EDITORIAL

Educational sciences and a media ecology perspective
Antti Räsänen

Teenage religion – religiousness among Finnish 8th and 9th graders
Harri Pitkäniemi

How the Teacher’s Practical Theory Moves to Teaching Practice
Joakim Larsson, Annica Löfdahl, Hector Pérez Prieto

Rerouting: Discipline, Assessment and Performativity in Contemporary Swedish Educational Discourse
Birgit Andersson

Introducing assessment into Swedish leisure-time centres – pedagogues’ attitudes and practices
Damaris Ngorosho and Ulla Lahtinen

The role of the home environment in phonological awareness and reading and writing ability in Tanzanian primary schoolchildren
Tomas Englund

Questioning the parental right to educational authority – arguments for a pluralist public education

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The role of the home environment in phonological awareness and reading and writing ability in Tanzanian primary schoolchildren

Damaris Ngorosho and Ulla Lahtinen*

Abstract
In developing countries, the role of the home environment in children’s development of literacy skills is largely unknown. This study examines the relationship in a sample of 75 grade two children from rural eastern Tanzania. It also discusses the role of house building material and domestic facilities, in addition to parents’ education and occupation, in describing socioeconomic status in developing countries in general, and in the current study. Most of the factors were significantly (ANOVA) related to phonological awareness and reading and writing. Hierarchical multiple regression analysis identified fathers’ education and mothers’ occupation as strong predictors. The home environment variables accounted for 25% of the variance in phonological awareness and 19% in reading and writing ability. Early screening and support of children in the risk zone of becoming poor readers are proposed. Activities like children’s book projects and school library facilities are suggested, aiming at supporting literacy-related activities in low capacity homes.

Keywords: home environment, phonological awareness, reading and writing ability, Kiswahili, transparent orthography, Tanzania

Introduction
It is well known that the home environment is one of the most important factors influencing the development of a child’s language and literacy skills (Bradley & Corwyn, 2002; Gillon, 2004). In this study the home environment captures the living and literacy environments. The contribution of the home environment to children’s literacy development is well documented in many developed countries. Studies have shown that socioeconomic status and home literacy environment, which are important aspects of the home environment, are related to children’s phonological awareness and reading and writing ability (e.g. Bowey, 1995; Burgess et al., 2002; D’Angiulli et al., 2004). Although the home environment varies and is defined differently in different social contexts, most likely the consequences for literacy development are also found in developing countries.

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Differences in the home environment across cultural contexts are largely influenced by differences in physical and social characteristics (Barnett & Casper, 2001). In several home-related studies from developing countries, the home environment has been defined to include the physical characteristics of the family housing, which is usually not the case in developed countries (Arias & de Vos, 1996; Arimah, 1992; Fiadzo et al., 2001; Ngorosho, 2009). Some studies from these countries have even shown that housing characteristics like house wall material, type of source of light and water in the home, show relationship with the development of at least some literacy skills (Kanyongo et al., 2006; Ngorosho, forthcoming). So far we do not have knowledge from the developing countries about how different home environment components, e.g. housing characteristics, are related to the development of phonological awareness.

Research findings reveal that the contributions of the home environment to literacy skills are partly contradictory across cultural contexts, and also within them (LeFevre et al., 2002; Leseman & de Jong, 1998). Most of the findings about the contribution of the home environment to the development of literacy skills are reported from the Western context. Thus, a study on how the home environment contributes to the development of phonological awareness and reading and writing ability from a rural area in a developing country is likely to deepen our knowledge and understanding.

The cultural context in this study is a rural area in Tanzania, a developing country, and the linguistic context is Kiswahili. A common and frequently used basic measure for the home environment is fathers’ and mothers’ education. In earlier studies on the topic in Tanzania, based on random samples, most of the fathers had a low level of education, which reflects the situation in the area. The distribution of the fathers according to their education was thus significantly skewed, with consequences for the analysis (Bhargava et al. 2009; Ngorosho, 2009). The findings from the studied context were also contradictory compared to most findings from developed countries in that the fathers’ education was not related to phonological awareness and reading and writing ability (Alcock et al. 2010). Thus, this study intends to provide pieces of the puzzle missing in earlier studies so as to create knowledge and understanding of the described phenomenon in Tanzania (Alcock et al., 2010; Bhargava et al., 2005; Ngorosho, forthcoming). In the following section, related research is analysed.

The relationship between phonological awareness and reading and writing ability

Phonological awareness has been linked to the development of early reading skills in various studies (Juel, 1988; Lundberg et al., 1980; Vellutino & Scanlon, 1987). These studies reveal that children who show poor early reading ability become poor readers even in later years. Another finding was the importance of phonemic awareness, which can be defined as the ability to identify, think about and manipulate the individual sounds in words, on the development of early reading ability (Torgesen, 1998). Vari-
ous training programmes have been designed to train children in factors regarded as being important for literacy development (Lewkowicz, 1980; Lundberg et al., 1988; Torgesen & Bryant, 1994). Decoding and comprehension are critical factors in reading (Gough & Tunmer, 1986; Juel et al., 1986). Once a child has acquired adequate decoding skill, they will be able to read and comprehend a written text. Poor decoding skill prevents children from recognising words and thus they have difficulties reading as much text as good readers. Consequently, such children become poor in both reading and writing. Therefore, the early screening of young children for potential problems with literacy skills is particularly important in order to identify those children who are at risk of reading and writing difficulties (Rathvon, 2004).

The early literacy screening of young children for potential problems with literacy skills has been conducted for children in kindergarten as well as in first or second grade. Catts et al. (2001), for example, screened kindergarten children for reading outcomes in second grade. Tests of language development, phonological awareness, rapid naming, letter identification, and non-verbal cognitive abilities were administered in kindergarten. The follow-up testing of reading achievement was administered in second grade. Mothers’ education was also used in the analysis to predict reading achievement. The findings showed letter identification, sentence imitation, phonological awareness, rapid naming and mother’s education as unique predictors of reading outcome in second grade. Other studies have also shown that some home-literacy related factors such as the child’s home reading, parent reading to the child, and exposure to printed material (e.g. reading books) predict early reading achievement (Bowey, 1995; Juel, 1988).

**Home environment in relation to phonological awareness and reading and writing ability**

The home environment can be defined as a setting which contains features of the living and literacy environment (Barnett & Casper, 2001). In addition to socioeconomic descriptors (parents’ education, occupation and income), the living environment includes physical objects such as housing variables (Wachs, 2003). The literacy environment includes literacy-related activities in the home, encompassing aspects like the availability of print material such as books (Leseman & de Jong, 1998). In this study, the focus is on these two components of the home environment: the living environment and the literacy environment, and how they are related to the phonological awareness and reading and writing ability of Kiswahili-speaking children in rural Tanzania. A study recently conducted in Tanzania showed that key indicators of the living environment included parents’ education and housing variables, while the home literacy environment was characterised by books found in the home environment (Ngorosho, 2009). Variables included in the analysis in the present paper are those which Ngorosho identified as key indicators as well as the other home environment variables.
One frequently used descriptor of the home living environment is socioeconomic status. Socioeconomic status, measured by education, occupation and income (Braveman & Cubbin, 2003; Sirin, 2005), is one of the commonly studied home environment factors. Studies show the contribution of socioeconomic status, measured in different ways, to differences in children’s performance in phonological awareness and reading and writing ability tasks (Bowey, 1995). Children from families with a lower socioeconomic status enter school significantly delayed in oral and pre-reading skills due to a lack of exposure to literacy facilities and experiences in the home (Whitehurst & Lonigan, 1998). Thus, these children lack both the knowledge and skills required for good reading.

The contribution of the home literacy environment to the phonological awareness and reading and writing skills of preschool and kindergarten children has been revealed in previous research (Neumann & Celano, 2001; Shah, 2000; Sénéchal & LeFevre, 2002). Studies indicate that children’s exposure to literacy-related activities at home (e.g. story book reading, visits to the library, parental involvement in teaching children to read and write etc) is important for children’s phonological awareness and reading and writing ability (Burgess 2002; Evans et al., 2000; Foy, 2003; Neumann et al., 2009; Roberts et al., 2005). Moreover, parents’ education, and especially mothers’ education, has been shown to significantly contribute to children’s reading and writing ability (Jariene & Razmantiene, 2006).

The studies presented above focused on children from developed countries. Research about the described relationships from developing countries is scarce, and the findings from the discussed studies may raise a question about their generalisation to different linguistic and cultural contexts. The studies reflect particular cultural and language related aspects and the findings may not extend to another cultural context with a different language. In this study, the effort is to extend our knowledge and understanding about the living environment to the cultural context of rural Tanzania and about the literacy environment to the linguistic context of Kiswahili.

**Kiswahili and studies in the language**

Kiswahili is a language of the Bantu group spoken in areas of East Africa, particularly Tanzania and Kenya, and it is a trade language in a wider area of East Africa, including some areas of Zaire, Burundi, Rwanda, Mozambique and Zambia (Alcock, 2005). Kiswahili is the language of inter-ethnic communication and is also used for official matters in Tanzania. About 90% of the estimated 42 million people speak the language (http://www.tanzania.go.tz/populationf.html). Kiswahili is a regularly spelt language with almost all letters (or a combination of letters) corresponding to only one Kiswahili sound (Ngugi, Okelo-Odongo & Wagacha, 2005). Thus, once children have learnt all the principles of phoneme-grapheme correspondences, they are expected to use this knowledge to both decode and spell any word. However, a significant number, about 10-15 percent of children, might still have difficulty reading and spelling in Kiswahili (Alcock & Ngorosho, 2003, 2004).
Some studies specifically focus on the acquisition of spelling skills and phonology in Kiswahili (Alcock & Ngorosho, 2003, 2006; Grigorenko et al., 2006). Researchers (Alcock et al., 2010; Ngorosho, forthcoming) have also looked at the relevance of the home environment for the development of phonological awareness and reading and writing ability. Findings of a recent study in a rural area in Tanzania show that, of the home environment factors, only fathers’ education had a significant correlation with children’s performance in phonological awareness, reading and cognitive measures (Alcock et al., 2010). The significance was, however, weak. In another recent study in the same area (Ngorosho, forthcoming), the findings reveal that the home environment accounts for about one-third (31%) of the variance in reading and writing ability. Among the home environment variables included in the study, fathers’ education seemed the primary predictor of reading and writing ability. Despite the findings, the interpretation of the results is in many cases problematic because of the frequently noticed situation with very low variance and skewed distribution patterns of the background variables, e.g. fathers’ education. In the mentioned studies, most families are poor and the parents’ education is low. Generally, there are few Tanzanian studies on the topic dealt with in this paper.

**Aim of the study**

The study aims at identifying specific aspects of the home environment that predict children’s phonological awareness and reading and writing ability, and the relationship between the literacy components in the described context.

**Methodology**

**Participants**

The participants of this study, 75 grade two children (40 boys and 35 girls) aged between 8 and 10 years (Boys: $M = 8.92$, $SD = .88$; girls: $M = 8.63$, $SD = .84$) were selected from four primary schools in the rural area of the Bagamoyo district in eastern Tanzania. A child was eligible to participate in the study if he or she had attended at least 75% of the 196 total school days in grade one. One hundred and fifty children had the required attendance rate. Information about school attendance was obtained from attendance registers. The children’s ages were obtained from school admission registers and later confirmed from a birth certificate, a clinic card, or a baptism certificate for those children who had been baptised.

The selection of the children was guided by fathers’ education. The idea was to find fathers with a variety of education levels in order to be able to analyse the relationship with the outcome measures. In this study we decided to try to overcome the problem with skewed distributions mentioned above by using the equal sample representation of fathers, according to their level of formal education.

The selection of fathers was made in two stages for the non-formal and secondary or higher education categories, and three stages for the selection of fathers in the
primary education category. In the first stage, the level of fathers’ formal education was recorded from school admission registers, and later checked through a written consent form signed by the fathers/guardians. Other traditional forms of education such as knowledge of traditional medicine and traditional dancing were not part of the present study. In the consent form, the father/guardian was asked to indicate the highest level of formal education he had attained, and the activity which was the main source of income. In the second stage, groups of fathers were created based on formal education level – no formal education, primary school education, and secondary school or higher education. In the four schools there were 25 children whose fathers had the lowest (no formal education level) and the highest (secondary education level), and 100 children with fathers who had the middle level of education (primary school). All the fathers in the no formal education and secondary or higher education groups were selected. A third stage involved fathers in the primary education category. A random sampling procedure was used to select 25 children from the primary education group. Due to the varied number of grade two children in the different schools, the selection for each school was conducted separately. The final study sample thus included three groups: two (no formal and secondary or higher education) with all the children available, and one (primary education) based on randomisation.

Due to the differences in the samples of the groups, there was a need to check for possible effects of the differences. A 60% random sample of the children from the group with fathers who had a high and low education (16 + 16) was added to the 25 from the middle education group already randomly picked (n = 57, sample b), and compared with the original total sample (n = 75, sample a). A paired t-test was conducted to compare summary scores for phonological awareness and reading and writing ability from the original sample (N = 75) and the randomly picked sample (N = 57). No significant differences were found (Table 1). According to the result, the sample selection has no effect on the children’s performance of the tests. As a consequence, the original sample (sample a) was used in all further analysis.

Table 1 Comparison of the original sample (sample a) and random sample (sample b) on the summary scores of phonological awareness and reading and writing ability (paired t-test)

| Measures          | Mean | SD  | T    | sig  |
|-------------------|------|-----|------|------|
| SumPA75           | 16.93| 8.24| .407 | .686 |
| SumPA57           | 16.33| 8.28|      |      |
| Sumreadwrite75    | 24.05| 10.84| .318 | .752 |
| Sumreadwrite57    | 23.44| 10.37|      |      |

Note: SumPA75 = summary score for phonological awareness tasks from sample a (n =75); SumPA57 = summary score for phonological awareness from sample b (n = 57); Sumreadwrite75 = summary score for reading and writing from sample a (n = 75); Sumreadwrite57 = summary score for reading and writing from sample b (n = 57)
The role of the home environment in phonological awareness and reading and writing ability in Tanzanian primary schoolchildren

Measures

Three instruments were used to collect the data: phonological awareness tasks, reading and writing ability tests, and a questionnaire-based interview. All measures were designed in Kiswahili, which is the language of instruction in the public primary schools and was also the language of communication at home. Phonological awareness was measured by sound deletion, initial sound identification and blending tasks. Reading was assessed by letter reading, word reading I, and picture-word, while writing was measured by word writing. Pupils were tested individually during the sound deletion and blending tasks, and in groups of 25 or less during the initial sound identification task and reading and writing tests. We spent between 30 and 40 minutes with each pupil during the individual tasks, and about the same time for each group testing session. An interview based on a questionnaire was administered to mothers/female guardians in the home.

Phonological awareness

Three measures of deletion, initial sound identification and blending were used to assess phonological awareness. Sound deletion is described in Grigorenko et al. (2006). The test was developed as a Kiswahili modification of Rosner’s Test of Auditory Analysis Skills (Rosner, 1999). Previously, the test had been developed and used in a study that investigated the predictability of reading and spelling performance using reading-related measures in primary schoolchildren in Tanzania. In the sound deletion task, children were required to remove sounds from the beginning, middle or end of a word, and to form another word: for example “Say mat. Now say it again but don’t say [m], the result will be [at]”. An example in Kiswahili is sema sita [six]. Sasa sema tena lakini usitamke [s]: the resulting word is [ita] (call). There were 20 items in the task. Nine items required the deletion of single, non-syllabic phonemes, and eleven items required the deletion of syllabic phonemes. The reliability score for the sound deletion task was .81.

The initial sound identification task involved identification of the initial sound of a word. This task was a modification of Rosinski’s picture word interference task (Rosinski et al. 1975). Children were shown 10 sets of pictures, each consisting of one target picture and four for comparison. The children’s task was to identify which picture among the four had the same initial sound as the target picture. For example, the tester held the demonstration pictures up and said “this is a picture of an elephant (tembo in Kiswahili). Here are four other pictures: What are they?” The children, one at a time, named the pictures, e.g. nyumba “house”, tatu “three”, yai “egg” and nne “four”. “Which one of these four pictures starts with the same sound as the one in this picture (tembo “elephant”)?” Then the tester drew a line across the correct picture. The practice items were performed twice. Then the children were given time to do the task individually. The alpha coefficient for the initial sound identification task was .84.
The blending task was originally developed and used in a study that examined phonological awareness and literacy in children attending or not attending school in rural East Africa (Alcock et al. 2010). Blending included words and syllables, and there were ten items. In this task, children were shown how to form longer words by blending two words (e.g. taka + tisha = takatisha (make clean), or two non-word pronounceable syllables (e.g. ko+ti = koti (coat), J+ina = jina (name). The alpha coefficient for the blending used in the current study is .78

A summary variable (SumPA) of the phonological awareness tasks (deletion, initial sound and blending) was created based on significant correlations (Table 6).

Reading and writing ability

Reading and writing tests were a revised version of the reading and writing tests described in Alcock et al. (2000). A summary description of the tests is also given in Ngorosho (forthcoming). The letter reading test involved deciding which letters are real and which are unreal letters in Kiswahili. Similarly, the word reading I test required children to discriminate between words (e.g. safi –clean, kiazi – potato, samaki – fish etc), and non-words (e.g. kigo, lanua, ramiko etc) in Kiswahili. In letter and word reading I tests (or tasks), the children were asked to put a tick or a cross next to real letters/words and unreal letters or words, respectively. There were 10 real and 10 false letters or words in each form of the test. For the letter reading test, capital letters were used in order to eliminate some pupils’ confusion between lower case letters that have reflectional equivalence with each other (such as b and d) (Alcock et al. 2000). The reliability for the reading and writing tests used in this study was 0.86 (4 items in the scale). The reliability indicated a high level of consistency.

The picture-word test (referred to in the current study as word reading II) also measures reading skills. This test was originally introduced as a picture word interference task (Rosinski et al., 1975). In this study a version was developed in Kiswahili in the context of Tanzania. The test involves word recognition. The child had to select a word that represented the target picture. Four pictures which were familiar to the children were used. The words consisted of two, three or four syllables with different consonant – vowel (CV) structures: e.g. meza (table) has two syllables [me - za] of a CV structure, chura (frog) has two syllables [chu-ra] of a CCV and CV structure, while kipepeo (butterfly) has four syllables [ki – pe – pe – o] of a CV, CV, CV and V structure. The children were asked to identify one correct word among four words by putting a line across the correct word. The reliability for the picture-word test was .86.

The writing test included words that consisted of two syllables (eight words), e.g. fupi (short), or three syllables (eight words), e.g gazeti (newspaper), to four syllables (four words), e.g. gudulia (jar). The test required a child to write words that were pronounced orally by the tester. First, the tester explained to the pupils that they would hear a word, followed by a sentence containing the word, and then they would hear the word again. They were told to listen carefully to the word they would be required
to write. Three examples were then given, with the tester reading the word, followed by the sentence, and then the word again. The children were asked if they recognised the word they were to write if they were asked to do so. For this test each correct item was awarded a score of 0.5.

A summary variable (Sumreadwrite) of the reading and writing tests (letter reading, word reading I and II, and word writing) was created based on significant correlations (Table 6).

**Interview**

The interview was based on a questionnaire (an interview guide is available as an appendix in Ngorosho 2009). The interview was administered at home, and an inspection of the housing conditions and presence of literacy materials was made after the interview. The information obtained from the interview described the home living environment and home literacy environment. The home living environment was characterised by family socioeconomic status, quality of housing material, and wealth resources material. The variables used in analysis in this paper had been identified and used in previous work (Ngorosho, 2009, forthcoming). These include parents’ education and occupation, house building material (for roof, floor and wall), type of source for light, water and fuel, and wealth-related items (land, radio, bicycle and furniture). The home literacy environment was defined by the availability of educational materials in the home such as books for school subjects, notebooks for writing school work, writing items, and parental involvement in the child’s school homework, and general progress in school learning.

The interview was conducted with mothers/female guardians at home after they had given informed consent. It was also necessary for the male heads of the households (e.g. husband, uncle, father or male guardian) to give permission for the wife/female guardian to be interviewed about the home environment. Traditional cultures and some religious practices in parts of Tanzania forbid a mother/female guardian being interviewed about their home environment. According to Burge and Haughey (2002), men control women in all aspects of their families and consequently do not allow them to take action or make a final decision that might affect their families. Each interview lasted for a minimum of 30 minutes, with most taking less than 45 minutes.

The reliability alpha value for home environment variables was 0.77 (based on 18 items). The alpha values indicated high internal consistency and were similar to the alpha coefficients observed in previous studies, which ranged from 0.73 (Ngorosho, forthcoming) to .80 (Arias & de Vos, 1996; Bradley & Caldwell, 1981; Fiadzo et al., 2001).

A summary variable house building material was created based on the quality of the building material for the roof, wall and floor of the house. Likewise, the summary variable domestic facilities was created based on figures for light, water and fuel, and the summary variable for wealth was constructed from figures for ownership of land, radio and bicycle, table, chair and bed. Further, a summary variable literacy
was made based on home literacy variables (books for school subjects, notebooks for writing school work, pen and parental involvement in school homework). The summary variables were used in ANOVA, correlation and hierarchical multiple regression analyses (Tables 7 – 10).

**Results**

The results presented in this chapter are based on descriptives, correlations, ANOVA and hierarchical multiple regression. The results for home environment are given first. Secondly, phonological awareness, and reading and writing and their relationship are described. Finally, the focus is on the relationship between the home environment variables and phonological awareness tasks and reading and writing ability.

**Home environment**

Descriptive data for the home environment variables are presented in Tables 2 and 3. Parents’ education was categorised as no formal education, primary education, and secondary and higher education. The distribution of mothers’ education was skewed. About one-quarter (23%) had no formal education, while the majority (73%) had a primary education (Table 2). Only 4% had attained a secondary or higher education. More than half (55%) of the fathers and almost 70% of the mothers had no regular income, but were dependent on non-monthly paid activities.

| Table 2 Parents’ education and occupation, distribution (families, n = 75) |
|---------------------------------------------------------------|
| **Fathers** | **Mothers** |
| **n** | **%** | **n** | **%** |
| Education | | | | |
| No formal | 25 | 33.3 | 17 | 22.7 |
| Primary | 25 | 33.3 | 55 | 73.3 |
| Secondary or higher | 25 | 33.4 | 3 | 4.0 |
| Occupation | | | | |
| Non-monthly paid activities | 41 | 54.7 | 52 | 69.3 |
| Monthly-paid activities | 34 | 45.3 | 23 | 30.7 |

The house building material and domestic facilities had a fairly low standard (Table 3). Most families (67%) had houses with walls made from poles and mud. The roofs were made of grass and the floors of sand or mud in about half the houses (45% and 53%, respectively). Fifty-five percent of the families used locally-made lamps as a source of light. The lamps were usually made from old used tins. More than 75% of the families used firewood as a source of cooking fuel and the remaining families used charcoal. No family used electricity or gas for cooking purposes.

Family income was measured by wealth material resource items, including land, furniture, radio and bicycle. The distributions showed that more than half (66%) of the families owned very little land, between one and two acres. Furniture items included beds, tables and chairs. Most of the families (78%) did not have enough beds. There was no chair and no table in about one-quarter of the houses. A radio was available in almost all (97%) families and about three-quarters (77%) of the families had a bicycle.
The findings reveal a shortage of home literacy facilities. The availability of reading books such as children’s reading books and story books was relatively low. One-third of the families had no reading books in the home as they are not received from the school. Further, in 48 homes (64%) there were no books related to the eight school subjects in the grade two syllabuses. Most parents could apparently not afford to buy books related to school subjects for their children. Only a few families (5%) had three or more books for school subjects.

A lack of books in homes in Tanzania was also reported by Alcock et al. (2010). This study finding revealed that 72% of families had no books in the home, including religious books. There was also a scarcity of notebooks for writing school homework. Despite the scarcity of literacy materials in the homes, more than one-third (35%) of the parents were involved in helping their children with school homework.

Table 3 Housing, wealth, and home literacy, distribution (families, n = 75)

| Housing variables               | n  | %   |
|---------------------------------|----|-----|
| House wall material             |    |     |
| Poles and mud                   | 50 | 66.7|
| Cement bricks                   | 25 | 33.3|
| House roof material             |    |     |
| Grass/coconut leaves            | 34 | 45.3|
| Corrugated iron sheets          | 41 | 54.7|
| House floor material            |    |     |
| Earth/sand                      | 40 | 53.3|
| Cement                          | 35 | 46.7|
| Water source                    |    |     |
| Public tap                      | 9  | 12.0|
| Neighbour’s tap                 | 58 | 77.3|
| Piped into plot                | 8  | 10.7|
| Light source                    |    |     |
| Locally-made lamp               | 41 | 54.7|
| Lantern lamp                    | 24 | 32.0|
| Electricity                     | 10 | 13.3|
| Cooking Fuel                    |    |     |
| Firewood                        | 57 | 76.0|
| Charcoal                        | 18 | 24.0|
| Wealth related variables        |    |     |
| Land ownership in acres         |    |     |
| One                             | 28 | 37.3|
| Two                             | 22 | 29.3|
| Three or more                   | 25 | 33.4|
| Radio                           |    |     |
| No radio                        | 2  | 2.7 |
| Radio                           | 73 | 97.3|
| Bicycle                         |    |     |
| No bicycle                      | 17 | 22.7|
| Bicycle                         | 58 | 77.3|
| Home literacy variables         |    |     |
| Books for school subjects at home|     |     |
| No books                        | 48 | 64.0|
| One or two books                | 23 | 30.7|
| Three or more                   | 4  | 5.3 |
| Note-books                      |    |     |
| Six or less than six            | 21 | 28.0|
| Seven                           | 37 | 49.3|
| Eight or more                   | 17 | 22.7|
| Pen                             |    |     |
| No pen                          | 34 | 45.3|
| One pen                         | 26 | 34.7|
| Two or more                     | 15 | 20.0|
| Parental involvement            |    |     |
| Never                           | 22 | 29.3|
| Sometimes                       | 30 | 40.0|
| Always                          | 23 | 30.7|
Phonological awareness and reading and writing ability

The basic characteristics of phonological awareness and reading and writing are presented in Tables 4, 5 and 6. The performance level in the phonological awareness and reading and writing ability tests (summary score) on average ranged from 40 to 60 percent of the maximum score (Table 4). Of the specific phonological awareness variables, initial sound seemed to be the most difficult one. Of all the children, 45% identified less than four sounds, and only 8% identified all ten sounds. The average score was below 50% of the maximum score on initial sound, while the average score was higher for blending and especially for deletion. Of the reading and writing tests, word writing was the most difficult, with an average score below 50% of the maximum score. The average scores in the letter and word reading tests were clearly higher. Almost 30% of the children did not write any word correctly, while 12% wrote all the words correctly.

Table 4 Descriptive statistics for phonological awareness, and reading and writing (children, n = 75)

|          | Mean | Median | Mode | SD    | Skewing |
|----------|------|--------|------|-------|---------|
| Deletion | 10   | 6.20   | 7.00 | 10    | 3.30    |
| Initial sound | 10 | 4.39   | 4.00 | 3     | 2.83    |
| Blending | 10   | 5.55   | 6.00 | 10    | 3.75    |
| SumPA    | 30   | 16.13  | 16.00| 10*   | 8.41    |
| Letter reading | 10 | 6.53   | 7.00 | 9     | 2.62    |
| Word reading I | 10 | 5.99   | 6.00 | 4     | 1.99    |
| Word reading II | 10 | 6.23   | 6.00 | 10    | 3.50    |
| Word writing | 10 | 4.59   | 5.00 | 0     | 4.03    |
| Sumreadwrite | 40 | 23.33  | 20.00| 12*   | 10.49   |

Note: SumPA = summary score for phonological awareness; Sumreadwrite = summary score for reading and writing. * Multiple modes exist

Overall, the boys performed slightly higher than the girls in both the phonological awareness and reading and writing tests (Table 5). The differences are, however, not statistically significant. There was wide variability of scores in all the tests.

Table 5 Phonological awareness (SumPA) and reading and writing (Sumreadwrite) in relation to gender (ANOVA) (children, n = 75)

|          | SumPA (maximum score = 30) | Sumreadwrite (maximum score = 40) |
|----------|---------------------------|----------------------------------|
|          | M  | SD  | F   | p   | M  | SD  | F   | p   |
|          |    |     | (df = 1/73) |     | (df = 1/73) |     |
| Girls    | 35 | 15.40| 7.96 | .496 | 22.74 | 9.84 |
| Boys     | 44 | 16.77| 8.83 | .484 | 23.85 | 11.14|
| Total    | 75 | 16.13| 8.41 | .205 | 23.33 | 10.50|

The three components used for creating the phonological awareness summary variable (deletion, initial sound and blending) are significantly inter-correlated and they also
correlate significantly with the summary variable (Table 6). For reading and writing the four components used to create summary variable (letter reading, word reading I and II, and word writing) are also significantly inter-correlated and they also correlate significantly with the summary variable. As could be expected, the summary variables are also significantly inter-correlated.

Table 6 Correlations between the phonological awareness and reading and writing ability measures (children, n = 75)

|       | 1     | 2     | 3     | 4     | 5     | 6     | 7     | 8     | 9     |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1. Deletion | 1     |       |       |       |       |       |       |       |       |
| 2. Initial sound | .52** | 1     |       |       |       |       |       |       |       |
| 3. Blending | .73** | .48** | 1     |       |       |       |       |       |       |
| 4. SumPA | .89** | .75** | .89** | 1     |       |       |       |       |       |
| 5. Letter reading | .54** | .25*  | .49** | .52** | 1     |       |       |       |       |
| 6. Word reading I | .39** | .36** | .51** | .50** | .55** | 1     |       |       |       |
| 7. Word reading II | .59** | .45** | .63** | .67** | .67** | .62** | 1     |       |       |
| 8. Word writing | .43** | .35** | .66** | .57** | .57** | .66** | .77** | 1     |       |
| 9. Sumreadwrite | .57** | .42** | .69** | .79** | .79** | .91** | .91** | 1     |       |

*p<.05; **p<.01

The role of the home environment in phonological awareness and reading and writing ability in Tanzanian primary schoolchildren

In the first analysis of the contribution of the home environment to phonological awareness and reading and writing, ANOVA was used. Several components of the home environment were significantly related to the summary variable of phonological awareness. These are fathers’ education and occupation, mothers’ occupation, house building material and domestic facilities (Table 7). The strongest relationship was observed for mothers’ occupation (p<.005). With regard to the summary variable of reading and writing, there was a significant contribution from parents’ education and occupation, and house building material and domestic facilities (Table 7).

As a second step, the correlations between home environment and phonological awareness and reading and writing were scrutinised (Table 8). Parents’ education and occupation, house building material and domestic facilities showed moderate to high significant correlations with phonological awareness and reading and writing tests.

The third step was to deepen the analysis of the contribution of the home environment components to phonological awareness and reading and writing ability through a hierarchical multiple regression. The idea of performing a multiple regression analysis was to identify those home environment variables that significantly predict phonological awareness and reading and writing. The two summary scores, one for phonological awareness and the other for reading and writing, were used as dependent variables.

Some of the home environment variables were excluded from the hierarchical multiple regression analysis, for different reasons. Fathers’ occupation was omitted from the analysis because of the high and significant correlation with fathers’
education (Table 8). No significant relationship could be seen between the wealth and literacy variables and phonological awareness and reading and writing. As a consequence, both wealth and literacy variables were excluded from the hierarchical multiple regression analysis.

Table 7 Phonological awareness and reading and writing ability in relation to home environment (n = 75)

| Variables          | Levels         | N   | M   | SD  | F  | df=2/72 | M   | SD  | F  | df=2/72 |
|--------------------|----------------|-----|-----|-----|----|---------|-----|-----|----|---------|
| Fathers’ education | No formal      | 25  | 13.64 | 7.68 | 18.68 | 10.02 |
|                    | Primary        | 25  | 15.56 | 8.67 | 24.72 | 10.07 | 4.224* |
|                    | Secondary      | 25  | 20.20 | 7.60 | 26.60 | 11.45 |
| Mothers’ education | No formal      | 17  | 13.06 | 9.37 | 17.00 | 7.73 |
|                    | Primary        | 55  | 16.91 | 7.34 | 25.04 | 10.41 | 4.505* |
|                    | Secondary      | 3   | 19.33 | 10.02 | 28.00 | 13.89 |
| Fathers’ occupation| Non-monthly paid| 41  | 14.02 | 8.21 | 20.76 | 9.44 |
|                    | Monthly paid   | 34  | 18.68 | 8.04 | 26.44 | 10.99 | 5.807* |
| Mothers’ occupation| Non-monthly paid| 52  | 13.77 | 8.17 | 21.54 | 9.62 |
|                    | Monthly paid   | 23  | 21.48 | 6.33 | 27.39 | 11.46 | 5.243* |
| House building materials | Poor quality | 39  | 13.90 | 8.31 | 19.19 | 8.74 |
|                    | Good quality   | 36  | 18.56 | 7.94 | 26.25 | 10.73 | 9.122** |
| Domestic facilities | Poor quality   | 44  | 14.16 | 8.33 | 20.75 | 10.13 |
|                    | Good quality   | 31  | 18.94 | 7.82 | 27.00 | 10.05 | 6.968* |
| Wealth             | Poor           | 21  | 13.95 | 10.29 | 21.62 | 11.95 |
|                    | Average        | 30  | 16.83 | 7.07 | 22.50 | 9.23 | 1.081(ns) |
|                    | Good           | 24  | 17.17 | 8.14 | 25.88 | 10.61 |
| Literacy           | Poor           | 27  | 18.00 | 8.64 | 24.41 | 11.45 |
|                    | Average        | 34  | 14.50 | 8.53 | 22.15 | 9.90 | .394(ns) |
|                    | Good           | 14  | 16.50 | 7.36 | 24.14 | 10.46 |

*p<.05; **p<.01; ***p<.005
The role of the home environment in phonological awareness and reading and writing ability in Tanzanian primary schoolchildren

Table 8 Correlations between the home environment variables and phonological awareness and reading and writing ability (families, n = 75)

| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 |
|----|----|----|----|----|----|----|----|----|----|
| 1. Fathers’ education | 1  |    |    |    |    |    |    |    |    |
| 2. Mothers’ education | .37** | 1  |    |    |    |    |    |    |    |
| 3. Fathers’ occupation | .68** | .30** | 1  |    |    |    |    |    |    |
| 4. Mothers’ occupation | .28*  | .25*  | .34* | 1  |    |    |    |    |    |
| 5. House building mat | .43** | .46** | .28* | .28* | 1  |    |    |    |    |
| 6. Domestic facilities | .37** | .33** | .37** | .19 | .49** | 1  |    |    |    |
| 7. Wealth | .08  | .09  | .14  | .19  | .22  | .09  | 1  |    |    |
| 8. Literacy | .05  | .06  | -.02 | -.06 | .06  | .01  | .08  | 1  |    |
| 9. SumPA | .32** | .21  | .29** | .38** | .32** | .28* | .15  | -.10 | 1  |
| 10. Sumreadwrite | .31** | .32** | .27*  | .22  | .33** | .29* | .16  | -.03 | .67* | 1  |

*p<.05; **p<.01

In the hierarchical multiple regression analysis, fathers’ education was entered in step 1 of the analysis. Earlier studies in Tanzania have shown that fathers’ education correlates strongly with fathers’ occupation and income and is therefore a strong determinant of a household’s assets (Mtana, Mhando & Hojlund, 2004; Ngorosho, 2009).

The total amount of variance explained by the home environment variables entered into the analysis was 25% of the variance in phonological awareness (Table 9). Fathers’ education accounted for 10% in step 1 of the analysis. After controlling for fathers’ education, 15% of the variance could be explained by adding other variables in the analysis. Mothers’ occupation was entered in step 2 and accounted for an additional 11% of the variance. Mothers’ education was entered into the analysis in step 3 and accounted for an additional 1% of the variance. However, mothers’ education was not a significant variable (t (71) = .484, p = .630). A summary score for house building material added in step 4 was also not a significant variable (t (70) = 1.168, p = .247), although it added 2% of the variance. Similarly, a summary score for domestic facilities added in step 5 accounted for an additional, but non-significant 1% of the variance (t (69) = .963, p = .339). The total output for the analysis of variance (ANOVA) showed that the final model F-ratio is $F(5, 69) = 4.451$, which is significant (p<.01).
Table 9 Hierarchical Multiple Regression Analyses: Dependent variable – the summary score of phonological awareness; Independent variables: Parents’ education, mothers’ occupation, summary score of house building material for wall, roof and floor, and summary score of source of domestic facilities (source of water, light and fuel) (n = 75)

| Variables                  | R    | R²   | Adj. R² | SE   | F change | F change df | df | Sig. |
|----------------------------|------|------|---------|------|----------|-------------|----|------|
| Fathers’ education         | .32  | .10  | .09     | 8.02 | 8.36     | 1           | 73 | .005 |
| Mothers’ occupation        | .46  | .21  | .19     | 7.53 | 10.73    | 1           | 72 | .002 |
| Mothers’ education         | .47  | .22  | .18     | 7.57 | .24      | 1           | 71 | .630 |
| House building materials   | .48  | .24  | .19     | 7.55 | 1.36     | 1           | 70 | .247 |
| Domestic facilities        | .49  | .25  | .19     | 7.56 | .92      | 1           | 69 | .339 |

With regard to reading and writing, the total amount of variance explained by the home environment variables was 19% (Table 10). Fathers’ education accounted for 9% in step 1 of the analysis. The other home environment variables entered into the analysis explained 10% of the variance after controlling for fathers’ education. Mothers’ occupation was entered in step 2 and accounted for an additional 3% of the variance. Mothers’ occupation was, however, not a significant predictor of reading and writing ability (t (72) = 1.996, p = .130). Mothers’ education entered in step 3 accounted for an additional, almost significant, 5% of the variance (t (71) = .1496, p = .050). The summary score for house building material added in step 4 was not a significant variable (t (70) = 1.144, p = .257), although it added 1% of the variance. Similarly, domestic facilities added in step 5 accounted for an additional non-significant 1% of the variance (t (69) = .934, p = .354). The total output for the analysis of variance (ANOVA) showed that the final model F-ratio is $F(5, 69) = 3.376$, which is significant (p<.01).

Table 10 Hierarchical Multiple Regression Analyses: Dependent variable – the summary score of reading and writing ability; Independent variables: Parents’ education, mothers’ occupation, summary score of house building material for wall, roof and floor, and summary score of source of domestic facilities (source of water, light and fuel) (n = 75)

| Variables                  | R    | R²   | Adj. R² | SE   | F change | F change df | df | Sig. |
|----------------------------|------|------|---------|------|----------|-------------|----|------|
| Fathers’ education         | .31  | .09  | .08     | 10.05| 7.76     | 1           | 73 | .007 |
| Mothers’ occupation        | .35  | .12  | .10     | 9.96 | 2.34     | 1           | 72 | .130 |
| Mothers’ education         | .41  | .17  | .13     | 9.76 | 3.98     | 1           | 71 | .050 |
| House building materials   | .43  | .18  | .14     | 9.73 | 1.30     | 1           | 70 | .257 |
| Domestic facilities        | .44  | .19  | .14     | 9.74 | .87      | 1           | 69 | .354 |

Discussion

The aim of the present study was to investigate how the home environment is related to phonological awareness and reading and writing ability in a Tanzanian rural context. Considerable research has shown the importance of various aspects of the home
environment (e.g. family income and parents’ education and occupation, and quality of learning interactions and experiences) for children’s phonological awareness and reading and writing ability (Jariene & Razmantiene, 2006; Kim, 2009; Sénéchal & LeFevre, 2002; Shah, 2000). However, most of this research has been conducted in developed countries. The main focus of the present study was to identify those home environment variables that contribute to and predict children’s phonological awareness and their ability to read and write in a Tanzanian rural context.

The first step in the analysis focused on the role of the different home environment variables. The results (based on ANOVA) show that various home environment variables make a significant contribution to the mean differences in phonological awareness and reading and writing scores. In accordance with expectations, the differences in children’s performance are mainly found between children from high and low home environment conditions. Significant factors were parents’ education and occupation, house building material and domestic facilities. In earlier studies, parents’ education and occupation have also been significantly related to children’s literacy skills (Bowey, 2005; Evans et al., 2000; Ortiz, 2000). It is obvious that parents engaged in professional jobs have attained a good level of education and income to support their children’s literacy development.

Of interest is the finding that house building materials and domestic facilities make a significant contribution to the mean scores of phonological awareness and reading and writing ability. Housing variables, e.g. the quality of the house wall material, were earlier identified as a significant specific housing-related predictor of reading and writing ability in the rural area of Tanzania (Ngorosho, forthcoming), but no findings were available concerning the contribution of housing characteristics to phonological awareness. The finding that house building materials and domestic facilities are related to phonological awareness adds to our knowledge about the importance of home environment variables on literacy skills. In addition, the finding supports earlier studies which show that the quality of material used for building parts of the house, e.g. roof, floor and wall, and type of source of facilities used in the house, e.g. water, light and fuel, can be used to describe and reflect the level of socioeconomic status of the family in developing countries (Arias & de Vos, 1996; Arimah, 1992; Fiadzo et al., 2001; Ngorosho, 2009). The house building materials and domestic facilities functioned well as variables defining family socioeconomic status in the present study.

The next step in the analysis was to find predictors of phonological awareness and reading and writing ability. A hierarchical multiple regression analysis was used. Home environment variables accounted for one-quarter (25%) of the variance in phonological awareness. Fathers’ education and mothers’ occupation were identified as strong predictors. Fathers’ education contributed 10% and mother’s occupation 11% of the variance. The finding that mothers’ occupation was a significant predictor of phonological awareness should be noted. The reason apparently relates to the quite even distribution pattern of mothers’ occupation, and through
the criteria for the sample also to fathers’ education. Men from different educational levels seem to have a tendency to marry women with comparable educational or occupational levels.

Regarding reading and writing ability, the home environment accounted for about one-fifth (19%) of the total variance. Parent’s education, and especially father’s education, was found to be the main predictor. Fathers’ education accounted for about half (9%) of the variance. This proportion is lower than the variance (16%) noted in an earlier study conducted in a similar rural area in Tanzania (Ngorosho, forthcoming). In the earlier study, which now receives support, fathers’ education was identified as a primary predictor of children’s ability to read and write. A significant contribution of fathers’ education to reading and writing components has also been seen in studies from various developed countries, e.g. Germany, Hungary and the USA (Marks, 2008). In the current study we also found a slight contribution (p=.050) from mothers’ education, contradicting an earlier finding in the same geographical area (Ngorosho, forthcoming). The obvious explanation for the difference relates to the selection criteria for the sample, as discussed above. In most homes, the level of the father’s education could be connected to that of the mother’s.

The effect of controlling for fathers’ education level in this study was that only mothers’ occupation added significantly to the information. The other home environment variables were apparently significantly related to the fathers’ education, but they did not add significantly to the information. In earlier studies conducted in rural Tanzania, fathers’ education was not evenly distributed and most fathers had a low level of education. The findings were that fathers’ education did not seem to be a significant predictor of children’s phonological awareness and reading and writing ability (Alcock et al., 2010; Bhargava et al., 2005). In those studies, other home environment variables, e.g. house building materials and domestic facilities were important predictors.

The fact that home literacy variables were not significantly related to or significant predictors of phonological awareness and reading and writing measures is mirrored in studies conducted in developing countries. For example, Bhargava et al. (2005) found that the availability of educational materials in the home was not related to reading achievement among primary school children in Tanzania. Similarly, Kanyongo et al. (2006) found that literacy-related items found in the home were not significant predictors of reading achievement among primary school children in Zimbabwe. Given the shortage of literacy facilities and practices in homes in developing countries, it is obvious that the impact of home literacy on children’s literacy related measures is difficult to point out.

The contribution of the home environment variables considered in this study signifies the noticeable role that the home environment plays in phonological awareness and reading and writing ability. Although this seems obvious, this finding is important for two reasons. First, most previous studies have been conducted in developed
countries where the definition of home environment differs from that in developing countries and, second, from the measures used in this study. We know that in developed countries the home environment is measured by structural and status indexes such as parental education, occupation, income, size of family, type of dwelling, and processes within a child’s environment (Caldwell & Bradley 1984; Coons et al., 1982; Entwisle & Astone, 1994; Iverson & Walberg, 1982; Mishra 1989). Measures of the home environment in developing countries have also included quality of housing and type and source of facilities such as water, light and fuel (Aria & de Vos, 1996; Arimah, 1992; Fiadzo et al., 2001; Kanyongo et al., 2006; Ngorosho, 2009).

The implications of the results are that irrespective of how the home environment is measured, it is an important setting that contributes to children’s development in literacy skills, including phonological awareness and reading and writing ability. Second, the finding clarifies earlier findings from studies in Tanzania which indicated that home environment variables (e.g. socioeconomic status) did not relate to phonological awareness and reading and writing achievement (Alcock et al., 2010; Bhargava et al., 2005). The explanation is probably, at least partly, related to the measures of home environment used. Certainly, differences in the criteria used to select the fathers to participate in the study lie behind the difference in the findings between the present study and earlier studies. Fathers involved in the two previous studies were randomly selected through the participation of their children in the study, with the consequence of skewed distributions and most fathers having a very low or no formal education. The selection of fathers for the current study focused on obtaining an equal number of fathers from low, medium and high levels of education, aiming at making it possible to analyse the effect of the very important home environment variable which father’s education is found to be.

The impact of the finding that the home environment contributes to phonological awareness and reading and writing ability is obvious. Given that more and more children in Tanzania complete primary school education still lacking adequate literacy skills, knowledge about the role played by the home environment in children’s development of literacy skills is a critical finding. In Tanzania it is common that well-to-do parents provide their primary school children with the necessary education facilities (e.g. books) which eventually support the children’s development of literacy skills. Parents, of course, also influence the children through their own education and literacy abilities. According to Bryant et al. (1990), parents’ education has an effect on children’s literacy skills in that parents with a high education, compared to those with a low education, place greater value on literacy-related activities and thus provide school-related activities for their children. Children who have had exposure to literacy-related facilities have the potential for literacy skills, unlike their counterparts from other kinds of home environments. Thus, the study demonstrates an important finding for a developing society: that the home environment contributes significantly to the development of literacy-related components in children.
The finding about the role of the home environment in phonological awareness and reading and writing ability provides evidence that socioeconomic status (usually assessed by family income, parents’ education or occupation) in developed countries is also an important background factor in developing countries. The relevance of house building materials and domestic facilities for children’s phonological awareness and reading and writing ability in the rural context of a developing country is shown. It is our expectation that the findings of this research will contribute to policy formulation and educational planning. Current education plans in Tanzania focus on the curriculum and school infrastructure in general. Our results point strongly to the need for the government to strengthen developing plans for improving the home environment because, as the findings show, the home environment plays an important role in enhancing literacy, and thus learners’ education. Early screening and support for children who are not becoming good readers are proposed for inclusion in educational plans and strategies. Activities like children’s book projects and school library facilities are suggested, aiming at supporting literacy-related activities in low income homes.

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The role of the home environment in phonological awareness and reading and writing ability in Tanzanian primary schoolchildren

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