

The Home Literacy Environment in Rural Rwanda and its Relationship to Early Grade

Reading

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Abstract

The developing world faces a learning crisis, wherein children fail to master basic skills despite years of primary school attendance. The literature indicates that both in-school and at-home experiences impact children's reading development, yet most developing world studies focus on children's in-school experiences exclusively. This current study addresses this imbalance by exploring the home literacy environment in rural Rwanda and its relationship to children's reading development. The data come from 466 parent surveys and 466 child reading assessments. An exploratory factor analysis of the survey data yields 5 distinct factors of the home literacy environment: family literacy and learning at home, parental competency in literacy, reading materials, child interest in literacy, and religious-related reading activities. Multivariate regression analyses reveal that family learning, parent competency, and child interest significantly predict early grade reading achievement. Implications of these findings for the developing world's learning crisis are discussed.

Keywords: Home Literacy Environment; Rwanda; Sub-Saharan Africa; Reading Development; Literacy

The Home Literacy Environment in Rural Rwanda and its Relationship with Early GradesReading

Children in developing countries are enrolling in primary school in record numbers, thanks to the abolition of school fees and the passage of compulsory education laws over the past quarter century. Despite the newfound, unfettered access to education, however, hundreds of millions of primary students never master basic skills like literacy (UNESCO Institute For Statistics, 2017). Developing world governments are routinely urged to rely on evidence-driven methods to address this ‘learning crisis’ (United States Agency for International Development, 2011; World Bank, 2018b). The evidence base clearly suggests that both home and school related factors impact children’s reading development (Snow, Burns, & Griffin, 1998), yet nearly all developing world research to date to address the learning crisis only examines school factors while ignoring children’s homes, as evident in several reviews and meta-analyses (Conn, 2017; Ganimian & Murnane, 2016; Kim, Lee, & Zuilkowski, n.d.; McEwan, 2015).

The focus on school environment, and corresponding lack of focus on children’s home environment, likely stems from the practicality of working within a well-defined education system. This system’s basic units are primary schools, which facilitate the implementation, observation, and evaluation of interventions to improve children’s learning. Unlike schools, however, developing world villages may have vaguely defined boundaries or sprawl over impassable terrain; unlike trained teachers, families may possess little to no formal education experience; unlike the legislated hierarchy with schools under the jurisdiction of a single Ministry of Education, each family has jurisdiction over children’s home learning experiences. Given these differences, community or home-based interventions to improve children’s learning are complex and costly in the developing world when compared to school-focused learning

interventions. This is especially true in rural areas, where most of the developing world's population lives (World Bank, 2018a).

Developing world governments and donors want to use evidence-based strategies to address the learning crisis. The evidence points to the important role that the home and the home literacy environment (HLE) plays in children's literacy development. However, this evidence overwhelmingly comes from developed world studies and should not be uncritically applied to rural developing world contexts. To better understand the HLE in rural Rwanda, I use contextually-sensitive instruments to measure the HLE and examine its relationship to children's reading development. I then discuss how these findings relate to other developed world studies and how they might help to better address the developing world's learning crisis.

The Home Literacy Environment

The contexts in which children grow and the people with whom children interact influence children's learning and development (Barron, 2004; Bronfenbrenner, 1979; Ford & Lerner, 1992; Gallimore & Goldenberg, 1993; Vygotsky, 1978). Especially important for literacy development are children's text-based interactions with family members, children's independent exploration of print, and children's observations of family members' literacy practices. These text-based interactions are all features of the HLE (Sénéchal, Whissell, & Bildfell, 2017). Many studies explore how the HLE relates to children's reading achievement (Evans, Shaw, & Bell, 2000; Hess & Holloway, 1984; Payne, Whitehurst, & Angell, 1994; Sénéchal, 2006; Snow et al., 1998), yet only a few studies of the developing world HLE are available to date.

Developed World Studies of the Home Literacy Environment

Most HLE studies examine developed world populations (Dickinson, Griffith, Golinkoff, & Hirsh-Pasek, 2012; Kim, Boyle, Zuilkowski, & Nakamura, 2016; Nag, Vagh, Dulay, &

Snowling, 2018). Likely due to the complexity and conceptual scope of the HLE, considerable variation exists in measurements of the HLE. Some researchers focus on printed text and the formal and informal ways that parents and children interact with text (Sénéchal & LeFevre, 2002, 2014; Sénéchal et al., 2017). Many studies investigate one or more aspects of the HLE, such as language use (Dickinson et al., 2012; Hart & Risley, 1995), parental reading beliefs and reading enjoyment (Bennett, Weigel, & Martin, 2002), the scholarly culture of the home (Evans, Kelley, Sikora, & Treiman, 2010), or, more rarely, the role of children's own interest or engagement (Crain-Thoreson & Dale, 1992; Scarborough, Dobrich, & Hager, 1991).

Despite variation in the measures used and samples collected, developed world evidence generally indicates positive relationships between the HLE and children's literacy development (Sénéchal et al., 2017). While some research reports mixed findings concerning reading achievement and various characteristics of the HLE (e.g., Puglisi, Hulme, Hamilton, & Snowling, 2017), the majority find at least some aspects of the HLE to positively relate to children's learning (Aikens & Barbarin, 2008; Bennett et al., 2002; Evans et al., 2000; Feitelson & Goldstein, 1986; Heath, 1983; Hess & Holloway, 1984; Inoue, Georgiou, Parrila, & Kirby, 2018; Kainz & Vernon - Feagans, 2007; Leseman & de Jong, 1998; Niklas & Schneider, 2013; Snow et al., 1998; van Bergen, van Zuijen, Bishop, & de Jong, 2017). These positive relationships persist not only in languages with opaque orthographies such as English (e.g., Snow et al., 1998) but also more transparent orthographies such as Spanish (e.g., Strasser & Lissi, 2009). Regarding the magnitude of these relationships, two meta-analyses find that the HLE accounts for approximately 8% of variance in language outcomes (Bus, van IJzendoorn, & Pellegrini, 1995; Scarborough & Dobrich, 1994). Despite this modest relationship, the HLE can be improved through intervention, unlike other home variables that may account for more

variance in learning outcomes like socioeconomic status (Aikens & Barbarin, 2008; Dickinson et al., 2012; Niklas, Cahrssen, & Tayler, 2016).

Developing World Studies of the Home Literacy Environment

Developing world HLE research is rare, encompassing a few dozen peer-reviewed articles. These existing studies echo the diversity of methods used in the developed world. For instance, in India, studies explore the number of children's books at home and frequency of library visits (Kalia & Reese, 2009) or mothers' perceptions of their role in children's education (Banerji, Berry, & Shotland, 2013). The extant research, however, generally does not conceptualize the HLE as a potential locus of intervention. Rather, the research uses HLE-associated variables as controls in attempts to isolate the effects of school-based interventions (Smith & Barrett, 2011; Valdez-Menchaca & Whitehurst, 1992).

The evidence of the relationship between the HLE and learning in the developing world often concurs with developed world findings. One review of developing world studies finds consistent associations between the HLE and learning (Nag et al., 2018). A meta-analysis of learning interventions in low income countries "has consistently identified relations between language and literacy activities in the home and children's literacy acquisition" (Kim et al., in press, p. 15). This meta-analysis estimates that the HLE has a small yet significant association ($d=0.2$) with reading, a finding that aligns with the estimated effect sizes from developed-world meta-analyses reported above.

Superficially, the concurrence between developed and developing world HLE research may suggest little need for in-depth investigations of the developing world HLE. However, notwithstanding efforts to adapt measures to reflect local contexts (e.g. Ngorosho, 2010), many tacit assumptions and a lack of contextual awareness on the part of researchers exclude

consequential features of local cultures from the analyzed data. One example of this is the focus on parents in developing world HLE research to the exclusion of other family members (e.g. Banerji et al., 2013; Kalia & Reese, 2009; Shah-Wundenberg et al., 2012). Such an exclusion ignores the important role that siblings and extended family play in child rearing in developing world pastoral societies (Chansa-Kabali, Serpell, & Lyytinen, 2014), thereby limiting the utility of the research.

Another assumption overlooks the impact of early primary student repetition rates. Studies draw student samples from upper primary levels (e.g. Rolleston & Krutikova, 2014; Yu & Thomas, 2008) without accounting for the selection bias caused by large attrition rates in lower primary common across the developing world (Crouch & Merseeth, 2017). Other researchers assume that only the school-related features of the HLE are important to measure. (Mccoy, Wolf, & Godfrey, 2014; Ngorosho, 2010). For instance, only schoolbooks are used to measure the HLE, despite the presence of Bibles or other non-school-related text in the home (Ngorosho, 2010). Such an omission ignores the role that such texts may play in the home's formal and informal literacy practices. We need more comprehensive studies of the developing world HLE to address these questionable assumptions and omissions.

The present study explores the conceptualization of the HLE and its relationship to learning in one developing world context. The research questions motivating this study are:

RQ1: What are the underlying factors of the home literacy environment in rural Rwanda?

RQ2: How do the factors of the home literacy environment in rural Rwanda relate to each other and to early grade reading achievement?

Study Setting: Rwanda

The present study is set in a rural area of Rwanda. Apart from the capital city of Kigali, Rwanda is a predominantly rural and agrarian country, with 84% of Rwandans living in rural areas (National Institute of Statistics of Rwanda [NISR], Ministry of Health, & ICF International, 2016). Less than half of Rwandans aged 15 to 49 have completed primary school, with the average Rwandan attending 4.6 years of school. Nonetheless, approximately 80% of the population can independently read a sentence and are considered literate (NISR et al., 2016).

Children grow up speaking Kinyarwanda, the nation's lingua franca. Like most Bantu languages, Kinyarwanda is tonal and agglutinative, with a transparent orthography that closely adheres to its phonology (Kimenyi, 2009; Trudell & Schroeder, 2007). The language contains 24 consonant and five vowel phonemes (Simons & Fennig, 2018). The orthography contains 102 letter or letter blends (Rwanda Ministry of Education, 2014), and the syllabus for Primary 1 (P.1) includes 94 of these 102 letters or letter blends (Rwanda Education Board & Rwanda Ministry of Education, 2015).¹

In the strategic planning document *Vision 2020*, government leaders and policy makers explicitly state their intention to develop their agricultural-based economy into a knowledge-based one, with education playing a foundational role in achieving this outcome (Ministry of Finance and Economic Planning, 2000). Following the publication of *Vision 2020*, authorities abolished school fees and enacted compulsory education laws (Williams, 2017). Despite, or perhaps due to these efforts, Rwanda is currently experiencing an early learning crisis, as recent

¹ According to linguist Alexandre Kimenyi, “[i]t is still an open debate in phonetics and phonology [of Kinyarwanda] as to whether these complex consonants are one with multiple articulators or a sequence of independent segments.” (2009 p. 218)

government statistics illustrate. Nearly 25% of primary school students either repeated a school year (18.4%) or dropped out (5.7%) (NISR, 2017).

In Rwanda, the three terms of the school year run from January to October, with a few weeks break between terms. Children enroll in P.1 at 7 years old. Teachers instruct children in Kinyarwanda from P.1 to P.3, and in English starting in P.4. Particularly true for lower primary levels, most schools operate a double-shift system, wherein one cohort of children attends school in the morning and a separate cohort attends after lunch (Holland, 2012). There are 58 students per teacher, although ratios are higher in lower primary levels given high student repetition and drop-out rates (NISR, 2017; World Bank, 2018a).

Administratively, Rwanda's five provinces are divided into three to eight districts, for a total of 30 districts nationally. Each district is divided into sectors, cells, and villages, with an average of one primary school per five villages, and five primary schools per sector (Rwanda Ministry of Education, 2016).

Method

The data analyzed here are drawn from a randomized control trial of an early grades literacy intervention implemented in one district. The trial took place in this district for several reasons, including how well it represented the other 26 rural districts in Rwanda across a range of socioeconomic and demographic indicators (Friedlander, Arshan, Zhou, & Goldenberg, 2019). The trial tested the impact of supporting children's learning in school – a school-only treatment – and supporting children's learning both in school and in children's homes and communities – a lifewide learning treatment – as compared to a business-as-usual control group.

Reading assessment data were collected in September 2013, eight months after the school year began in January 2013. In October 2013, the research team and district officials randomly

assigned the district's 21 sectors to treatment and control groups. Following random assignment, the team administered an HLE survey to a random sample of assessed children's parents who lived in the 14 sectors assigned to either the lifewide learning or control group.² HLE data collection began a few days following random assignment and two months prior to the start of program implementation. Data collectors were unaware of group assignment to limit any potential bias.

Following informed consent by school authorities, all participants younger than 18 years old provided informed assent and all adults provided informed consent prior to data collection, in accordance to protocols approved by both the Rwanda National Ethics Committee and Stanford University's Institutional Review Board. For more on the randomized control trial, see Friedlander & Goldenberg (2016).

Participants

Participants in the study were 466 children who participated in the reading assessment and their parents or caregivers (hereafter parents), all of whom participated in an HLE survey. The children attended 30 different schools located in 14 sectors, with two or three schools sampled per sector. Children were 7 years and 8 months old on average and had received at least

² The school-only treatment group was excluded from the survey for reasons related to the impact evaluation. Given that sectors were randomly assigned, this exclusion is unlikely to introduce bias into the data.

eight months of P.1 instruction.³ The majority of children (86.9%) reported speaking Kinyarwanda at home, with the rest speaking a closely related language or dialect.⁴

The 466 respondents in the survey sample were predominantly mothers (46.4%) and fathers (40.6%), with siblings and extended family members making up the rest. Most respondents read and signed the informed consent form independently (60.0% of women and 69.7% of men), indicating that each household had at least one functionally literate person on average. Family size ranged from two to 13 individuals (Mean = 6.2; SD = 1.7).

Measures and Procedures

The measures analyzed in the current study came from two instruments: an HLE survey and a reading assessment. The survey is available as an online appendix.

Home literacy environment survey

Given contextual differences between the study's rural setting and most of the developed world, no contextually appropriate and psychometrically validated surveys were available for use. Thus, selected items from various HLE surveys were combined and supplemented with additional questions to better capture unique characteristics of rural Rwanda's HLE. Following the centrality of the printed word underlying the Home Literacy Model (Sénéchal et al., 2017), the survey captured the presence and use of written words in daily family life. Therefore, while

³ Many students (58.4%) reported repeating their P.1 school year baseline. It is unclear whether these students had dropped out the previous year and enrolled again in P.1, whether they were required to repeat P.1 due to sub-standard academic performance at the previous year, or another reason. Endline data from 2015 revealed annual repetition rates of 44% in the control group, which lends credibility to the high rate of repetition reported at baseline (Friedlander et al., 2019).

⁴ Those who did not speak Kinyarwanda at home reported speaking Rukiga. No authoritative source exists to determine whether Rukiga is a separate and distinct language or a dialect of Kinyarwanda. Rukiga speaking students were matched with Rukiga speaking assessors who provided assessment instructions in Rukiga.

the survey was not a pre-existing and psychometrically validated instrument, it collected very similar data found in other HLE research (e.g., Aikens & Barbarin, 2008; Chansa-Kabali et al., 2014; Ngorosho, 2010; Niklas & Schneider, 2013; Sénéchal & LeFevre, 2014). To ensure that it captured the local variation unique to the study site, the team collected and used pilot survey data to adapt the instrument to the local context.

The survey comprised six sections. The first contained background information. The second asked respondents to enumerate reading and writing materials (e.g., “How many children’s books are in the home?”). The third mapped out the people at home, their literacy skills, and their literacy interactions with the child who participated in the reading assessment (hereafter, the focus child). The fourth measured the respondent’s attitudes and beliefs primarily through agree/disagree statements (e.g., “There are many benefits to knowing how to read.”). The fifth section solicited information about the respondents own learning history (e.g., “Who taught you to read?”). Finally, the sixth explored the focus child’s literacy-related interactions at home (e.g., “Does [focus child] ever see writing and ask how to read it?”).

The survey contained 68 questions. Depending on the response to an individual question, one question could produce several potential variables for analysis. For example, “Who taught you to read?” yielded six variables, including ‘Teacher’, ‘Parent’, and ‘Priest’. In total, the survey yielded 113 variables for analysis.

Procedure. Two teams of Kinyarwanda-speaking university graduates collected the data. These enumerators were all new employees of an organization designated to implement intervention activities for the larger study. Enumerators located children’s homes using information collected during the reading assessment. After obtaining informed consent, the enumerators read the questions to parents and recorded their answers.

Reading assessment

The reading assessment was an adapted version of early grade reading assessments widely administered across the developing world (Dowd et al., 2017; Dubeck & Gove, 2015). It included a background section to record the names of children, parents, and home villages, and several sections containing different subtests of reading-related skills. For a full description of the assessment, see Friedlander & Goldenberg (2016). This present study only describes measures used to answer the research questions.

Letter identification. Assessors provided children a chart of randomly ordered, mixed-case letters printed in a government-approved font and asked children to identify the 24 letters of the Kinyarwanda alphabet. Students scored a point if they identified the letter by its name or associated sound (e.g. /m/ or “em”).

Decoding. Assessors presented children with ten decodable pseudowords, explaining that the words had no meaning in Kinyarwanda. Government education officials ordered the pseudowords from the least to most difficult, as defined by the then-current expectations of reading development. The pseudowords came from a prior national reading assessment (DeStefano, Ralaingita, Costello, Sax, & Frank, 2012), and matched the phonotactics of Kinyarwanda. Words ranged from three to six letters in length. The subtest contained all five vowels, 12 consonants, four words containing a single consonant blend, and one word containing a pair of consonant blends. Children scored one point for correctly reading the entire pseudoword.

Reading fluency. Children read a 21-word text aloud as quickly and accurately as possible, and assessors marked the words children read correctly. Government education officials helped craft the passage to meet official guidelines with respect to syntax, font size, font style, and orthographic complexity for P.1.

Reading comprehension. Assessors first asked children to read a simple one or two sentence-long text, either silently or aloud. Then, assessors asked a question that required children to use information from the sentence. The wording of the six items and related questions on this subtest were crafted to avoid the possibility of a child scoring a point by merely re-reading the entire sentence. For example, if the sentence was, “Marie milks her brown cow every day”, the assessor asked, “What color is Marie’s cow?”. Acceptable answers included “brown” and “the cow is brown”. Children who simply re-read the sentence aloud received zero points.

Procedure

Teams of assessors, all of whom had at least bachelor’s degree and spoke Kinyarwanda fluently, visited schools and randomly selected 25 P.1 students to assess. The sampling of P.1 students may have introduced a minute amount of selection bias into the sample, in that children who were not in school for various reasons were excluded from the sample. Assessors individually administered the assessments to the students in a quiet area of the school.⁵

Results

HLE Survey Descriptives

A selection of descriptives are presented in Table 1. Overall, there were extremely few

⁵ Approximately 10% of the randomized control trial’s sample were assessed by two assessors simultaneously to provide data on interrater reliability. In these instances, one talking assessor conducted the assessment as normal, while another listening assessor marked another assessment copy. After calculating interrater reliability statistics, only data from the talking assessor was retained.

Table 1: *Selected Descriptive Statistics for HLE Survey Variables with Percent of Missing Observations*

Variable	N^a	Mean	SD	% Missing
<i>N of Literacy Materials</i>				
Adult books	462	1.29	5.89	1%
Textbooks	464	1.20	2.48	0%
Children's books	459	0.31	2.05	2%
Newspapers	462	0.19	1.33	1%
Magazines	463	0.51	3.29	1%
Writing instruments (e.g. pencils)	444	2.72	2.60	5%
Posters or other wall hangings with text	466	1.24	3.35	0%
Religious texts (e.g. Bibles, Qurans)	465	1.50	3.42	0%
<i>Family</i>				
Family size	463	6.18	1.74	1%
N of family who can write	466	3.29	1.98	0%
N of family who read	466	3.35	1.98	0%
N of family who read to focus child	466	1.97	1.77	0%
N of family who help focus child study	466	1.92	1.76	0%
N of family who talk to focus child	466	4.06	1.85	0%
Total years of schooling in the family	466	24.01	13.78	0%
Average years of family schooling	466	3.79	1.66	0%
<i>Parent literacy</i>				
Parent read consent without assistance	457	0.60	0.49	2%
Parent signed the consent fluently	456	0.70	0.46	2%
Parent's teacher taught parent to read	466	0.64	0.48	0%
Parent's teacher taught parent to write	466	0.64	0.48	0%
Parent reads to gain religious knowledge	466	0.26	0.44	0%
Parent reads the textbook to focus child	466	0.31	0.46	0%
<i>Miscellaneous</i>				
Parent has seen focus child pretend to read	459	0.89	0.31	2%
Focus child likes to read.	463	0.92	0.28	1%
Focus child asks parent what writing says	466	0.66	0.47	0%
Focus child asks parent to read to him/her	466	0.55	0.49	0%
N of days last week focus child asked to be read to	466	1.28	1.65	0%
N of days last week parent read to focus child	466	0.96	1.48	0%
N of minutes that parent read to focus child last week	466	14.33	23.21	0%
Parent does not help the focus child learn	466	0.09	0.29	0%

Note. 'Focus child' refers to the Primary 1 child who had participated in the reading assessment. ^aThe N of surveys administered was 466. Data were missing due to enumerator error or illegible handwriting. HLE = Home Literacy Environment; N = Number; SD = Standard Deviation

children's reading materials (Mean = 0.3; SD = 2.05). The most common type of reading materials (Mean = 1.5; SD = 3.42) were religious in nature (e.g., Bibles, Qurans, hymnals).

Parents overwhelmingly felt confident they could support their children's learning, but fewer than half (47.9%) reported reading anything to the focus child in the past week, fewer than 15% reported helping the focus child with homework, and 9% reported not helping the focus child to learn at all. For a complete set of survey descriptives, refer to the online appendix.

As assessors recorded the HLE survey data on paper, various items were either unintentionally skipped or illegible. There was no evidence of systematic bias in the missing data and all variables from the survey had less than 5% of observations missing. As such, item mean substitution (Schafer, 1999) was used to replace the missing data.⁶

Reading Assessment Descriptives

Table 2 provides descriptive statistics and, where relevant, reliability estimates for the control and outcome measures used in the analysis. Reliability estimates ranged from good to excellent.

Overall, children's reading skills were very low. They scored highest on the most basic skill, letter identification, correctly identifying eight letters (36.1%) of the alphabet on average. Only 15.7% of children independently read the 21-word reading passage, at an average rate of 2.55 words correctly per minute.⁷ While no published research exists about the average onset age of reading in the Kinyarwanda language, the lack of reading skills in the large majority of the sample runs counter to government expectations for the skills students should master by the end of P.1 (Rwanda Education Board, 2012). Nonetheless, these descriptive statistics concur with

⁶ I also estimated missing data using multiple imputation. Using Stata's *mi impute* command and with reading outcomes and non-missing variables as covariates, I created and analyzed 12 additional imputed datasets. The 13 sets of results from the identical analyses revealed no substantive differences. Therefore, I use the easier-to-grasp approach of item-mean substitution.

⁷ This average includes non-readers.

Table 2: *Descriptive Statistics from the Reading Assessment*

Variable / Outcome	N	Mean	SD	Mini- mum	Max- imum	Skew- ness	Kurt- osis	School- level ICC	% of sample who scored >0	Coeff- icient Alpha	Inter- rater ICC ^a
Child age in years	447	7.67	1.47	4	15	1.00	5.69	0.06	n/a	n/a	n/a
Student is female	466	48.50%	0.50	0	1	0.06	1.00	0.00	n/a	n/a	n/a
Repeated P.1	462	58.22%	0.49	0	1	-0.33	1.12	0.05	n/a	n/a	n/a
Letter identification (24 items total)	466	36.10%	0.31	0%	100%	0.60	2.11	0.11	85.19%	0.96	0.99
Decoding (10 items total)	466	10.90%	0.20	0%	100%	1.88	5.99	0.16	29.40%	0.87	0.99
Reading fluency (21 words total)	466	2.55 wpm	7.25	0	48.46 ^b	3.61	17.5 2	0.10	15.67%	n/a ^c	0.99
Reading comprehension (6 items total)	466	8.40%	0.22	0%	100%	2.64	9.04	0.10	14.80%	0.77	0.99

Notes: All subtests were in the Kinyarwanda language. Assessors used the Rukiga language / dialect to ask background questions and provide instructions to students when necessary. All data are student-reported. ^aTo measure inter-rater reliability, two enumerators simultaneously assessed seven percent of children from the full sample (157 out of 2118 learners). The ICC in this column therefore represents a measure of interrater reliability. ^bIf students read the text in less than one minute, their words per minute score was extrapolated by multiplying their score by the fraction of the unused minute (the seconds remaining). ^cNo coefficient alpha estimate exists for fluency as only the number of words read correctly in a minute, and not the individual 21 words, were recorded. n/a = not applicable; P.1=Primary 1; SD = Standard Deviation; ICC = Intraclass Correlation Coefficient.

nationally representative reading assessments conducted across Rwanda (DeStefano et al., 2012; Subramanian, Murray, & Shillington, 2011).

To better understand how differences between schools might explain the observed variance in reading outcomes, Table 2 also contains the intraclass correlation coefficient (ICC) comparing variances within each school versus between schools. These school-level ICCs indicated a need to account for the nesting of students in schools (Hox, 2010), as explained below.

RQ1: What are the underlying factors of the home literacy environment in rural Rwanda?

To answer the first research question, I used Stata version 14.0 to conduct two iterations of an exploratory principal components factor analysis with an oblique (*promax*) rotation to allow underlying factors to co-vary. The first iteration of the exploratory factor analysis was intended and used as a mechanism for data reduction and variable selection. The second iteration investigated the underlying structure of HLE.

The first iteration of the analysis identified those variables that most strongly loaded onto the underlying factors. Following this first iteration, a scree test (Cattell, 1966) and a cutoff score of 1.0 for factor eigenvalues revealed a five-factor solution as most appropriate for the data. A total of 32 variables with factor loadings greater than $|0.40|$ were retained for the second iteration of the analysis. As done in previous research (Levy, Gong, Hessels, Evans, & Jared, 2006), I set the loading criteria relatively high to reduce statistical noise from the large set of variables and identify stronger and more cohesive underlying factors.

The second iteration of the factor analysis yielded 30 variables that met the factor loading criteria, and more importantly, generated a theoretically cohesive and parsimonious model that explained the observed pattern of correlations. Table 3 contains the results of this second

Table 3: Rotated Pattern Matrix Showing Factor Loadings of Survey Variables, 2nd Iteration

Factor # & Name	Eigen- value	Variance Explained	Variable	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
1. Family literacy & learning at home	6.36	0.20	Family size	.81	-.19	-.05	-.21	.06
			N of family who can write	.91	.19	-.02	-.07	-.03
			N of family who read	.91	.19	-.02	-.08	-.03
			N of family who read to focus child	.70	.04	-.04	.37	-.05
			N of family who help focus child study	.70	.03	-.06	.38	-.08
			N of family who talk to focus child	.75	-.26	-.03	.09	.13
			Total years of schooling in the family	.86	.08	.16	-.09	-.02
			Average years of family schooling	.58	.28	.23	.03	-.09
2. Parent competency in literacy	5.54	0.17	Parent read consent without assistance	.02	.82	.01	-.09	.09
			Parent signed the consent fluently	.10	.82	-.12	-.03	.09
			Parent's teacher taught parent to read	.08	.90	-.09	.01	.07
			Parent's teacher taught parent to write	.09	.89	-.06	-.02	.08
			Parent reads the textbook to focus child	-.03	.51	.01	.43	-.15
3. Reading materials	4.09	0.13	N of adult books	-.03	-.06	.79	.02	.00
			N of textbooks	.12	-.10	.62	.00	-.15
			N of children's books	-.05	-.02	.70	.05	.02
			N of writing instruments (e.g. pencils)	.23	-.19	.56	.05	.13
			N of posters / wall hangings with text	-.01	.01	.40	-.11	-.02
			N of religious texts	.09	-.13	.47	.04	.40
4. Child interest & engagement	3.84	0.12	Focus child likes to read	.09	-.11	-.17	.48	-.12
			Focus child asks parent what writing says	-.07	-.18	.05	.75	-.01
			Focus child asks parent to read to him/her	-.03	-.05	.08	.69	-.01
			Parent does not help the child learn	-.05	.08	.11	-.46	-.12
			Parent has seen focus child pretend to read	.08	-.20	-.20	.44	.17
			N of days last week parent read to focus child	-.03	.35	.09	.55	.08
			N of minutes that parent read to child last week	-.10	.42	.12	.47	-.08
5. Religious reading activities	3.00	0.09	Parent reads to gain religious knowledge	.01	.25	-.09	-.16	.73
			Parent writes religious related items	-.13	.05	.10	.05	.66
			Parent reads religious text to focus child	-.08	.05	.09	.23	.56
			Parent reads religious related material	.04	.45	-.06	-.05	.56

Notes: Factor loadings greater than |.40| reported in **bold**. Variables with loadings greater than |.40| on more than 1 factor are grouped according to the factor upon which it loaded with the greatest magnitude. Factors were rotated using an oblique (promax) rotation. Two variables with loadings less than |.40| are omitted from the table. 'Focus child' refers to the child who participated in the reading assessment.

iteration of the exploratory factor analysis, including the eigenvalues, proportion of variance explained by each factor, and factor loadings for all 30 variables. Factor loadings greater than $|0.40|$ are shown in bold. In four instances, variables loaded highly onto two factors. They are presented in Table 3 in the factor with the higher of the two loadings.

The five factors that emerged from the survey data are: family literacy and learning at home (hereafter, *family learning*); parent competency in literacy (*parent competency*); reading materials (*materials*); child interest & engagement in literacy (*child interest*) and religious reading activities (*religious*). The five factors together, all with eigenvalues greater than 1.0, account for 71% of the data's variance.

RQ2: How do the factors of the home literacy environment in rural Rwanda relate to each other and to early grade reading achievement?

To answer the first part of this question, I examined the correlations among the five factors and the reading outcomes, presented in Table 4. All factors correlated significantly ($p < .01$) and fell within the range of $r = 0.14$ (*religious* and *materials*) to $r = 0.37$ (*family learning* and *materials*). These correlations, which fall between low and medium in magnitude, are expected given that the promax rotation allowed for factors to covary.

To explore the relationship among all the HLE factors and reading achievement, I first analyzed the distribution of the literacy outcomes to assess the suitability of an Ordinary Least Squares analysis approach. Skewness and kurtosis statistics in Table 2 indicated non-normal distributions for decoding, reading fluency, and reading comprehension, with 70.6%, 84.3%, and 85.2% of students scoring zero, respectively. Given these non-normal distributions, I converted these three outcomes into binary variables indicating whether children scored greater than zero on a particular subtest.

Table 4: *Correlation Matrix for the Five Factors of the HLE and Reading Outcomes*

#	Factor Names / Reading Outcomes	1	2	3	4	5	6	7	8
1	Factor: Family literacy & learning at home	.							
2	Factor: Parent competency in literacy	.21***	.						
3	Factor: Reading materials	.37***	.27***	.					
4	Factor: Child interest & engagement in literacy	.25***	.22***	.21***	.				
5	Factor: Religious reading activities	.18***	.27***	.14**	.14**	.			
6	Continuous outcome: Letter identification	.19***	.17***	.16***	.17***	.04	.		
7	Binary outcome: Decoding	.18***	.14**	.13**	.17***	.06	.76***	.	
8	Binary outcome: Reading fluency	.15**	.16***	.17***	.18***	.01	.69***	.65***	.
9	Binary outcome: Reading comprehension	.18***	.14**	.19***	.17***	-.02	.68***	.63***	.82***

Notes: **p<0.01, ***p<0.001

I used Stata 14.0 to run a series of multivariate regressions (one linear and three logistic) that controlled for children's age, sex, and grade repetition. As indicated by the school ICC in Table 2, I clustered standard errors at the school level to account for unique effects that schools may have on children's reading development. I used all five factors as independent variables to predict three outcomes: letter identification, decoding, and reading fluency. I omitted *religious* when predicting reading comprehension due to evidence of suppression effects (Tzelgov & Henik, 1991).

Table 5 contains the regression models and includes the amount of variance (r^2) accounted for by each factor. *Child interest* consistently and significantly predicts all four reading outcomes. *Family learning* and *parent competency* significantly predict three outcomes (except for reading fluency and reading comprehension, respectively). Neither *materials* nor *religious* significantly predicts any outcome.

Table 5: Using the HLE Factors to Predict Early Reading Achievement

Dependent Variables & Controls	Letter Identification		Decoding		Reading Fluency		Reading Comprehension	
	β (SE)	ΔR^2	β (SE)	ΔR^2	β (SE)	ΔR^2	β (SE)	ΔR^2
Family literacy & learning at home	.040** (.013)	.012	.305** (.103)	.012	.230 (.142)	.012	.304* (.150)	.012
Parent competency in literacy	.040** (.014)	.013	.259* (.124)	.008	.396* (.194)	.011	.297 (.179)	.009
Reading materials	.023 (.015)	.003	.091 (.143)	.001	.192 (.113)	.009	.227 (.141)	.001
Child interest & engagement in literacy	.035* (.015)	.000	.285* (.120)	.000	.370** (.131)	.008	.345** (.128)	.011
Religious reading activities	-.012 (.014)	.010	.008 (.109)	.011	-.158 (.138)	.016	omitted ^a	
Control: Sex of focus child	.066* (.031)	n/a	.459 (.244)	n/a	.692* (.319)	n/a	.787* (.313)	n/a
Control: Age of focus child	.029** (.010)	n/a	.284*** (.079)	n/a	.189* (.090)	n/a	.237** (.088)	n/a
Control: Focus child repeated P.1	.096** (.029)	n/a	.543* (.244)	n/a	.924*** (.279)	n/a	.890** (.275)	n/a
N of observations	466		466		466		466	
N of schools	30		30		30		30	
R ² / pseudo-R ²	.123		.095		.123		.133	

Notes: *** p<0.001, ** p<0.01, * p<0.05. β = beta-coefficient; (SE) = Standard Error; ΔR^2 = Change in R². Standard errors, shown in parentheses, are clustered at the school level to account for the nesting of students within schools. The ΔR^2 is the difference in explained variance between the full model versus models that omitted specific factors. ^aThe religious factor was omitted when predicting reading comprehension due to suppression effects. Full regression models available from the author.

Discussion

The present study aimed to explore the home literacy environment in the rural developing world and to determine whether the HLE significantly predicted P.1 students' reading achievement. Despite less than ideal descriptive statistics – family members averaged less than 4 years of school attendance and few homes had any children's books – I found five distinct and cohesive HLE factors: family literacy & learning at home, parent competency in literacy, availability of reading materials, religious reading activities, and child interest & engagement in literacy. Further, three factors – *family learning*, *parent competency*, and *child interest* – significantly predicted several or all the reading outcomes included in this study.

The factors' non-orthogonal rotation yielded complex but informative correlations among the HLE factors (see Table 4), providing greater insight into the HLE's structural nature. The highest correlation was between *family learning* and *materials* ($r = .37$), implying that *family learning* activities are likely rare in homes that lack reading *materials* and conversely, *materials* are likely rare in families with little formal education or habitual engagement in literacy. Conversely, the weak correlation observed between *religious* and *child interest* ($r = .14$) may reflect the starkly different features of the HLE that each factor measures. That is, one factor measures parents' religious motivations for reading while the other measures children's literacy interest and engagement more broadly.

Although some similarities exist between my findings and previous developed world research, such as the relationship between reading skills and children's interest in reading (Bracken & Fischel, 2008), the five factors identified here, taken as a whole, add important nuance to our understanding of the developing world HLE. For instance, by accounting for the

entire family, rather than simply parents, *family learning* hints at the central role that the broader family may play in children's learning, both in terms of each individual's educational history and each individual's reading habits and practices. This factor aligns with recent findings that underscore the important role that siblings play in children's home learning in other developing countries (Nag et al., 2018), and reinforces the importance of accounting for local cultures and contexts to better address learning issues.

Another important nuance relates to *materials*. Given the extremely low mean values of the variables that loaded onto *materials* – homes possessed 0.3 children's books on average – it is a surprising, positive result to see modest yet significant correlations between *materials* and reading skills. The failure of *materials* to significantly predict reading skills, however, suggests that the variance in reading skills explained by *materials* is not unique to that factor. That is, the high correlation between *family learning* and *materials* suggests that *family learning* accounts for the variance that *materials* would have otherwise, were *family learning* omitted from the models.

The *religious* factor represents a more unique dimension of the HLE. Notwithstanding the significant correlations with other factors, *religious* neither correlated nor predicted reading outcomes. The limited research on religion's role in literacy development (e.g., Besnier, 1995; Farr, 1994; Kapitzke, 1995; Reese, 2008; Reese & Goldenberg, 2008) suggests that religious activities are generally not utilized to help children's literacy development. For example, researchers found that “while adults engaged in reading...religious texts, church-sponsored practices centering on use of text for children was relatively rare” (Reese, 2008, p. 141). Moreover, parents used religious stories to teach good, moral behavior rather than the mechanics of reading or importance of literacy *per se* (Reese, 2008). These findings help explain why *religious* did not show any significant relationship with reading skills.

The context in which *religious* emerged may provide new avenues through which to improve children's early literacy. Evidence from elsewhere in sub-Saharan African (e.g. Botswana: Commeyras & Mazile, 2011; Tanzania: Jukes et al., 2018) indicates that religiosity plays a critical role in rural village life. With 99.6% of Rwandans actively practicing religion (NISR, 2017), the hierarchical organization of most denominations, and the omnipresence of churches and mosques across the country, religious organizations could play an important role in promoting literacy. Discovering ways to capitalize on this factor may yield greater enrichment of the reading culture both in Rwanda and elsewhere.

The HLE factors' relationships to children's reading enhance our understanding of the developing world HLE and illustrate the limits of applying developed world research directly to different contexts. For instance, though the *child interest* factor's existence echoes developed world research (e.g. Baker & Wigfield, 1999; Scarborough et al., 1991), it hints at a limit of common definitions of the HLE in the developed world. That is, child interest is commonly examined as a separate concept, distinct from the HLE. Semantically, 'environment' implies surroundings, but excludes the interactions between individuals and their surroundings. In this study, however, children's own interest or motivation consistently accounts for unique variation in their reading skills. Building off foundational theories of child development (Barron, 2004; Bronfenbrenner, 1979; Vygotsky, 1978), the factors described in this study may better be described as the home literacy *ecology*, a term used rarely in HLE research (e.g. Azuara & Reyes, 2011).

The average age of the sample represents both a strength and a limitation of the present study. Collecting data from younger students rather than older ones limited the potential selection bias observed in other studies (e.g. Rolleston & Krutikova, 2014). Yet the sample's age

also prevented the assessment from capturing adequate variance in children's reading outcomes, as indicated by the high percentages of children scoring zero on several subtests. The insensitivity of the outcome measures to children's emerging reading skills implies that other unobserved relationships between emergent reading skills and the HLE may exist. Further research examining the links between children's emergent skills and their HLE is warranted.

Another limitation of this study is the exclusion of school-level variables. Given that school-level factors receive significantly more attention in the literature, and that this was an exploratory study, I excluded school-level factors to better focus on children's lives outside of school. However, as schools undoubtedly influence children's learning, I clustered the standard errors at the school level to account for the possible school-related factors known to influence children's reading achievement (Aikens & Barbarin, 2008). Future investigations would do well to combine home, school, and even community level data to achieve a more comprehensive understanding of children's learning experiences.

A third limitation regards this study's generalizability to elsewhere in Rwanda and beyond. As recommended by others (Kanyongo, Certo, & Launcelot, 2006; Nag et al., 2018), the survey was adapted to better capture variation within the local context. As mentioned earlier, comparisons of socioeconomic indicators between the study district and other rural districts indicated that study district was an adequate representation of rural Rwanda. Yet, it is possible that the findings may have differed had data been collected in another district or country. To address this limitation, future research could explore the survey's reliability and validity in other areas of Rwanda and beyond. In so doing, educators would better understand how factors may vary across contexts. Such research would contribute to the development of both common

international approaches and individualized ones to respond to local, unique characteristics of the HLE in different cultures.

Limitations aside, this study possessed several strengths. It contributes to the understanding of the HLE in an unusual, developing world setting. By working with government officials and knowledgeable local citizens, the research instruments were adapted to the context. The study provides new insights into features of children's homes and underscores the important potential role that families can play even in extremely rural, low-resourced contexts.

For educators and policy makers in Rwanda and elsewhere, the findings above suggest new approaches to address the developing world's learning crisis. Rather than focusing narrowly on schools, authorities could approach learning through a life-wide learning perspective (Friedlander, Dowd, Borisova, & Guajardo, 2012), exploring how HLE improvements impact early learning. Though such an approach would be complex and require multisectoral cooperation, it is encouraging that Rwandan government authorities and partners have already embarked on such an approach through its Mureke Dusome project (SCI Rwanda, 2018) and other initiatives.

Conclusion

There is still much to learn about the HLE in developing countries, particularly in rural areas where a majority of the population live (World Bank, 2018a). Applying developed world findings wholesale in low-resource contexts of developing countries is irresponsible at best, given that large populations may have little or no formal education experience and own few books, whether in the local language or otherwise. Measures that reflect the lived realities of the participants, rather than implicit cultural biases of researchers, are needed to better understand how the developing world HLE relates to reading achievement.

This study is one of the first to consider the overall composition of the HLE in the rural developing world. It has shown that a multifaceted and cohesive set of factors can be identified in rural homes, and that these factors associate with children's reading skills. Though children's books are rare and the practice of storybook reading infrequent, reading materials and readers *do* exist that could be encouraged to better support children's learning.

Despite the incredible achievement of universal access to primary school, a quality education remains elusive for hundreds of millions of children. Innovative approaches are desperately needed if the substantial investments that families and governments make in children's education are to benefit the population. By considering the home and the family, the education community can meet children where they are. Working with locally available tools and resources and empowering families to more directly support learning could help unlock the solution to the learning crisis. Educators must explore ways to improve the overall culture of reading, including children's reading development at school and the quality of children's home and community literacy environment and literacy ecology.

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References

- Aikens, N. L., & Barbarin, O. (2008). Socioeconomic differences in reading trajectories: The contribution of family, neighborhood, and school contexts. *Journal of Educational Psychology, 100*(2), 235–251. Retrieved from <http://psycnet.apa.org.stanford.idm.oclc.org/fulltext/2008-05694-001.pdf>
- Azuara, P., & Reyes, I. (2011). Negotiating worlds: a young Mayan child developing literacy at home and at school in Mexico. *Compare: A Journal of Comparative and International Education, 41*(2), 181–194. <https://doi.org/10.1080/03057925.2011.547283>
- Baker, L., & Wigfield, A. (1999). Dimensions of children's motivation for reading and their relations to reading activity and reading achievement. *Reading Research Quarterly, 34*(1996), 452–477. <https://doi.org/10.1598/RRQ.34.4.4>
- Banerji, R., Berry, J., & Shotland, M. (2013). The impact of mother literacy and participation programs on child learning: Evidence from a randomized evaluation in India. *Cambridge, MA: Abdul Latif Jameel Poverty Action Lab (J-PAL)*, (February), 48.
- Barron, B. (2004). Learning ecologies for technological fluency: Gender and experience differences. *Journal of Educational Computing Research, 31*(1), 1–36. <https://doi.org/10.2190/1N20-VV12-4RB5-33VA>
- Bennett, K. K., Weigel, D. J., & Martin, S. S. (2002). Children's acquisition of early literacy skills: examining family contributions. *Early Childhood Research Quarterly, 17*(3), 295–317. [https://doi.org/10.1016/S0885-2006\(02\)00166-7](https://doi.org/10.1016/S0885-2006(02)00166-7)
- Besnier, N. (1995). *Literacy, emotion, and authority: Reading and writing on a Polynesian atoll*. Cambridge, Mass: Cambridge University Press.
- Bracken, S. S., & Fischel, J. E. (2008). Family reading behavior and early literacy skills in preschool children from low-income backgrounds. *Early Education & Development, 19*(1), 45–67. [doi:10.1080/10409280701838835](https://doi.org/10.1080/10409280701838835)
- Bronfenbrenner, U. (1979). *The ecology of human development: Experiments by nature and design*. Cambridge: Harvard University Press.
- Bus, A. G., van IJzendoorn, M. H., & Pellegrini, A. D. (1995). Joint book reading makes for success in learning to read: A meta-analysis on intergenerational transmission of literacy. *Review of Educational Research, 65*(1), 1–21. <https://doi.org/10.3102/00346543065001001>
- Cattell, R. B. (1966). The scree test for the number of factors. *Multivariate Behavioral Research, 1*(2), 245–276
- Chansa-Kabali, T., Serpell, R., & Lyytinen, H. (2014). Contextual analysis of home environment factors influencing the acquisition of early reading skills in Zambian families. *Journal of Psychology in Africa, 24*(5), 410–419. <https://doi.org/10.1080/14330237.2014.997008>
- Commeyras, M., & Mazile, B. M. (2011). Exploring the culture of reading among primary school teachers in Botswana. *Reading Teacher, 64*(6), 418–428. Retrieved from [doi:10.1598/RT.64.6.3](https://doi.org/10.1598/RT.64.6.3)
- Conn, K. M. (2017). Identifying effective education interventions in Sub-Saharan Africa: A meta-analysis of impact evaluations. *Review of Educational Research, 87*(5), 863–898. <https://doi.org/10.3102/0034654317712025>
- Crain-Thoreson, C., & Dale, P. S. (1992). Do early talkers become early readers? Linguistic precocity, preschool language, and emergent literacy. *Developmental Psychology, 28*(3), 421–429. <https://doi.org/10.1037/0012-1649.28.3.421>
- Crouch, L., & Merseeth, K. A. (2017). Stumbling at the first step: Efficiency implications of poor

- performance in the foundational first five years. *PROSPECTS*, 47, 1–22.
<https://doi.org/10.1007/s11125-017-9401-1>
- DeStefano, J., Ralaingita, W., Costello, M., Sax, A., & Frank, A. (2012). *Task order 7: Early grade reading and mathematics in Rwanda*. Research Triangle Park, NC. Retrieved from pdf.usaid.gov/pdf_docs/pdact621.pdf
- Dickinson, D. K., Griffith, J. A., Golinkoff, R. M., & Hirsh-Pasek, K. (2012). How reading books fosters language development around the world. *Child Development Research*, 2012, 1–15. <https://doi.org/10.1155/2012/602807>
- Dowd, A. J., Friedlander, E. W., Jonason, C., Leer, J., Sorensen, L. Z., Guajardo, J., ... Pisani, L. (2017). Lifewide learning for early reading development. *New Directions for Child and Adolescent Development*, 155, 31–49. <https://doi.org/10.1002/cad.20193>
- Dubeck, M. M., & Gove, A. (2015). The early grade reading assessment (EGRA): Its theoretical foundation, purpose, and limitations. *International Journal of Educational Development*, 40, 315–322. <https://doi.org/10.1016/j.ijedudev.2014.11.004>
- Evans, M. D. R., Kelley, J., Sikora, J., & Treiman, D. J. (2010). Family scholarly culture and educational success: Books and schooling in 27 nations. *Research in Social Stratification and Mobility*, 28(2), 171–197. <https://doi.org/10.1016/j.rssm.2010.01.002>
- Evans, M. A., Shaw, D., & Bell, M. (2000). Home literacy activities and their influence on early literacy skills. *Canadian Journal of Experimental Psychology*, 54(2), 65–75.
<https://doi.org/10.1037/h0087330>
- Farr, M. (1994). En los dos idiomas: Literacy practices among Chicago Mexicanos. In *Literacy Across Communities* (pp. 9–47).
- Feitelson, D., & Goldstein, Z. (1986). Patterns of book ownership and reading to young children in Israeli school-oriented and nonschool-oriented families. *The Reading Teacher*, 39(9), 924–930. Retrieved from <http://www.jstor.org/stable/20199270>
- Ford, D. H., & Lerner, R. M. (1992). *Developmental Systems Theory: An Integrative Approach*. Thousand Oaks, CA, US: Sage Publications, Inc.
- Friedlander, E. W., Arshan, N., Zhou, S., & Goldenberg, C. (2019). Lifewide or school-only learning: Approaches to addressing the developing world’s learning crisis. *American Educational Research Journal*, 56(2), 333–367. <https://doi.org/10.3102/0002831218792841>
- Friedlander, E. W., Dowd, A. J., Borisova, I., & Guajardo, J. (2012). Life-wide learning: Supporting all children to enjoy quality education. In *Addressing Inequalities: The heart of the post-2015 development agenda*. New York: UN Women & UNICEF. Retrieved from <https://globalreadingnetwork.net/publications-and-research/life-wide-learning-supporting-all-children-enjoy-quality-education>
- Friedlander, E. W., & Goldenberg, C. N. (Eds.). (2016). *Literacy Boost in Rwanda: Impact evaluation of a two year randomized control trial*. Stanford, CA: Stanford University.
- Gallimore, R., & Goldenberg, C. N. (1993). Activity settings of early literacy: Home and school factors in children’s emergent literacy. *Contexts for Learning: Sociocultural Dynamics in Children’s Development*, 315–335.
- Ganimian, A. J., & Murnane, R. J. (2016). Improving education in developing countries: Lessons from rigorous impact evaluations. *Review of Educational Research*, 1–37.
<https://doi.org/10.3102/0034654315627499>
- Hart, B., & Risley, T. R. (1995). *Meaningful differences in the everyday experience of young American children*. Baltimore: Paul H Brookes Publishing.
- Heath, S. B. (1983). *Ways with words: Language, life and work in communities and classrooms*.

- Cambridge: Cambridge University Press.
- Hess, R. D., & Holloway, S. D. (1984). Family and school as educational institutions. *Review of Child Development Research*, 7, 179–222.
- Holland, M. (2012). *Community based barriers and opportunities to promote reading attainment among early grade learners in the rural Southern Province of Rwanda*. Kigali: Centre for Global Development through Education & the Rwanda Education Board. Retrieved from http://idd.edc.org/sites/idd.edc.org/files/USAID_L3_Community_Literacy_Study_0.pdf
- Hox, J. J. (2010). *Multilevel analysis: Techniques and application* (2nd ed.). New York: Routledge.
- Inoue, T., Georgiou, G. K., Parrila, R., & Kirby, J. R. (2018). Examining an extended home literacy model: The mediating roles of emergent literacy skills and reading fluency. *Scientific Studies of Reading*, 22(4), 273–288. <https://doi.org/10.1080/10888438.2018.1435663>
- Jukes, M. C. H., Gabrieli, P., Mgonda, N. L., Nsolezi, F., Jeremiah, G., Tibenda, J. L., & Bub, K. L. (2018). “Respect is an investment”: Community perceptions of social and emotional competencies in early childhood from Mtwara, Tanzania. *Global Education Review*, 5(2), 160–188.
- Kainz, K., & Vernon-Feagans, L. (2007). The ecology of early reading development for children in poverty. *The Elementary School Journal*, 107(5), 407–427. <https://doi.org/10.1086/518621>
- Kalia, V., & Reese, E. (2009). Relations between Indian children’s home literacy environment and their English oral language and literacy skills. *Scientific Studies of Reading*, 13(2), 122–145. <https://doi.org/10.1080/10888430902769517>
- Kanyongo, G. Y., Certo, J., & Launcelot, B. I. (2006). Using regression analysis to establish the relationship between home environment and reading achievement: A case of Zimbabwe. *International Education Journal*, 7(5), 632–641. Retrieved from <http://files.eric.ed.gov/fulltext/EJ854316.pdf>
- Kapitzke, C. (1995). *Literacy and Religion: The Textual Politics and Practice of Seventh-Day Adventism*. Amsterdam, The Netherlands: John Benjamins Publishing Co.
- Kim, Y.-S. G., Boyle, H. N., Zuilkowski, S. S., & Nakamura, P. (2016). *Landscape report on early grade literacy*. Washington D.C.: USAID. Retrieved from <https://allchildrenreading.org/resources/usaid-landscape-report-early-grade-literacy/>
- Kim, Y.-S. G., Lee, H., & Zuilkowski, S. S. (n.d.). Impact of literacy interventions on reading skills in low- and middle-income countries: A meta-analysis. *Child Development*, 00(0), 1–23. <https://doi.org/10.1111/cdev.13204>
- Kimenyi, A. (2009). Kinyarwanda. In K. Brown & S. Ogilvie (Eds.), *Concise Encyclopedia of Languages of the World* (Concise En, pp. 217–223). Oxford, UK: Elsevier Ltd. <https://doi.org/10.1093/0198261829.001.0001>
- Leseman, P. P. M., & de Jong, P. F. (1998). Home literacy: Opportunity, instruction, cooperation, and social-emotional quality predicting reading achievement. *Reading Research Quarterly*, 33(3), 294–318. <https://doi.org/10.1598/RRQ.33.3.3>
- Levy, B. A., Gong, Z., Hessels, S., Evans, M. A., & Jared, D. (2006). Understanding print: Early reading development and the contributions of home literacy experiences. *Journal of Experimental Child Psychology*, 93(1), 63–93. <https://doi.org/10.1016/j.jecp.2005.07.003>
- Mccoy, D. C., Wolf, S., & Godfrey, E. B. (2014). Student motivation for learning in Ghana: Relationships with caregivers’ values toward education, attendance, and academic

- achievement. *School Psychology International*, 35(3), 294–308.
<https://doi.org/10.1177/0143034313508055>
- McEwan, P. J. (2015). Improving learning in primary schools of developing countries: A meta-analysis of randomized experiments. *Review of Educational Research*, 85(3), 353–394.
<https://doi.org/10.3102/0034654314553127>
- Ministry of Finance and Economic Planning. (2000). *Rwanda Vision 2020*. Kigali: MINECOFIN. Retrieved from:
http://www.minecofin.gov.rw/fileadmin/templates/documents/NDPR/Vision_2020_.pdf
- Nag, S., Vagh, S. B., Dulay, K. M., & Snowling, M. J. (2018). Home language, school language and children’s literacy attainments: A systematic review of evidence from low- and middle-income countries. *Review of Education*, rev3.3130. <https://doi.org/10.1002/rev3.3130>
- National Institute of Statistics of Rwanda. (2017). *Statistical Yearbook 2017*. Kigali, Rwanda.
- National Institute of Statistics of Rwanda, Ministry of Health, & ICF International. (2016). *Rwanda demographic and health survey 2014-15*. Rockville, Maryland, USA: NISR, MOH, and ICF International. Retrieved from <https://dhsprogram.com/pubs/pdf/FR316/FR316.pdf>
- Ngorosho, D. (2010). Key indicators of home environment for educational research in rural communities in Tanzania. *Child Indicators Research*, 3(3), 327–348.
<https://doi.org/10.1007/s12187-009-9061-7>
- Niklas, F., Cohrssen, C., & Tayler, C. (2016). Parents supporting learning: A non-intensive intervention supporting literacy and numeracy in the home learning environment. *International Journal of Early Years Education*, 24(2), 121–142.
<https://doi.org/10.1080/09669760.2016.1155147>
- Niklas, F., & Schneider, W. (2013). Home literacy environment and the beginning of reading and spelling. *Contemporary Educational Psychology*, 38, 40–50.
<https://doi.org/10.1016/j.cedpsych.2012.10.001>
- Payne, A. C., Whitehurst, G. J., & Angell, A. L. (1994). The role of home literacy environment in the development of language ability in preschool children from low-income families. *Early Childhood Research Quarterly*, 9(3–4), 427–440. [https://doi.org/10.1016/0885-2006\(94\)90018-3](https://doi.org/10.1016/0885-2006(94)90018-3)
- Puglisi, M. L., Hulme, C., Hamilton, L. G., & Snowling, M. J. (2017). The home literacy environment is a correlate, but perhaps not a cause, of variations in children’s language and literacy development. *Scientific Studies of Reading*, 21(6), 498–514.
<https://doi.org/10.1080/10888438.2017.1346660>
- Reese, L. (2008). Literacy practices among immigrant Latino families. In G. Li (Ed.), *Multicultural Families, Home Literacies, and Mainstream Schooling* (pp. 129–149). Information Age Publishing.
- Reese, L., & Goldenberg, C. N. (2008). Community literacy resources and home literacy practices among immigrant Latino families. *Marriage & Family Review*, 43(1–2), 109–139.
<https://doi.org/10.1080/01494920802010272>
- Rolleston, C., & Krutikova, S. (2014). Equalising opportunity? School quality and home disadvantage in Vietnam. *Oxford Review of Education*, 40(1), 112–131.
<https://doi.org/10.1080/03054985.2013.875261>
- Rwanda Education Board. (2012). Standard bidding document for goods and related services: Submission of proposals for textbooks and teachers’ guides for a Kinyarwanda language course for secondary grades 1-3 and all curriculum subjects for secondary grades 4 to 6 and Kinyarwanda reading. Kigali: Rwanda Education Board.

- Rwanda Education Board, & Rwanda Ministry of Education. (2015). Integanyanyigisho y'iKinyarwanda ikiciro cya mbere cy'amashuri abanza. Kigali, Rwanda: Rwanda Education Board. Retrieved from https://reb.rw/fileadmin/competence_based_curriculum/syllabi/LANGUAGES/IKINYARWANDA_IKICIRO_CYA_MBERE_CY_AMASHURI_ABANZA_NEW.pdf
- Rwanda Ministry of Education. (2014). *Ministerial instructions Number 001/2014 of 08/10/2014 governing the orthography of Kinyarwanda*. Kigali, Rwanda: author. Retrieved from http://www.editions-sources-du-nil.fr/Photoshop/ImyandikireyikinyarwandaOfficial_Gazette_no_41_bis_of_13.10.2014.pdf
- Rwanda Ministry of Education. (2016). *2015 Education Statistical Yearbook*. Kigali: MINEDUC. Retrieved from [http://www.mineduc.gov.rw/fileadmin/user_upload/Amatangazo/2015 Education Statistical YearbookF.pdf](http://www.mineduc.gov.rw/fileadmin/user_upload/Amatangazo/2015_Education_Statistical_YearbookF.pdf)
- Scarborough, H. S., & Dobrich, W. (1994). On the efficacy of reading to preschoolers. *Developmental Review, 14*, 245–302.
- Scarborough, H. S., Dobrich, W., & Hager, M. (1991). Preschool literacy experience and later reading achievement. *Journal of Learning Disabilities, 24*(8), 508–511. <https://doi.org/10.1177/002221949102400811>
- Schafer, J. L. (1999). Multiple imputation: A primer. *Statistical Methods in Medical Research, 8*(1), 3–15. <https://doi.org/10.1177/096228029900800102>
- SCI Rwanda. (2018). What We Do: Education. Kigali, Rwanda: Save the Children International Retrieved from: <https://rwanda.savethechildren.net/what-we-do/education>
- Sénéchal, M. (2006). Testing the home literacy model: Parent involvement in Kindergarten is differentially related to Grade 4 reading comprehension, fluency, spelling, and reading for pleasure. *Scientific Studies of Reading, 10*(1), 59–87. Retrieved from <http://www.scriptil.org/upload/SenechalSSR.pdf>
- Sénéchal, M., & LeFevre, J.-A. (2002). Parental involvement in the development of children's reading skill: A five-year longitudinal study. *Child Development, 73*(2), 445–460. <https://doi.org/10.1111/1467-8624.00417>
- Sénéchal, M., & LeFevre, J.-A. (2014). Continuity and change in the home literacy environment as predictors of growth in vocabulary and reading. *Child Development, 85*(4), 1552–1568. <https://doi.org/10.1111/cdev.12222>
- Sénéchal, M., Whissell, J., & Bildfell, A. (2017). Starting from home: Home literacy practices that make a difference. In K. Cain, D. L. Compton, & R. K. Parrila (Eds.), *Theories of Reading Development* (pp. 383–408). Amsterdam, The Netherlands. <https://doi.org/10.1075/swll.15.22sen>
- Shah-Wundenberg, M., Wyse, D., & Chaplain, R. (2012). Parents helping their children learn to read: The effectiveness of paired reading and hearing reading in a developing country context. *Journal of Early Childhood Literacy*. <https://doi.org/10.1177/1468798412438067>
- Simons, G. F., & Fennig, C. D. (Eds.). (2018). *Ethnologue: Languages of the world*. *Ethnologue* (21st ed.). Dallas, Texas: SIL International. Retrieved from <https://www-ethnologue-com.stanford.idm.oclc.org/language/kin>
- Smith, M., & Barrett, A. M. (2011). Capabilities for learning to read: An investigation of social and economic effects for grade 6 learners in Southern and East Africa. *International Journal of Educational Development, 31*, 22–35. <https://doi.org/10.1016/j.ijedudev.2010.06.006>

- Snow, C. E., Burns, M. S., & Griffin, P. (1998). *Preventing reading difficulties in young children*. Washington D.C.: National Academy of Sciences.
- Strasser, K., & Lissi, M. R. (2009). Home and instruction effects on emergent literacy in a sample of Chilean Kindergarten children. *Scientific Studies of Reading, 13*(2), 175–204. <https://doi.org/10.1080/10888430902769525>
- Subramanian, V., Murray, T. S., & Shillington, R. (2011). Initial results of the literacy assessment in Rwanda study. Ontario, Canada: Data Angel.
- Trudell, B., & Schroeder, L. (2007). Reading methodologies for African languages: Avoiding linguistic and pedagogical imperialism. *Language, Culture and Curriculum, 20*(3), 165–180. <https://doi.org/10.2167/lcc333.0>
- Tzelgov, J., & Henik, A. (1991). Suppression situations in psychological research: Definitions, implications, and applications. *Psychological Bulletin, 109*(3), 524–536. <https://doi.org/10.1037/0033-2909.109.3.524>
- UNESCO Institute For Statistics. (2017). *More than one-half of children and adolescents are not learning worldwide*. Paris. Retrieved from <http://uis.unesco.org/sites/default/files/documents/fs46-more-than-half-children-not-learning-en-2017.pdf>
- United States Agency for International Development. (2011). *Education: Opportunity through learning*. Washington DC: Author.
- Valdez-Menchaca, M. C., & Whitehurst, G. J. (1992). Accelerating language development through picture book reading: A systematic extension to Mexican day care. *Developmental Psychology, 28*(6), 1106–1114. <https://doi.org/10.1037/0012-1649.28.6.1106>
- van Bergen, E., van Zuijen, T., Bishop, D., & de Jong, P. F. (2017). Why are home literacy environment and children's reading skills associated? What parental skills reveal. *Reading Research Quarterly, 52*(2), 147–160. <https://doi.org/10.1002/rrq.160>
- Vygotsky, L. S. (1978). *Mind and society: The development of higher mental processes*. Cambridge, MA: Harvard University Press.
- Williams, T. P. (2017). The political economy of primary education: Lessons from Rwanda. *World Development, 96*, 550–561. <https://doi.org/10.1016/j.worlddev.2017.03.037>
- World Bank. (2018a). World dataBank: World Development Indicators. Retrieved October 24, 2018, from <http://databank.worldbank.org/data/source/world-development-indicators>
- World Bank. (2018b). *World development report 2018: Learning to realize education's promise*. Washington DC: Author. <https://doi.org/10.1596/978-1-4648-1096-1>
- Yu, G., & Thomas, S. M. (2008). Exploring school effects across southern and eastern African school systems and in Tanzania. *Assessment in Education: Principles, Policy & Practice, 15*(3), 283–305. <https://doi.org/10.1080/09695940802417525>