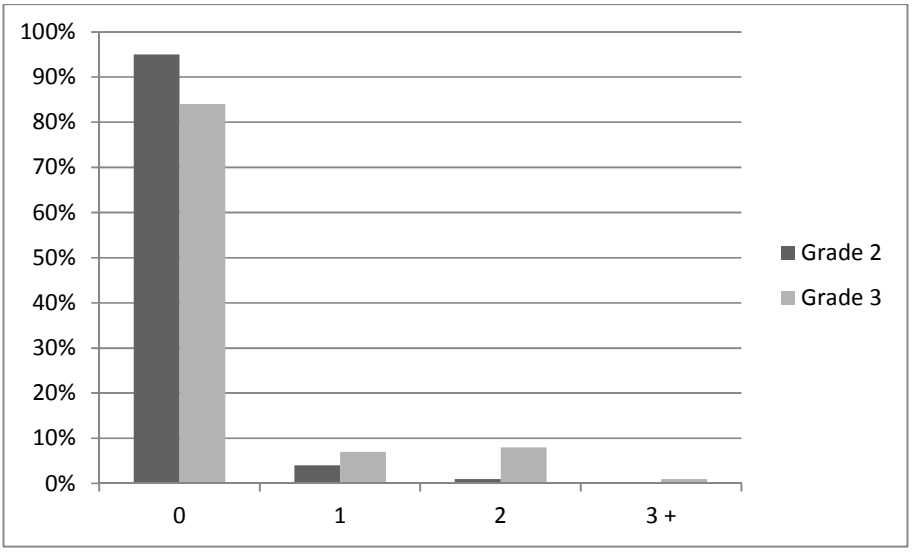


4.2.4 Reading comprehension

After reading the passage aloud for one minute, the pupils who were able to read at least one word correctly were asked five questions about the story. Questions were both literal, requiring pupils to directly recall information from the story; and inferential, requiring pupils to combine information from the story with their background knowledge to derive a correct answer. Pupils' reading comprehension scores were recorded as the percentage of correct responses to the five questions.

Overall, pupils had very weak reading comprehension scores, with the majority of pupils unable to answer a single question ***(Figure 19).*** In grade 2, the average comprehension scores ranged from 0.6% to 2.6%, and in grade 3, comprehension scores were marginally better at 2.8 to 6.4%.

Figure 19. Percentage of pupils obtaining reading comprehension scores of 0, 1, 2, and 3+ in grades 2 and 3

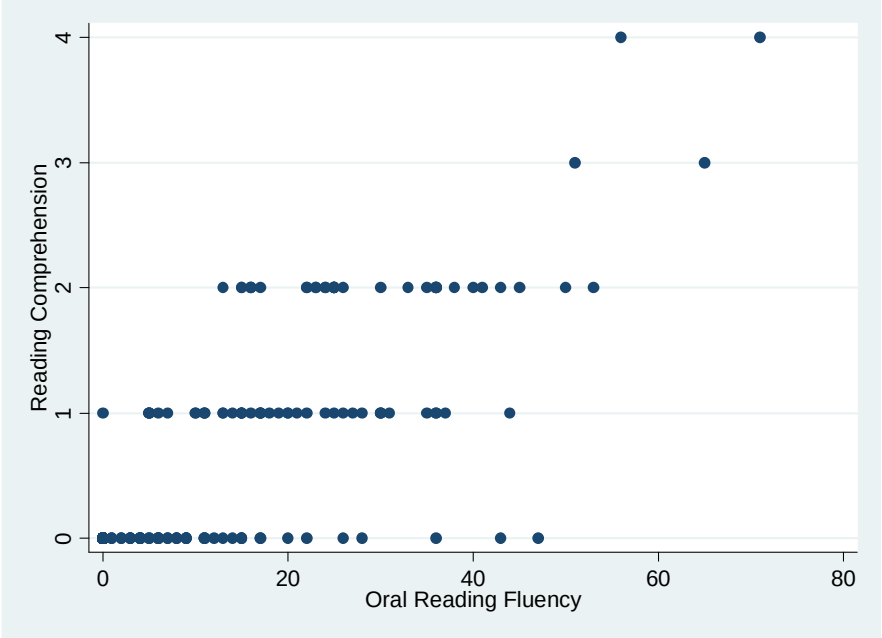


Numerous large-scale studies and meta-analyses have reported robust correlations between oral reading fluency and reading comprehension.[39] The relationship between decoding speed and reading comprehension is particularly strong among beginning readers, as their word recognition skills still require conscious control.[40] This was supported by the large correlation (r = 0.62) between pupils' scores in oral reading fluency and reading comprehension.

Similarly, ***Figure 20*** illustrates the well-documented relationship between oral reading fluency and reading comprehension. Overall, 93 pupils successfully read 11 or more correct words in a minute. Only four pupils answered three or more comprehension questions accurately. It seems that pupils with a reading fluency of 30 wpm were capable of answering two questions correctly, while those with 50 to 60 wpm could answer three or four questions correctly. While the number of pupils reading at that speed is too small to present strong evidence, it does appear that pupils' weak performance in reading comprehension can be attributed to slow and inaccurate word reading skills. Thus, addressing pupils' word recognition and decoding skills is a critical step for improving their reading comprehension.

[39] E.g., M.C. Daane, J.R. Campbell, W.S. Grigg, M.J. Goodman, and Orange, (2005). Fourth-grade pupils reading aloud. NAEP 2002; G.S. Pinnell, J. J. Pikulski, K. K. Wixson, J. R. Campbell, P. B. Gough, and A.S. Beatty, (1995). *Listening to children read aloud.* Washington, DC: U.S. Government Printing Office; and C. E. Snow, M. S. Burns, and P. Griffin, (Eds.). (1998). *Preventing reading difficulties in young children.* Washington, DC: National Academy Press.
[39] Hoover & Gough, 1990.

Figure 20. Number of reading comprehension questions answered correctly as a function of oral reading fluency scores

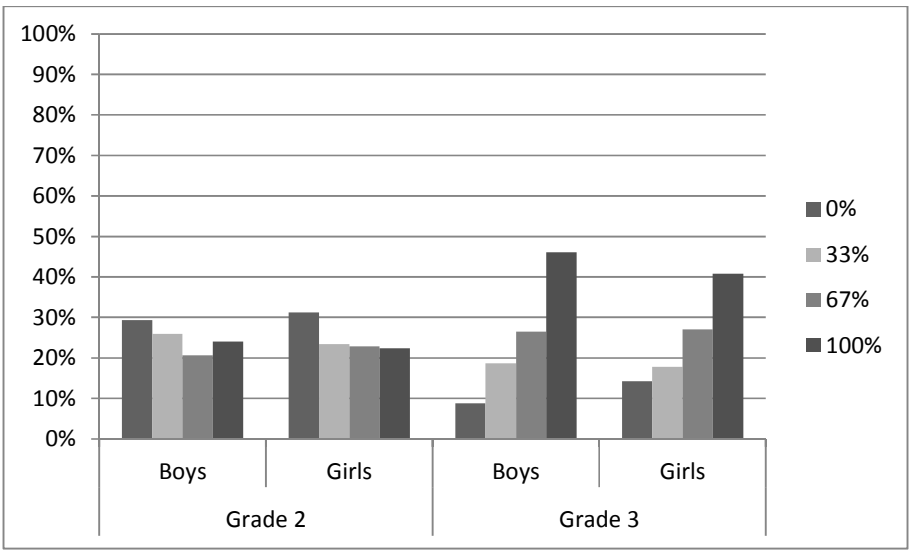


4.2.5 Listening comprehension

For the EGRA listening comprehension subtask, the assessor read a short narrative story to the pupils, followed by three questions about that story. This was purely a listening task, as the pupils were not given a copy of the story to follow along or to have as reference when answering the questions. Thus, the listening comprehension subtask assessed a range of language and cognitive skills, such as attention, vocabulary knowledge, comprehension strategies, processing of oral language, and generating of appropriate replies. To facilitate direct comparisons with reading comprehension, scores on the listening comprehension subtask were recorded as the percentage of correct answers. This comparison is important, as makes it possible to determine whether poor reading comprehension can be attributed to limited reading skills or to more general difficulties in language comprehension.

Although pupils obtained low reading and reading comprehension scores, their scores in listening comprehension were considerably stronger. ***Figure 21*** presents the average scores by grade and gender. Pupils in grade 2 answered almost half of the questions correctly while their peers in grade 3 answered on average more than two of the three questions correctly. Indeed, about one third of all pupils received perfect scores.

Figure 21. Percentage of pupils obtaining listening comprehension scores of 0, 33%, 67%, and 100% in grades 2 and 3, by gender



The research team also examined the relationship between listening comprehension and reading comprehension. Whereas oral reading fluency shared a large correlation with reading comprehension (r = 0.62), listening comprehension's relationship with reading comprehension was much smaller (r = 0.16) and was not statistically significant. Thus, it appears that pupils' oral language skills were strong enough to comprehend grade-level text. The difficulty in reading comprehension lay in weak decoding skills that prevented pupils from quickly and accurately recognizing the words of the text.

4.2.6 Number identification

This subtask targeted pupils' knowledge and identification of written symbols. It assessed recognition and understanding that each of the numbers is a constant with one number-word associated with it, and that the pupil knew the number word(s) associated with the number symbol.

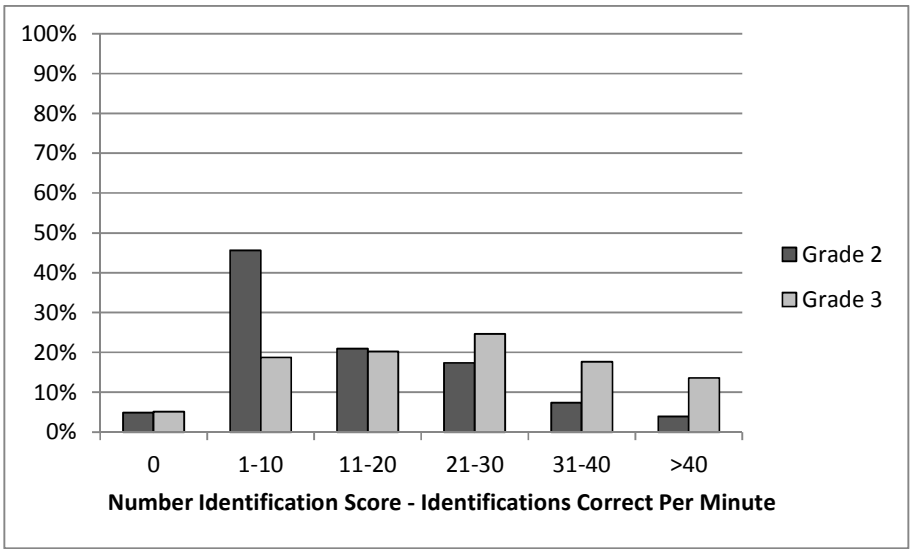
Number identification: Sample items

12	2	17
9	18	32
62	93	34
10	19	25

Grade 2 pupils were able to correctly identify an average of 14.6 numbers in one minute while grade 3 pupils were able to correctly identify an average of 23.7 numbers in one minute ***(Figure 22).*** Grade 2 pupils were accurate (percent correct out of attempted) 61.4% of the time, and grade 3 pupils 77.3% of the time. There were very few zero scores on this subtask. Of the subtasks included in the Zambia EGMA, this was the most basic. Although very few pupils (5%) had a score of zero on this subtask, it would be desirable for pupils at the end of two years of schooling to be able to name numbers with well more than 60% accuracy. Pupils had more difficulty identifying numbers over 20. Given that the local curriculum stipulates that by the end of grade 2 pupils should be able to count, read,

and write numbers up to 1,000, such difficulty indicates that pupils are falling well below expectations.

Figure 22. Scores for number identification subtask, grades 2 and 3



4.2.7 Quantity discrimination

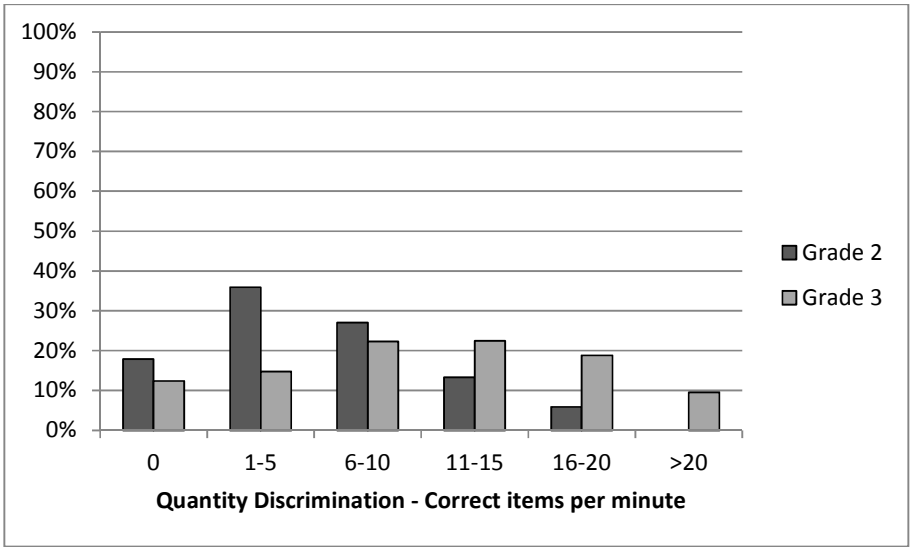
Quantity discrimination in EGMA measures pupils' ability to make judgments about differences by comparing quantities. Quantity discrimination in the early grades demonstrates a critical link to an effective and efficient counting strategy for problem solving. Without this ability, pupils are more apt to make errors or use less efficient strategies. For the Zambian EGMA, pupils were asked to compare single- and double-digit numbers.

Quantity discrimination: Sample items

5	6
15	20
19	18
50	57

In grade 2, 18% of pupils were unable to correctly answer a single quantity discrimination item, while in grade 3, 12% of pupils were unable to answer a single item ***(Figure 23).*** On average, grade 2 pupils responded correctly 50% of the time and grade 3 pupils responded correctly 68% of the time. As with the number identification subtask, pupils had most difficulty with items involving numbers greater than 20, with grade 2 unable to respond correctly at all.

Figure 23. Scores for quantity discrimination subtask, grades 2 and 3

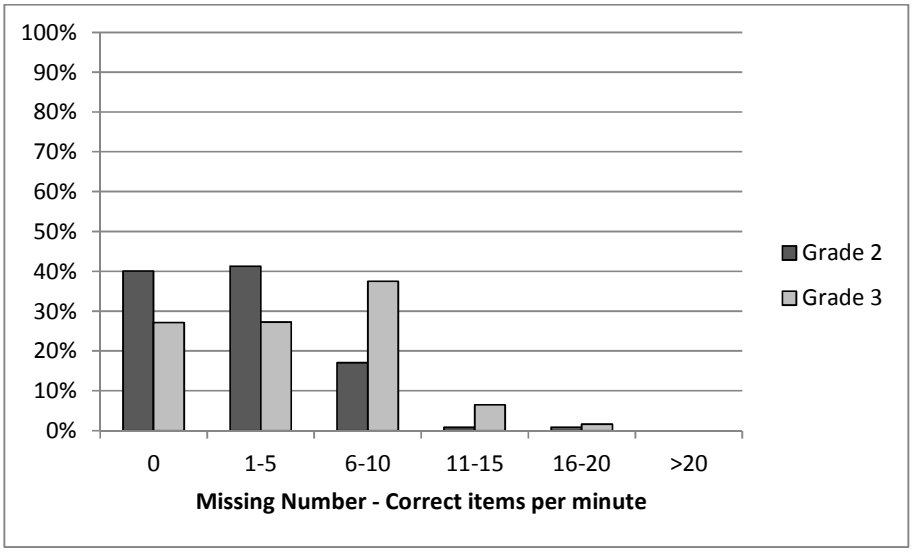


4.2.8 Missing number

Recall that this subtask assesses pupils' ability to discern and complete number patterns. For Zambia, each item in this subtask consisted of three to four numbers in a number sequence and a placeholder (a blank line) for a next or missing number. The child was asked to name the missing number. Being able to recognize number patterns and to count in patterns (by ones, by twos, by tens, counting backward, etc.) lays the foundation for multiplication and, later, algebra. Being able to identify patterns generally also aids pupils in problem solving.

Forty percent of second graders and 27% of third graders were unable to answer a single missing-number item correctly, including items that were simply counting by one ***(Figure 24).*** On average, grade 2 pupils responded correctly 28% of the time and grade 3 pupils responded correctly 44% of the time. Pupils had the least problems with sequences of numbers under 20 where the pattern was a simple count-by-one pattern (such as 6, 7, __, 9). Overall, pupils in both grade 2 and grade 3 appeared to struggle with recognizing or counting in patterns. The local curriculum expects pupils to be able to recognize patterns using all four operations, whereas the patterns included in this subtask focused on addition and subtraction (or what could simply be considered skip-counting). Pupils had not mastered this competency by the end of grade 3, and were falling well below the expectations laid out in the local curriculum. This could make it difficult for them to master multiplication and other, more complex, problem solving later on.

Figure 24. Scores for missing-number subtask, grades 2 and 3



4.2.9 Addition and subtraction

The addition and subtraction subtasks assess pupils' procedural competency in basic operations. For Zambia EGMA, pupils were presented with and asked to solve simple addition problems using numbers up to 20, with no regrouping. The local curriculum specifies that pupils in grade 2 should be able to solve addition problems with numbers up to 1,000 without regrouping, and up to 100 with regrouping. As such, the items included in these subtasks should indeed have been very basic for these pupils and, as such, they should have been able to do them with a good deal of automaticity. If pupils are not fluent with simple, single-digit addition or subtraction, they will likely struggle with double- and triple-digit addition and subtraction, particularly with regrouping.

Addition and subtraction:
Sample items

Addition:

4 + 2 =	8 + 2 =	8 + 6 =
5 + 4 =	10 + 3 =	2 + 2 =

Subtraction:

6 – 2 =	10 – 2 =	14 – 6 =
9 – 4 =	13 – 3 =	4 – 2 =

These two subtasks showed significant growth across grades ***(Figures 25 and 26).*** In grade 2, 21% of pupils could not answer a single addition problem correctly and 26% could not answer any subtraction problems. In grade 3, these figures were significantly better, with only 9% scoring zero on the addition subtask and 9% scoring zero on subtraction. Grade 3 pupils appear to have made significant progress in addition and subtraction, compared to grade 2 pupils. While these pupils were answering problems with a fair degree of accuracy, almost 50% managed to correctly answer only four problems in a minute, and over 50% could answer only four subtraction problems, indicating that they had not achieved automaticity on these problems. When pupils have not gained procedural fluency on simple addition and subtraction problems, they will be likely to use inefficient strategies and will have increasing difficulty as numbers get larger and operations get more complicated.

Figure 25. Scores for addition subtask, grades 2 and 3

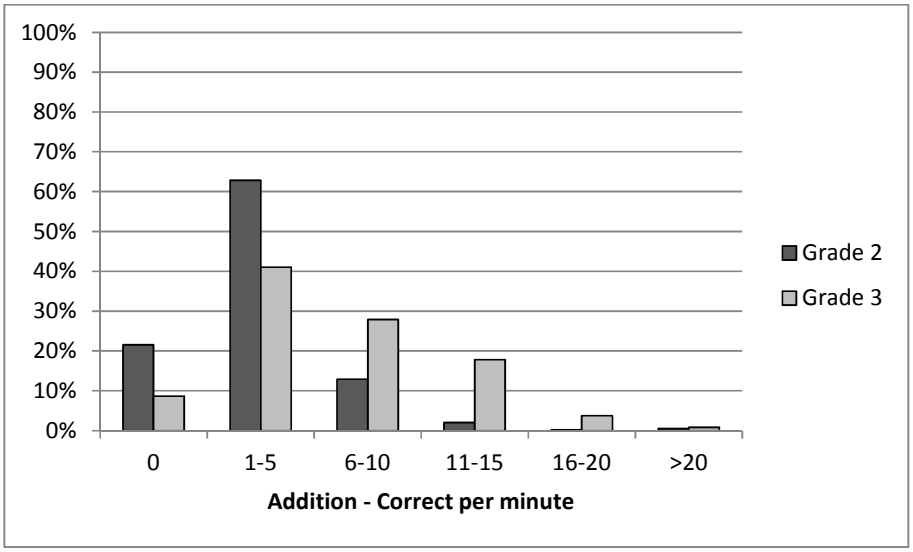
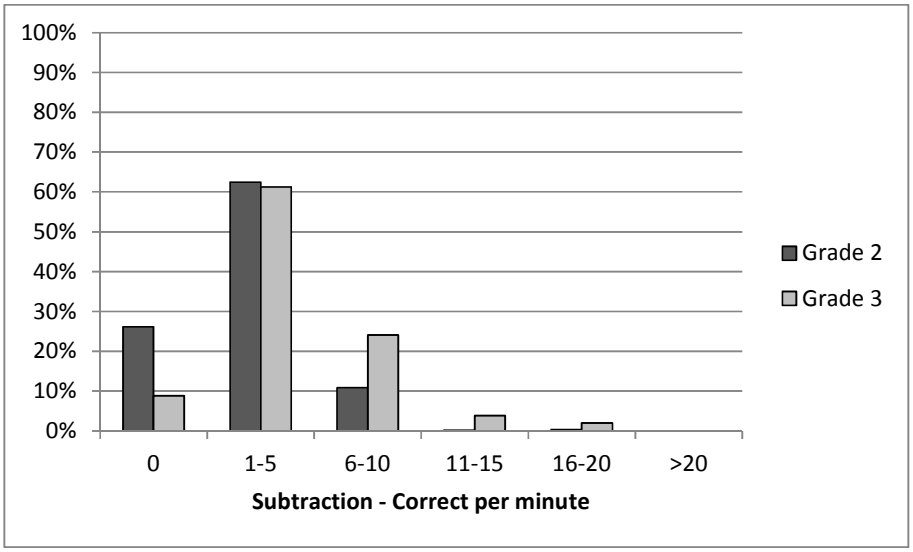


Figure 26. Scores for subtraction subtask, grades 2 and 3



4.3 What Contributes to Pupil Performance?

In order to better meet pupils' learning needs, it is important to identify malleable factors that were related to pupil reading achievement. These may be home factors, classroom practices, access to materials, or teacher qualifications. The pupil and parent questionnaires were the primary vehicles for collecting this type of information (refer to details in ***Annex A***).

This section discusses the results of multiple regression models to examine which factors predict pupil performance. The research team compared responses on the pupil questionnaires to pupils' EGRA oral reading fluency scores as well as their EGMA scores on number identification and addition. There were relatively few statistically

significant relationships in reading due to the limited variance in pupils' low oral reading scores. Because there was more variability in math scores, more statistically significant relationships were identified. Thus, only the statistically significant results are presented.

4.3.1 Pupil factors

Pupils were asked several questions concerning socioeconomic status (SES) and their access to reading materials both in and out of school. The results showed that five main factors contributed to pupils' performance in school: SES, having attended preschool, attending school on time (i.e., starting at the expected age), reading independently in and out of school, and receiving corrective feedback from teachers.

SES: While no statistically significant differences were found for reading (likely because of the low variability), SES (as measured via an asset-based wealth proxy) was associated with better performance across all of the math subtasks.[41]

Preschool attendance: Although no statistically significant differences were found for reading (likely because of the low variability), pupils who had attended preschool performed better on all of the math subtasks. These pupils identified 5.49 more numbers, and they answered 2.43 more items correctly on quantity discrimination and 0.86 more items on the missing number subtask. They also answered 1.94 more addition and 0.76 more subtraction problems correctly.

Attendance: Pupils who were late for school the prior week showed weaker performance on three of the EGRA subtasks and all of the EGMA subtasks. More specifically, pupils who were late for school identified 1.9 fewer correct letter sounds, read 1.06 fewer invented words, and read 1.34 fewer words of connected text (oral reading fluency). In math, these pupils identified 3.39 fewer numbers, and they answered 1.84 fewer items correctly on quantity discrimination and 0.63 fewer items on the missing number subtask. They also answered 1.69 fewer addition and 1.15 fewer subtraction problems correctly.

Independent reading: Independent reading was associated with gains in pupils' reading skills. For example, pupils who reported having books at home showed gains in their letter sound fluency scores of 2 correct letters per minute. Similarly, pupils who were read to obtained higher letter sound fluency scores by a factor of 1.5, and higher oral reading fluency scores by a factor of 1.15. Further, pupils who read to someone at home saw increases in their letter sound fluency scores by a factor of 1.4 and in their oral reading fluency scores by a factor of 1.6 correct words per minute. These findings highlight the importance of providing pupils access to reading materials, whether they read the books themselves or are read to by someone at home.

Receiving corrective feedback: Receiving corrective feedback was an important factor in reading achievement for Zambian pupils. Pupils whose homework was corrected by their teachers could recognize the sounds of 1.46 more letters than those who did not receive corrective feedback. In math, these pupils performed better on all

[41] Coefficients ranged from 3.02 for number ID down to .34 for addition problems. P-values for umber ID, quantities, and missing Number were 0. P-values for addition and subtraction were .06 and .001 respectively.

the subtasks than those who did not receive corrective feedback, answering one to two more items correctly on every subtask (and identifying almost four more numbers correctly) Similarly, pupils who received comments from their teachers identified 1.57 more letter sounds and read 1.56 more words of connected text than those who did not. In math, these pupils answered one to two more items correctly on every EGMA subtask (and identified almost five more numbers correctly).

4.3.2 Teacher factors

As described in the introduction, in addition to interviewing pupils, the research team also interviewed teachers and Headteachers. Questions addressed a range of issues that might influence pupil reading achievement, such as teacher education, professional training, and professional practices. Teachers who had received professional training were more successful at teaching pupils to identify the letter sounds. In fact, their pupils showed gains of 1.44 correct letters per minute.

In mathematics, pupils in multigrade classrooms performed more poorly, identifying 7.81 fewer numbers correctly and answering 1.36 fewer addition problems than those in regular classrooms.

5. Conclusions and Recommendations

5.1 Workshop Study Findings and Implications

On November 21-22, 2011 a workshop, 'Policy Dialogue on Early Grade Literacy', was convened to review the study findings, to examine the implications arising from those findings, and to make recommendations for this report. The workshop was introduced by Mr. Wick Powers, USAID/Zambia Education Team Leader, and the opening address was given by the Permanent Secretary, Dr. Felix Phiri, followed by remarks from Mr. Chekani Sakala, Director of the Examinations Council of Zambia. There were forty-two workshop participants at the opening, including Ministry of Education senior staff from the Curriculum Development Center, Education Broadcasting, the Examinations Council, USAID, and staff from Family Health Trust who had carried out the field survey.

Dr. Ash Hartwell facilitated the presentation and review of the study findings. During the second day participants formed working groups to examine the implications and recommendations for improving pupil learning outcomes in the schools. The following recommendations for the study reflect the deliberations and outcomes from the 'Policy Dialogue on Early Grade Literacy' workshop.

5.2 Recommendations

- The pilot EGRA, EGMA, and SSME, as adapted from international applications for Zambia, has demonstrated that this early grade assessment provides critically important information for the review of education sector program and policy. Although the results reveal disturbingly low pupil

performance, they are consistent with assessments of reading and mathematics performance by the periodic National Assessments and SACMEQ at grades 5 and 6.

- The EGRA and EGMA should now be further developed into versions in English and the other 6 Zambian languages used in schools. The English version of EGRA and EGMA should be used, along with the appropriate Zambian language version, in grade 3.
- This expanded use of EGRA and EGMA should be incorporated into the set of instruments used as a part of the regularly scheduled Zambian National Assessments. The results of grade 2 and grade 3 reading (in Zambian languages and English) and mathematics performance would then be reported as a part of the overall Zambian education sector performance.
- The SSME instrument provides valuable information on the conditions and management of the schools and classes. In particular, workshop participants noted evidence of the following key factors influencing the low EGRA results:
  - A general lack of instructional materials in Bemba, with a ratio of one reading book for every 5 pupils. This situation reflects the fact that publishers were no longer making Zambian language early grade reading materials available, and there have not been purchases of these materials for the past three or four years.
  - Teachers lack the guidance and proficiency to teach phonics, a fundamental building block for literacy, and other pre-reading skills, such as print awareness. This was confirmed by the fact that few pupils were able to recognize letter sounds (in contrast to pupils' ability to name the letters). Participants in the workshop noted that these skills are taught in pre-school, but that teachers in the early grades are not guided by a curriculum to do this.
  - The lack of sufficient time on task, with a focus on pre-reading and early reading skills, was particularly noted. This arises from a number of factors noted by the SSME including:
    - A shortening of total instructional time by the double, and even triple, shift system, whereby the official timetable calling for 4 hours and 40 minutes is, in practice, reduced to 3 ½ to 4 hours;
    - The curriculum provides for a Zambian language period only in grade 1, while in grade 2 the language period focuses on English. The medium of instruction in all other subjects is English. This means that in grade 1 pupils are exposed, at a maximum, to 8 periods per week (320 min or 5 hrs 20 min) of Zambian language practice, and 3 periods (2 hours) per week in grades 2 and 3. This is far short of what is generally recognized as necessary for pupils to achieve reading fluency, even in cases where there are adequate materials and teachers are well trained in reading instruction.

    - Teacher and pupil absences further reduce instructional time. Although the SSME indicated an average estimate of 11% teacher absenteeism, as reported by the Headteachers, a study with a larger sample, making unannounced visits to schools in 2010 estimated 43% of teachers were absent on average (ZAMTEK 2011).
  - The role of homework, and of both teacher and parent (or guardian) feedback to the pupil plays a vital role in motivation and in developing pupil reading and basic computational skills.
- There are a number of changes to the SSME that workshop participants noted could improve the quality of information provided:
  - Items which arise from interviews with pupils, teachers, Headteachers and parents do not always provide reliable, unbiased information, and need to have means of verification. For example, asking pupils whether their parents are literate and help them in their reading resulted in far higher adult literacy rates than other sources; asking Headteachers about teacher absences (as noted above) provides very low estimates; and Headteachers seem to report high levels of activity for the PTAs (Headteachers are secretaries of PTAs and are expected to see that they function effectively) which is contrasted with a low opinion of PTA effectiveness by teachers. In general, interview questions that request self-reports about behavior need to be independently verified with evidence to be credible.
  - The classroom observation instrument needs to focus more specifically on pupils' time on task in relation to pre-reading and early reading skills, so as to determine how much of the available instructional time is actually used to enhance reading.
  - A fundamental issue is that the SSME process, by informing schools that the team is to arrive on a given day, reflects the schools' response to the visit, rather than the typical school day. Thus teacher absenteeism reported by SSME is 11%, whereas the ZAMTEC study – done on a nationally representative sample of schools – indicates a 43% absenteeism rate. This suggests that a subsample of the SSME – of schools and classes – should be based on unannounced visits and observations.

5.3 Policy and Program Implications

Workshop participants considered that the results of EGRA, EGMA, and SSME indicate a critical and timely need to review national policies and their implementation related to early grade language and literacy. These include:

- The curriculum for early grade literacy needs the development of standards and milestones for pre-reading and early reading based on the stages of learning to read, including oral language development, phonological awareness, print awareness, phonetics, reading fluency and comprehension.
- The curriculum should be revised to reflect best-practices on transitional bi-lingual language and literacy learning. This would include having pupils' first

language utilized as the primary language of literacy through grade 3, while progressively introducing English, first orally, and then, by grade 3, in print.

- First language of literacy: the Zambian language selected for each school should be the dominant language used by pupils on the playground (a language which all pupils understand and speak).
- The school timetable needs to be rearranged to assure greater time for pupil instruction and practice in reading: at least 10 periods per week (each period of 40 minutes = 400 min) x 38 weeks, or a total of 253.3 hours with no time lost.
- Instructional materials: a priority is to provide a regular supply of Zambian language instructional materials.
- Teacher assignments: the criteria of Zambian language competence for early grade teachers should be considered in placement; incentives are needed for rural early grade teachers;
- Absenteeism of teachers needs to be addressed as a priority: this will involve issues of management, involvement of the PTA and community, and incentives;
- Teacher training needs to be reformed to include teaching pupils how to read in both Zambian language and English.
- Community and parental engagement and support for early grade readers is an essential element of an effective literacy program. A public relations communication campaign is needed to educate parents on this role.

Annex A: Description of SSME Components

This annex describes the content of the standard SSME tool, including the mini-EGRA and EGMA. The instrument for Zambia closely followed this typical structure.

- Headteachers Questionnaire: This instrument is administered to the Head teacher in each school visited during an in-person interview. He or she is asked questions about a host of areas, including the education level and training of the Headteacher; lateness or absenteeism on the part of the school staff; the number of days the school is open and time spent in the classroom; frequency of visits from education officials; availability of curricular materials; parental involvement; involvement in lesson planning; procedure for teacher dismissal; and safety at the school.
- Teacher Questionnaire: This instrument is administered to the two teachers—one from a lower grade and one from a higher grade—whose pupils are selected for assessment. The interviewer asks several questions that are similar to those asked of the Headteacher about teacher training, availability of curricular materials, and visits by administration. The instrument also records information about lesson planning, teaching style and assessment.
- Parent Questionnaire: This instrument is administered to the parent of a child in each grade being assessed (two parents total). The purpose of this instrument is to get a sense of parents' investment in and perception of their child's education experience, how involved they are both at the school and at home, what they like and dislike about the school or teachers, and any safety concerns they have.
- Pupil Questionnaire: This instrument is administered to each pupil who is randomly selected for assessment. The assessor asks questions about language, transportation to school, experience with teachers, homework, meals, family involvement, and literacy, as well as a number of questions about family assets (electricity, vehicle, water source, etc.) to get a sense of the pupil's socioeconomic status.
- Mini-EGRA and Mini-EGMA: These instruments are administered to a random sampling of pupils in two grades and are used to measure pupils' basic literacy and numeracy skills. The mini-EGRA measures letter-sound knowledge, invented word decoding, oral reading and reading comprehension, and listening comprehension. The mini-EGMA measures number identification, quantity discrimination, comprehension of number sequencing and patterns, and ability to perform addition and subtraction.
- School Observation: This instrument is administered at each school visited and is used to record information about the condition of the school's infrastructure and the existence of various facilities. The observer notes the working condition of toilets, telephones, electricity, and water sources, as well as whether there is a playground and a library.

- Classroom Inventory: This instrument is administered in each of the two sampled classrooms and is used to record the resources available to the teacher and pupils. The observer records the number of girls and boys in class, the number of available textbooks and other reading materials, the presence or absence of pupil work displayed in the classroom, and the furniture and its configuration in the room.
- Classroom Observation – Reading: This instrument is administered during the reading lesson in the lower grade classroom. Its purpose is to record the language of instruction, the teacher's focus, action, and instructional content, as well as pupil action and materials used. At three-minute intervals during the lesson, the observer takes note of what is occurring in each of these areas. For example, nine minutes into the class the observer may record that the teacher is focusing on the whole class, is speaking Arabic, the content is reading comprehension, the teacher is reading out loud, the pupils are listening/watching the teacher, and the materials being used are a textbook and pupil notebooks.
- Classroom Observation – Mathematics – This instrument is administered during the mathematics lesson in the lower grade classroom and serves the same purpose as the classroom observation during a reading lesson. In a mathematics lesson, for example, 12 minutes into the class the observer may record that the teacher is focusing on a small group of pupils, is speaking English, the content is multiplication, the teacher is listening to the pupils, the pupils are answering a question, and a worksheet is being used. At the next three-minute mark, the scenario may be the same or completely different.

Annex B: Sample Design

This annex presents additional details about the sample design for the Zambia pilot assessment (see also Section 2.5).

A total of 17 districts within the regions was desired. The number of districts within regions was distributed randomly such that there was nearly the same weight at the first level of selection (1.25 versus 2.0). Five districts were selected from the Copperbelt region, four districts from Northern and Laupula, and three from Central region.

Districts that were deemed unavailable for sampling (due to geographical or travel considerations) were excluded from the district sampling. The remaining districts were selected with equal probability. There were no population or size measures associated with the districts.

Within districts, the school list was examined and schools with very few pupils (fewer than 20 pupils in grade 2 or grade 3) were removed from the frame. The survey protocol called for 10 pupils to be selected from each grade. Schools with fewer than 20 pupils might not have had sufficient pupils present on the data collection day, and were excluded.

Schools were sorted in ascending order by the number of pupils in grade 2 and grade 3. Within each district, schools were randomly selected with equal probability of selection. A target total of 10 schools in each region was desired. Depending on the number of districts in the region, the number of schools was randomly allotted to districts. For Northern and Copperbelt regions, two schools were sampled in each district. For the Laupula and Central regions, schools were randomly allotted to the selected districts. Schools were randomly sampled from within districts.

Replacement schools were selected at the same time as the sampled schools. If a school was unwilling or unable to participate, the next school above it on the list served as the first replacement. If that school was unable to participate, the school immediately following the sampled school on the list was selected as the second replacement. In the instance of a school being on the district border, the replacement schools were the closest schools to the sampled school, within the specified district. Using replacement schools next to the sampled school on the list ensured a replacement of similar size within the district.

Table B-1. Region, district, and school allocation

Region	District	Number of Schools
Northern		
	Kasama	2
	Luwingu	2
	Mbala	2
	Mpika	2
Laupula		
	Mansa	1
	Samfya	3
	Kawaubwa	3
	Nchelenge	2
Copperbelt		
	Chinolga	2
	Kitwe	2
	Masaiti	2
	Kalulushi	2
	Mpongwe	2
Central		
	Serenje	3
	Mkushi	4
	Kapiri Mposhi	1

Calculating Sampling Weights

As described above, the sampling plan included two stages. The first set of weights was for the districts within regions. The second set of weights was for the schools within districts. The final school level and classroom level weight was the product of these two preliminary weights.

Sampling Weights

The final school weight (Final_WT) was set equal to the reciprocal of the product of the probability of the district selection (ProbofDistrictSelection) and the probability of the school selection (ProbabilityofSchoolSelection).

Algebraically, this is represented as follows:

Final_WT=1/(ProbofDistrictSelection * ProbabilityofSchoolSelection).