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Digital Solutions for Multilingual Learning Environments

The Case of GraphoGame™ Adaptations in Kenya

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UNIVERSITY OF JYVÄSKYLÄ

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ABSTRACT

In Kenya, poor infrastructure and a lack of resources have led to low literacy
levels. Inadequate teacher training programs lack focus on the key areas related
to language and learning, which are essential in multilingual learning
environments such as those found in Kenya. Multilingualism in the country
means that there is a great deal of language code-switching in everyday
language use, which is reflected in the classrooms. The country's language
policy states that early reading should be taught in a child's mother tongue or
in the language of the school catchment area, but it is difficult to implement this
in reality. Consequently, the situation in the classroom does not reflect the
Ministry of Education's language policy. Furthermore, the teacher training falls
short on methodological training regarding the teaching of initial reading
acquisition in indigenous language. The present research explored the current
status of teachers' language competence, pupils' early literacy skills, and the
plausibility of using GraphoGame as an intervention tool to assist pupils
acquire early reading skills. The research was divided into three studies. Study
1 investigated teachers' perceptions regarding teaching early reading in
indigenous languages and their knowledge of metalinguistic skills in Kikuyu
and Kiswahili languages. Study 2 examined the orthography skills of first-grade
pupils in the two languages and investigated GraphoGame Kikuyu and
Kiswahili language adaptations as plausible intervention tools. Study 3
investigated the spelling skills of Kiswahili early readers and the effectiveness
of GraphoGame Kiswahili adaptation in second-language acquisition. The
study's results indicate that both teachers and their pupils lacked basic
knowledge in letter-sound knowledge, syllable knowledge, and spelling, both
in Kikuyu and Kiswahili languages. Analysis of the post-assessment tasks
shows that children who received the GraphoGame Kikuyu and Kiswahili
intervention in the second study and GraphoGame Kiswahili intervention in
the third study improved in letter-sound knowledge, word recognition, and
spelling. These findings further support the use of GraphoGame as a tool to
assist in early reading acquisition in multilingual learning environments.

Keywords: reading acquisition, GraphoGame, multilingual learning, teacher
training, Kikuyu, Kiswahili

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TIIVISTELMÄ

Keniassa väestön alhainen lukutaidon taso on iso ongelma, joka johtuu etenkin resurssipulasta ja infrastruktuurin puutteista. Ongelman ytimessä ovat puutteelliset opettajankoulutusohjelmat, joissa ei oteta kunnolla huomioon monikielisiin oppimisympäristöihin ja oppimiseen keskeisesti liittyviä kielellisiä kysymyksiä. Monikielisessä yhteisössä koodinvaihto kuuluu olennaisena osana jokapäiväiseen kielenkäyttöön ja tämä näkyy myös koululuokissa. Siitä huolimatta, että maan virallisen kielipoliittisen kannan mukaan peruslukutaito on opetettava lasten äidinkielellä tai koulupiirin kielellä, opetusryhmissä tämän toteuttaminen on osoittautunut hyvin haastavaksi. Tämän lisäksi opettajankoulutuksessa ei paneuduta alkuunkaan riittävästi niihin menetelmiin, joita voitaisiin käyttää paikalliskielten peruslukutaidon opettamisessa. Siksi tässä tutkimuksessa selvitettiin opettajien kielitaidon tasoa, oppilaiden peruslukutaitoa ja sitä, auttaisiko GraphoGame-menetelmä lapsia peruslukutaidon saavuttamisessa.

Tutkimus koostui kolmesta osasta. Ensimmäisessä osassa selvitettiin opettajien käsityksiä ja asenteita paikalliskielten lukemisen opetuksesta sekä heidän metalingvistisiä taitojaan kikujun ja swahilin kielissä. Toisessa osassa arvioitiin ensimmäisen luokan oppilaiden tietämystä kikujun ja swahilin kirjoitusmerkeistä sekä sitä, olisiko GraphoGame tehokas opetuksen tuki näissä kielissä. Tutkimuksen kolmannessa osassa selvitettiin aloittelevien swahilin lukijoiden oikeinkirjoitustaitoja ja sitä, tehostaako swahilinkielisen GraphoGamen pelaaminen toisen kielen oppimista. Tutkimustulokset osoittavat, että sekä opettajilta että oppilailta puuttuvat perustiedot kirjain-äänne-vastaavuuksista, tavuista ja oikeinkirjoituksesta niin kikujun kuin swahilinkin kielessä. Interventiotutkimuksen jälkeinen arviointi osoittaa, että oppilaat, jotka tutkimuksen toisessa osassa pelasivat kikujun- ja swahilinkielistä sekä kolmannessa osassa swahilinkielistä GraphoGamea, edistyivät kirjain-äänne-tietoisuudessa, sanojen tunnistuksessa ja oikeinkirjoituksessa. Saatujen tulosten perusteella voidaan todeta, että GraphoGame-menetelmä edistää lukutaidon perusteiden saavuttamista monikielisessä ympäristössä.

Avainsanat: lukemaan oppiminen, Grahogame, monikielinen oppiminen, opettajankoulutus, kikuju, swahili.

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1 INTRODUCTION

Children in early grade classrooms in Kenya face several difficulties in early reading acquisition. At the center of these challenges are the conflicting language codes used to instruct early reading acquisition, and inadequate teacher training, which falls short in terms of appropriate methodologies of teaching initial literacy skills in early grade classrooms. There is a global consensus among education practitioners that early reading skills are best taught in children's mother tongue. While this is true, multilingual settings such as Kenya face roadblocks in implementing mother tongue language policies in education. Consequently, lingua franca such as Kiswahili is used instead in urban settings. However, Kiswahili is not a first language to the majority of these teachers and their pupils, and the teachers have not received sufficient methodological training on how to teach early reading in Kiswahili. In the case of the other indigenous languages, no reading material is available for pupils and teachers have no training on how to teach early reading in these languages.

In this research, I sought to confirm the status of teachers' linguistic knowledge of Kikuyu and Kiswahili, the availability of teacher guidebooks and reading material for their pupils and the precise level of children's early reading skills in the two languages. I also examined the plausibility of GraphoGame as a tool to enhance early reading skills for pupils in Kikuyu and Kiswahili.

1.1 The Kenyan education system

Since Kenya achieved independence in 1963, the structure of the country's school and education has followed the 8-4-4 system taken from the British model (Commeyras & Inyega, 2007). Primary school includes grades 1 to 8 and is followed by four years of secondary education (forms 1 to 4). Students who pass the Kenya Certificate of Primary Examination (KCPE) can go on to higher education in technical institutes, polytechnics, or undertake a four-year university degree program. Prior to joining primary school, children between the ages

of three and six are required to attend pre-primary (pre-unit) for one or two years.

The official language policy in Kenya mandates a bilingual approach to education, in which a mother tongue or the language of wider communication (such as Kiswahili) is used as the medium of instruction in the first three years of primary school (grades 1–3). During this period, English and Kiswahili are taught as subjects in schools where mother tongue is used as language of instruction; where Kiswahili is used as medium of instruction, English is taught as a subject. English becomes the language of instruction from grade 4 onwards, at which point Kiswahili is taught as a subject (MacKay Commission, 1981; Ogechi, 2009). After grade 3, the mother tongue is neither taught as a subject nor used as a language of instruction. This policy is generally not followed and, according to Trudell and Piper (2013), English is the dominant language in the classrooms in both rural and urban areas. The proportion of classroom instruction time for a local language (such as Kikuyu in Central Province in Kenya) ranges from 1.7 percent in urban areas to 18 percent in the rural areas (Trudell & Piper, 2013). Hence, the language policy creates a confusing and challenging situation for both pupils and teachers regarding early literacy acquisition in Kenya (Khejeri, 2014).

1.1.1 Literacy in Kenya

Literacy levels in Kenya, as in other Sub-Saharan Africa regions, remains low, as reflected in the EFA Global monitoring report (2013/14). The net enrolment rate for primary school was 87.2 percent in 2009, according to the Kenya National Bureau of Statistics (KNBS). This has placed a strain on the country's already overburdened education system and various studies have shown that the quality of education in Kenyan schools is declining (Nderitu & Nyaoga, 2013; Uwezo, 2011). The level of literacy of primary school children in the grades 1–3 is predominantly low (Kenyan National Examinations Council (KNEC), 2010; Piper 2010; USAID, 2012; Uwezo 2010). At least half of primary school children in Kenya cannot read basic second- grade-level stories in Kiswahili (Uwezo Kenya Learning Assessment Report, 2012).

Furthermore, most primary school teachers lack the necessary training, resources, and motivation to teach early reading skills, as indicated in various studies (Gakure, Muria & Kithae, 2013; Mwayume, Mulambe & Cherutich 2012; Reche, Bundi, Riungu & Mbugua, 2012). Table 1 shows the overall reading situation of primary school children across Kenya based on results from the Uwezo Kenya Learning Assessment report (2012).

TABLE 1   Percentage of Kenyan primary school children who cannot read in Kiswahili (Uwezo, 2012[1]).

Grade	Pupils who cannot recognize letters (%)	Pupils who cannot read syllables (%)	Pupils who cannot read words (%)	Pupils who cannot read a Grade 2-level story (%)
1	27.1	36	22.8	7.1
2	13.2	23.5	30.8	15.8
3	7.4	13.5	24.4	31.8
4	3.6	6.1	12.9	54.5
5	2.5	3.2	6.9	72.0
6	1.4	1.9	3.8	83.6
7	1.0	1.3	2.0	90.4
8	0.7	0.9	1.6	93.4

As highlighted by Muriu and Gathogo (2005), adult literacy levels in Kenya are also substandard, which further complicates the practical participation of parents in supporting their children's formal learning in school. The most accurate studies, conducted by the Kenya National Bureau of Statistics (KNBS), in conjunction with Ministry of Planning and National Development and the Department of Adult Education, Ministry of Education (2007), reveal that 38.5 percent (7.8 million) of the Kenyan adult population is illiterate. More recent reports by UNICEF (2012) and World Bank (2014) are somewhat ambiguous, as they measure an adult's literacy based on his or her ability to comprehend, read, and write short simple sentences. Such measures fall short of reflecting the long-term implications of literacy, such as using literacy for the meaningful life of a given person, community, or society.

Most studies of the level of adult literacy in Kenya have not assessed literacy levels in the indigenous African languages, which makes reverting to teaching early literacy skills in the indigenous languages unworkable. This problem is compounded by the lack of reading material, as highlighted by a study by KNBS and UNESCO (2006). Furthermore, existing teacher training programs are not appropriate for the needs of the pupils (Bunyi, 2001; Ngasike, 2012). Studies by Bwonda and Njeru (2002), Gacheche (2010), Ogola (2010), KNBS and UNESCO (2012) indicate that the available curricula for teachers and pupils do not provide the required methodologies in early reading acquisition and instead give many ambiguous tasks. This leads to an overburdened primary school system with no practical follow-up to existing policies, which in turn adversely affects primary education.

1.1.2 Early primary education in Kenya

Primary education begins at grade 1, which is the official start of the first phase of the formal educational system. As per a directive by the Ministry of Education, children admitted to first grade are required to be at least seven

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[1]   http://www.uwezo.net/wp-content/uploads/2014/05/Kenya-Report-2012-WebFinalUpdate.pdf

years old. However, it is common to have children above this age enrolling for primary education (Education Policy and Data Centre, 2009). Early primary education – or lower primary education as it is commonly known in Kenya – constitutes grades 1–4, after which children move to fifth grade and are considered to be in upper primary (Dubeck, Jukes & Okello, 2012).

All children in first grade are taught elementary Kiswahili (Kiswahili is a second language to 99 percent of Kenya's population), English, and mathematics, as well as basic knowledge of history, geography, natural science, social science, art, and music (Benoit, 2013). Although the language policy states otherwise, all subjects except for Kiswahili and mother tongue are taught in English. No books are available for teachers or pupils on the above-mentioned subjects in indigenous languages. This raises the question of how teachers can ensure that the children understand what they are taught in English, which is a "foreign" language to almost all of them.

An article in the *Daily Nation* Kenyan newspaper (2015) explained recent efforts have been made to develop mother-tongue language teaching. However, the unavailability of mother-tongue-based literature for children has led to poor results, as reflected in the study by Trudell and Piper (2014). Primary education runs for eight years and at the end of grade 8, students sit the KCPE. All KCPE examinations, apart from language subjects, are in English.

1.1.3 Teacher training

Primary teacher education is offered through a course known as Primary Teacher Education (PTE), which is provided in 21 certificate-level mixed-gender colleges through a two-year residential program in various teacher training colleges known as teacher training colleges (TTCs). To be considered eligible for the PTE course, a potential candidate should score a minimum grade of C in the Kenya Certificate of Secondary Examination (KCSE) and at least a minimum grade of D in math and C- in English (University of Sussex, Centre for International Education (CIE), 2014). The Kenya Institute of Curriculum Development (KICD) (previously known as the Kenya Institute of Education) also offers a Primary Teacher Certificate through the continuing education program. This course follows the same program as the teacher training offered in the TTCs and also takes three years to complete (KICD, 2014). Additionally, since the early 1980s the Kenya government has had a policy under which the Ministry of Education, together with the college of Education and External Studies, has created a distance learning program that enables teachers to teach while also taking classes to improve their professional qualifications (Education Encyclopedia, n.d.).

Officially, there are several levels of teacher certification: Primary 1 (P1) (certificate holders), Primary 2 (P2) Primary 3 (P3) and Primary 4 (P4) (Bunyi et al., 2013). The P1 certificate holders are qualified to teach pupils in either public or private primary schools in Kenya. The P1 certificate also acts as a bridge to higher courses such as diplomas or degrees. The P1 course curriculum includes comprehensive training in languages, basic mathematics, child development,

human and children's rights, psychology, and administration, all geared to-
wards the primary school curriculum delivery. The P1 course is examinable by
the Kenya National Examination Council (KNEC) and Gretsa University in
Kenya (Othaya Teachers' College, 2014). Although the P2, P3, and P4 certifica-
tion exists in the PTE syllabus, most of the TTCs do not offer their certification
and focus mainly on the P1 certificate.

   Special education teachers receive diploma training in special needs at the
Kenya Institute of Special Education, KISE. This training is offered in addition
to the PTE course. According to the World Bank, 96.81 percent of Kenya's
teachers in 2009 were trained, as shown in Figure 1. The number of unqualified
(untrained) teachers (UQT) has become progressively lower over the years.
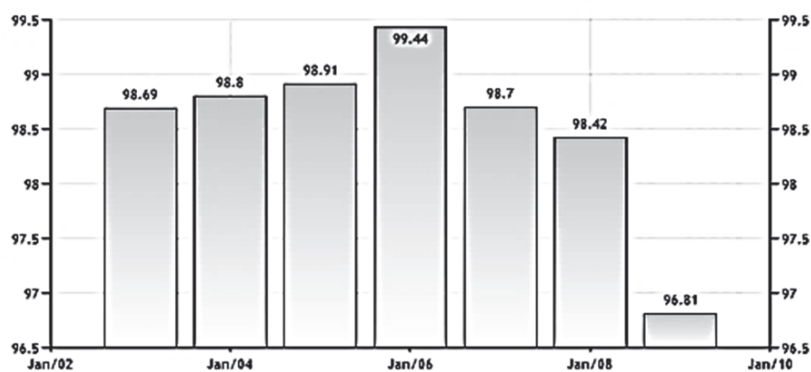
FIGURE 1   Trained teachers in primary education (percentage of total teachers) in Kenya
            (Trading Economics, 2014).

Primary teacher education and training faces various challenges in Kenya. For
example, in 2009 the Teacher Service Commission (TSC) barred primary school
teachers from obtaining a university degree, based on the claim that the P1
teachers did not merit university education as they had not scored the
university minimum requirement of C+ in the secondary school final exam
(KCSE) (Buchere, 2009). This low-level academic qualification requirement
gives the teaching profession a discrediting image, which is worsened by the
low salaries paid to teachers (Kafu, 2011; Odula, 2011). Garcia et al. (2008) noted
that an attempt by the government to raise the entry requirement to the TTCs
led to low enrollment of student teachers. Some universities (such as Kenyatta
University) offer diploma courses that primary school teachers can undertake in
order to upgrade their qualifications. However, upon attaining the diplomas,
most of the teachers then look for better-paying jobs in other sectors.

1.2 The effect of language issues on Kenyan education

1.2.1 Language use in Kenya

Sub-Saharan Africa is the most linguistically diverse region in the world with the population speaking over 1000 different languages (Bowden, 2007). A representation of this diversity can be found in Kenya, a multi-ethnic state with 41 million inhabitants (Kenya National Population Census, 2009).

The language situation in Kenya is quite complex, as highlighted by Ogechi (2009). The country boasts between 42 and 67 indigenous languages, depending on the criteria chosen to differentiate languages from dialects. The diverse population includes most major, ethnic, linguistic, and racially diverse groups found across Africa. Fourteen of these languages have written forms (Lewis, Simons & Fennig, 2014). The indigenous languages spoken in Kenya fall under three main language groups: Bantu, Nilotic and Cushitic. The Bantu languages of Gikuyu, Luhya, Kamba, Embu, and Meru are spoken by approximately 62 percent of the population. The Nilotic languages of Dholuo, Kalenjin, Turkana, and Maasai are spoken by 30 percent, while the Cushitic languages of Somali, Oromo, and Rendille form an ethnic minority spoken by less than 5 percent of the population (Lewis, Simons & Fennig 2014). In addition, there are Indo-European, Indo-Asiatic and Semitic languages that are spoken by less than 1 percent of the population (CIA, The World Fact Book, 2014).

Kenya has eight provinces, which were originally divided by the colonial administration along ethnic lines (Odhiambo & Ndilinge, 2005). In general, the Kenyan language population distribution in the provinces is not exclusively homogenous. Language populations are mixed across most urban centers engaged in business, with the Rift Valley, Nairobi, and Coast provinces being the most linguistically heterogeneous provinces. The most commonly spoken languages are Kikuyu (7.18 million speakers), Dholuo/Luo (4.27 million), Kamba (3.96 million) and Kalenjin (1.6 million) (Kenya National Population Census, 2009). The languages spoken in these provinces are explained below. A map of the provinces and regional division the ethnic groups can be seen in Figure 2.

TABLE 2   Languages spoken in Kenyan provinces

No.	Province	Language description
1.	Central Province	Inhabited almost exclusively by Kikuyu-speaking language groups
2.	Coast Province	Inhabited by Bantu Coastal tribes; Kiswahili language is used for communication
3.	Eastern Province	Inhabited by Meru-, Kamba-, and Embu-speaking communities
4.	Nairobi Province	Multilingual; Sheng' is used among peers, Kiswahili is used in formal settings, and English is used in the upmarket areas
5.	North Eastern Province	Inhabited predominantly by ethnic Somalis; Ogaden, Gurreh, Murale, Ajuran, Degodia and Hawiye
6.	Nyanza Province	Inhabited predominantly by the Luo. Bantu-speaking ethnic groups such as Gusii, Kuria, and Luhya also live in the province
7.	Rift Valley Province	Different ethnic groups inhabit the province. Kalenjin and Maasai
8.	Western Province	Inhabited mainly by the Luhya ethnic communities
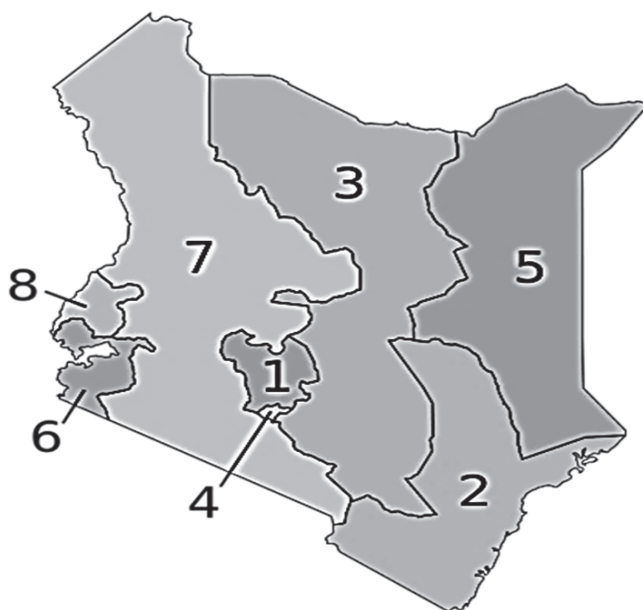
FIGURE 2   Map of Kenyan provinces divided along ethnic lines by the colonial administration (Public domain natural earth data, 2014).

Trade and rural-to-urban migration has led to a lot of code-switching in everyday language use among Kenyans. Ethnic code composition in Kenya comprises of Kikuyu (21 percent of the population), Luhya (14 percent of the population), Luo (12 percent of the population), Kalenjin (12 percent of the population) and Kamba (11 percent of the population), which are the larger

tribes; Abagusii (6 percent of the population), Meru (5 percent of the population), Mijikenda (5 percent of the population), Maasai (2 percent of the population), and other smaller tribes and communities (12 percent) (Elischer, 2008).

English is the official language of Kenya and the language used in formal communication in offices and institutions, including schools. It is generally associated with prestige and enjoys strong support from Kenyans across all socio-economic classes (Ogechi, 2009). Overall, fluent speakers of the English language are estimated to represent 15 percent of the population (Trudell & Piper, 2014). Because it is the official language, all school-going children are expected to learn the language proficiently.

Kiswahili was the national language of Kenya from the country's independence until 2010, when the promulgation of the new constitution made it an official language (The Standard, 2010). It is classified as a Bantu language with a transparent orthography (Massamba, 2002; Ngugi, Okelo-Odongo & Wagacha, 2005). It is generally not considered to be a mother tongue of any ethnic groups, except for the Waswahili people, an ethnic group and culture found in the area encompassing the Zanzibar archipelago, coastal Kenya, and northern Mozambique. The Kenyan population of Waswahili is approximately 110,000; which represents approximately 0.2 percent of the country's population (Jenkins, 2008). Kiswahili is used as a lingua franca in the Eastern African geopolitical area (Habwe, 2009), but only a very small percentage of the Kenyan population speaks the standard form of the language. Most people speak colloquial forms of it, which include the increasingly popular Sheng'.

Sheng' is a Kiswahili-based creole that originated in the 'Eastlands' ghettos of Nairobi, Kenya. Overcrowding led young people to want to have a secret code that their parents or other adults would not understand (Kembo-Sure, 1992). Its exact origins are unclear, with some sources dating it back to the 1950s (Spyropoulos, 1987) and others to the 1980s (Dean, 2013). However, Mazrui and Mphande (1990) and Mazrui (1995) proposed that a Sheng'-like code was in existence as early as the 1930s among Nairobi's underground crooks. Sheng' holds a language variety that has Kiswahili-like sounds (Ngesa, 2002). However, it is a constantly evolving language with a distinctively unstable vocabulary influenced by the different languages spoken in Nairobi and in Kenya as a whole.

The word Sheng' was based on some of the letters of the names of the two languages '(S)wa(h)ili' and '(Eng)lish'. In practice, it borrows words from other languages such as 'Kamba', 'Kikuyu', 'Luo' and even from other European languages such as French (examples of words borrowed from these languages include *njiva, modo, ocha,* and *dame,* respectively) (Kikuyu.com, 2007; The team, 2013). Many youths have adopted Sheng' as a vernacular language and many critics (especially primary and secondary school teachers responsible for language instruction) claim that it is undermining standard Kiswahili (Chege, 2002). The increasing visibility of Sheng', which is now used by adults in 're-spectable' professions, is clear proof of the code-switching that exists between languages, especially English and Kiswahili.

1.2.2 Language use in education in Kenya

The question of what language is to be used as a medium of learning especially in first-to-third-grade classrooms, has never been appropriately addressed in Kenya (Liddicoat, 2007). In the pre-colonial period, early reading instruction was taught in the indigenous African languages so that the natives could translate the Bible into their vernacular languages (Dye, 2009; Mojola, 2002). English was first introduced to schools in Kenya during a 1909 missionary conference. However, the Phelps-Stokes Commission (1924) recommended the use of African indigenous languages as languages of instruction and the teaching of English as a second language. This commission also recommended that Kiswahili language be taught in the Kenyan coastal region only to those people for whom it was a mother tongue.

Based on recommendations from the East African Royal Commission Report (1953–1955), English was introduced as the language of first instruction in grade 1 in 1958. Not all the schools followed this policy and recommendations, and because there was no unified examination at the end of primary school education, the follow-up to the policy was not emphasized (Kioko & Muthwii, 2001). This marked the point from which government language policies in education existed only in theory.

After independence, Kenya, like many other British colonies, inherited the use of English as an official language, which affirmed the dominance of English in the education system (Semali and Kincheloe, 1999). In 1964, the Ominde Commission further strengthened the position of English by instituting it as the language of instruction from grades 1–8. The Ominde Commission also recommended that Kiswahili should only be taught as a subject. The Kenyan education system began to face many challenges with regard to language of early instruction, so it set up the Koech Commission, whose report was tabled in 1999. The Koech Commission collected extensive information on how to improve the Kenyan education system, which was facing numerous challenges. However, it failed to address the issue of the language of early reading instruction.

Although there is a language policy that encourages the use of indigenous languages as the languages of early instruction, English is still being used to teach early reading in first grade in many primary schools across the country. In an attempt to teach early reading in English, the teachers use a mixture of languages, including Kiswahili, because neither the teachers nor their pupils are first-language speakers or fluent speakers of the English language. This point was revealed in a study conducted by Bunyi (2001) and more recently by Trudell and Piper (2014). English is the language of instruction in almost all upper primary schools and institutions of higher learning. It is the language of examination for the final primary school examination (KCPE) and secondary school examination (KCSE) for all subjects other than the language subjects (such as Kiswahili, German, and French) (Semali & Kincheloe, 1999). For these reasons, English continues to be accorded a strong status in primary schools,

while the emphasis on the importance of indigenous languages continues to diminish.

1.3 Theories related to language teaching and learning

1.3.1 Language and learning

In the broader educational context, language is important for communication and comprehension in the classroom (Benson, 2004; Hillman, 1997; Polias, 2004). More recently, researchers and educationists have started to emphasize the vital role that language plays, especially in early reading acquisition. Comparative studies and analysis of different language writing systems have helped researchers understand that early reading acquisition needs to be taught in regard to the specific writing systems of the respective languages (McGuiness, 2004).

Pufahl, Rhodes, and Christian (2001) showed that available data regarding issues related to language and learning are mainly associated with the learning of a second or foreign language. Therefore, many of these studies show the learning models of early reading acquisition in English language; for example, the Whole-Word and Look & Say methods. There are two reasons why English language models are inappropriate for teaching early reading acquisition for various African languages, which have different orthography systems than English. First, the English language has a complex writing system in which numerous spelling are used to represent the same phoneme and letters can be decoded in diverse ways (Kessler & Treiman, 2003; McGuiness, 2004). Second, there is no agreement on the efficiency of the available models for teaching English effectively, which means that these models are not the most ideal in teaching early literacy acquisition. This is evident in various studies (such as Aro & Wimmer, 2003; Campbell et al., 1996; Landerl, Wimmer & Frith, 1997; Wimmer & Goswami, 1994), which have shown that English-speaking children are lagging behind in early reading acquisition compared to their European counterparts. While this can be attributed to the complex nature of the language, it is safe to say that the inappropriate teaching methods do worsen the English early readers' situation.

Other European nations, such as Austria and Finland, that have less complicated writing systems and employ appropriate teaching methodologies, have high success rates in early literacy acquisition and overall literacy levels in their general population (UNESCO Institute for Statistics, 2013). These models, such as the use of phonics method, are likely to be more applicable in teaching early reading acquisition in the Bantu languages, which generally have a simple writing system. Since as early as 1953, when the 'Report on The Use of Vernacular Languages' in Education in Africa was tabled, African countries have faced many challenges in terms of finding an effective approach that would enable the delivery of a transformative and culturally relevant education system for

African people (Alidou et al., 2006). This can only be achieved by focusing on the children's mother tongues. All stakeholders agree that there is a literacy crisis in Sub-Saharan Africa (UNESCO Education for All Report, 2011) and that language is the key to curbing the high illiteracy rate (Trudell et al., 2012).

The 2003 Biennial Meeting "Improving the Quality of Education in Sub-Saharan Africa" of the Association of the Development of Education in Africa (ADEA) was the first meeting to focus on the need for research into mother tongue education and bilingual education. However, Africa continues to fall short in terms of providing documented evidence into the area of early learning, and more specifically reading, in African indigenous languages (UNESCO, EFA Global Monitoring Report, 2015). Research evidence, (e.g. Cordeur, 2014; Skutnabb-Kangas, 2014; UNESCO, 2003) has shown that the use of a child's mother tongue in teaching early reading is more effective for ensuring that the child obtained the reading skills that he or she needs to become a fluent and proficient reader. Therefore, it is important to avoid providing initial reading instruction in a language that pupils do not understand (Skutnabb-Kangas, 2000).

Globalization has contributed to it becoming normal practice for people to master one or more other languages in addition to their mother tongue (Fenner, Trebbi & Aase, 1999). In Africa, however, international foreign languages were learnt with the coming of missionaries. Also, the multilingual situation there means that all languages are considered foreign languages for people for whom they are not a mother tongue. There are generally two methods to develop an ability in a second language: one can either acquire it subconsciously or learn it (Krashen, 2013). Because African indigenous languages are not used in formal learning, models for first language (L1) and second language (L2) acquisition in these languages have not been developed. It is true that teaching a child to read in his or her mother tongue is the most appropriate and ethically correct way to teach a child to read. However, the practical situation in multilingual class-rooms is rather complex. In Nairobi, for example, pupils speak a variety of mother tongues and the school environments are generally linguistically heter-ogeneous. Consequently, the only way to communicate within the schools is through the lingua franca of Kiswahili. It follows that early reading acquisition is taught in a second language (L2), in this case Kiswahili, when children have not mastered reading in their first language (L1). Even in such a case, it is important that the children's mother tongue is well developed at home and can be used as a learning base for transitioning into a second language in the school environment and, accordingly, improving the children's early learning skills in the majority school language (Cummins, 2001). In the fundamentals of language teaching, transition is described as the shift of teaching from one language to another. Teaching L1 alongside L2 allows the sounds and structures of a language to be transferred more easily from one language to another. This is because the learner builds on what is already known. The transfer process is not negatively affected, even when the two languages have different structures (Alidou et al., 2006; Benson & Kosonen, 2013; Cummins, 1981; UNESCO, 2008).

Research by Cummins (2000) indicated that bilingualism has positive effects on children's linguistic and educational development: when they develop literacy skills in both languages, they are able to develop better analytical skills overall.

1.3.2 Early learning in different language structures: Consistent and inconsistent orthographies

The theories presented here have elaborated on early learning in different language structures in a general context and have borrowed heavily from the European models. This is mainly due to the fact that there are significant gaps in the research, and national and international literature is generally not informed by data and evidence from research on first- or second-language acquisition in African contexts (Heugh, 2011).

Languages can be divided into languages with consistent and inconsistent orthographies. Languages with inconsistent orthographies are those whose sounds do not have a regular representation in print; that is, they have an unclear grapheme-phoneme representation (Aro, 2004). Their writing systems are unclear and possess multiple decoding possibilities for their letters and sounds. This is what characterizes an opaque writing system (McGuiness, 2004). English is widely accepted as the language with the most inconsistent orthography, as it has more than 40 different sounds and approximately 176 ways to spell these phonemes (Venezky, 1999). It is important to note that variations in tones of sounds may exist depending on the language background of the English speaker; for example, an African speaker may produce different vowel sounds of the English language.

Languages with consistent orthographies are those that have a regular grapheme-phoneme representation; that is, the way in which a word is spelled is consistent with the way it is written (represented in print) (Aro, 2004). Most Bantu languages are examples of languages with consistent orthographies. Alcock and Ngorosho (2003) and Seymour et al. (2003) agree that the orthographic depth of a language determines how difficult it is to learn to read in that language. Accordingly, one can learn to read faster in languages with consistent orthographies than in languages with inconsistent orthographies such as English (Wimmer & Aro, 2003).

Because different languages possess different characteristics in their writing systems, early reading methodologies used to teach initial reading acquisition in these languages must be sensitive to the features of the writing systems of the respective languages. A writing system is basically a code, which means it is reversible; it is interpreted through decoding (reading) and encoding (spelling) (McGuiness, 2004). Children must be taught to understand the basic elements in coding and decoding; that is, reading and spelling. Learners learning in transparent and opaque writing systems may display typical characteristics respective to their languages in the area of early reading acquisition. For example, Seymour et al.'s (2003) study of children with similar social standing found no significant difference between English speaking children and the non-English-speaking children in terms of knowing letter-name connections. How-

ever, the speed and accuracy of reading familiar words and pseudo words was much poorer in the English sample than in the rest of the language groups. The rate of learning to read was significantly slower in English learners than in learners of languages with more regular orthographies. Therefore, sensitizing children to orthographic awareness becomes a paramount factor in teaching them early reading skills (Aro, 2005).

Orthographic awareness can be described as the ability to learn and re-member how to spell words and the general grammatical rules of a given lan-guage (Trabasso et al., 2005). Orthographic awareness is reciprocally connected to phonological awareness (Vellutino et al., 2004). Phonological awareness re-fers to an individual's awareness of sound structure or phonological structure. It includes the ability to distinguish units of speech such as word syllables and syllables of individual phonemes by hearing them. The ability to segment and blend phonemes is critical for the development of decoding skills, reading flu-ency, and spelling. Brainbridge (2014) defined a phoneme as the smallest mean-ingful unit of sound in a language. In this case, the word *meaningful* indicates that when this sound is added to another word, it will change the meaning of the word. Examples of phonemes in English are /r/ and /l/, which, when add-ed to '*i*' and '*p*', distinguish the word *rip* from the word *lip* (SIL International, 2004). In Kiswahili, /r/ and /t / are examples of phonemes that distinguish *bahari* (sea) from *bahati* (luck). Kikuyu phonemes /û/ and /o/ distinguish *hûna* (satisfied) from *hona* (heal).

Phonemic awareness is a reliable predictor of later reading abilities and is demonstrated by awareness of sounds at three levels: sound structure syllables, syllable fragments (onsets and rimes), and phonemes (McGuiness, 2004). Chil-dren who have difficulty acquiring phonological awareness and learning to map alphabetic symbols to sounds will have difficulty acquiring orthographic awareness (Vellutino et al., 2004). Nonetheless, the importance of phonological awareness is significantly smaller in languages that have regular orthographies (Holopainen, 2001). Phonological and orthographical awareness are both neces-sary in order to form sensitivity to the characteristic of alphabetic writing sys-tems. In English, adding the [ing] suffix denotes a verbal action in words. For example, the word *talk* becomes *talking*, *speak-speaking* and *walk-walking* (Vellutino et al., 2004). An example in Kiswahili is the [na] ending in words. The words *kaza* (fasten/tighten) *chota* (scoop) *piga* (hit) *rusha* (throw) are trans-formed to reciprocal forms *kazana*, *chotana*, *pigana*, *rushana*. Orthographic and phonemic awareness enable children to learn to read.

Initial literacy acquisition is first acquired through reading (Perfetti & Marron, 1998).Various authors have defined reading to include reading com-prehension as the process of deriving meaning from written or printed texts (Nordquist, 2014; Pressley, 2006). The most important point about early reading acquisition is that because reading is primarily a linguistic skill, a child will learn to read faster and optimally when reading is taught in a language that a child is familiar with and is consistently used at home; this language is almost always the child's mother tongue (Vellutino et al., 2004). In multilingual set-

tings, reading difficulties often stem from inappropriate teaching methodologies that do not sensitize children to the differences in the codes of the various languages). Therefore, effective learning requires pupils to receive appropriate instructions on the different codes (Bunyi, 2001; Pressley, 2006). As noted earlier, languages differ orthographically and in terms of their overall phonological patterns. Therefore, it is important to be aware not only of which phonemes exist in the language, but also which combinations of these phonemes are permissible and what constitutes an acceptable syllable, among other differences. Hence, difficulties that exist for beginning English spellers may not necessarily exist for beginning spellers in other languages such as the African Bantu languages. In this regard, English-based methodologies are not appropriate for teaching early reading skills in African languages.

1.3.3 The role of orthographic recognition and spelling in early reading acquisition

Orthographic recognition helps a person to become aware of the common spelling patterns that exist in a given language (Mather & Goldstein, 2001). For example, in Kiswahili spelling, words generally do not have the consonants *bdfgjklprvwyz* without vowels in between them. Sensitivity to orthography helps a person learn the standardized spellings and be knowledge of acceptable or unacceptable writing systems, and enables us to identify spelling mistakes in print, even if the words are not familiar to us (Vellutino et al., 2004). Orthographic awareness is often measured with reading or spelling of pseudo-words (words that do not mean anything, but are structurally correct in a particular language) (McGuinness, 2004). Previous research has shown that children tend to develop orthographic skills followed by spelling skills as they master reading (Santa, 1976-1977; Treiman, 1993). Therefore, orthographic knowledge or awareness is the first step in the process of reading acquisition and it enables the development of spelling skills.

Spelling or encoding is the fundamental operation of turning sounds (phonemes) into symbols (graphemes, letters). The reading process involves decoding those symbols back into speech sounds to recover the words. The process of spelling involves identifying each phoneme in a sequence in the mind, which leads to remembering how each phoneme in that particular word is spelled, and then writing it down. In other words, a person can easily read what he or she can spell (McGuinness, 2004). In inconsistent orthographies, spelling skills generally lag behind reading skills (Rahbari, Senechal, & Arab-Moghaddam, 2007; Sprenger-Charolles, Siegel, & Bonnett, 1998).

1.3.4 Conflicting language codes of consistent and inconsistent languages: The case of Kenya

The language groups found in Kenya vary in terms of their code composition and language structure. Most of the narrow Bantu languages, as classified by Guthrie (1948; 1971), such as Kikuyu and Kiswahili, are generally transparent;

that is, they have a clear grapheme-to-phoneme correspondence. Nonetheless, some Bantu languages that are referred to as Bantoid languages (for example, Giriama) have unclassified structures (Blench, 2009; Blench, n.d.; Greenberg, 1963; Krause, 1895). However, as stated by Babaev (n.d.), classification of Niger-Congo languages remains a subject of constant debate. The Cushitic languages are restricted or accentual tone languages, which make them rather complex when represented using the Latin alphabet because their different tones are not differentiated by the Latin alphabet (Mous, 2012). As is common with the African language groups, the phonological and lexical reconstruction of Cushitic languages is a work in progress (Appleyard, 2006; Ehret, 1980; Heine, 1979; Hudson, 1986; Kießling, 2001; Kießling & Mous, 2003; Sasse, 1979).

Nilotic languages are no different in terms of their tonal accentuation. Linguistically, they are divided into Nilo-Saharan (Bender, 2000) and ParaNilotic, as originally proposed by Carl Meinhof et al., in (1932) and later by Tucker and Bryan (1966). The ParaNilotic languages are originally Nilotic languages that have been influenced by Hamitic languages (Heine & Nurse, 2000). Because Nilotic languages are tonal and yet are represented using the Latin alphabet in print, they are classified as non-transparent languages or languages with inconsistent orthographies. Some Nilotic languages – such as Nubian, which descended from Old Nubian – had their own alphabets in the 14th and 15th centuries (Browne, 2002). However, with the coming of missionaries, all these languages were represented in print using the Latin alphabet. In summary, the languages spoken in Africa have a wide range of unclear specifications in their structure and many of these languages are not documented, which makes it challenging to understand which teaching methodologies work best. These languages/language groups co-exist in the African communities like they do in Kenya, so there tends to be code switching in every day interactions. Table 3 summarizes the code composition of the Kenyan provinces.

Code switching tendencies, which are very common in urban areas, affect a child's early reading environment (Ogechi, 2009). Even the teachers are using conflicting language codes to teach early reading in the classroom. Studies by Bunyi (2001) and Trudell and Piper (2014), which have observed teachers' practices in the classroom, have established that teachers in rural and urban schools employ practices that involve code-switching, overlapping speech routines in English, Kiswahili, Kikuyu, and Dholuo languages. Bunyi (2001) found that when the children emulated the code-switching patterns of the teachers, their answers were accepted as only partially correct.

Additionally, the demand for the use of the English language as a national language further complicates language code-switching because the English language has an inconsistent orthography and is consequently often referred to as an inconsistent (opaque) language (McGuiness, 2004). In English, many words are pronounced differently from how they are written, which creates a great deal of confusion, especially for early learners, when the English letter sounds are mixed with the African indigenous language letter sounds in teaching early reading skills.

TABLE 3   Ethnic code composition of Kenya's provinces[2] (Elischer, 2008).

Province	Ethnic Composition	Language distribution
Nairobi	47 percent Kikuyu 16 percent Luhya 15 percent Luo 15 percent Kamba	Kenya's most ethnically diverse region
Coast	Coastal communities	96 percent of Kenyan coastal communities live in coastal areas, where Kiswahili is widely used
Eastern	55 percent Kamba 39 percent Meru/Embu	
North-Eastern	96 percent Somali	95 percent of all Somalis live in North Eastern province
Rift Valley	51 percent Kalenjin 15 percent Kikuyu 7 percent Maasai	95 percent of all Kalenjin live in Rift Valley 97 percent of all Maasai live in Rift Valley
Western	88 percent Luhya	80 percent of all Luhya live in Western province
Nyanza	63 percent Luo 31 percent Abagusii	87 percent of all Luo live in Nyanza 95 percent of all Abagusii live in Nyanza

1.3.5   Structure of Kikuyu and Kiswahili languages

Kikuyu

Kikuyu is a language in the Bantu family that is spoken by the Kikuyu people, who comprise 22 percent of Kenya's total population (Kenya Population and Housing Census, 2009). The word Kikuyu is a Swahili spelling of the word; the proper term for the language is Gĩgĩkũyũ and the people refer to themselves as Agĩkũyũ (Kariuki, 2013). The Agĩkũyũ are the largest ethnic group in Kenya and live primarily in the Central Province area. However, due to agriculture, trade, and employment, they now live in all parts of Kenya.

Gĩkũyũ language is written with a modified Latin alphabet. The language does not use the Latin alphabet symbols of /f/ /l/ /p/ /q/ /s/ /v/ /x/ /z/. It also does not use the sound [b]. The language uses seven vowels; in addition to the vowel /a/ /e/ /i/ /o/ /u/ it also uses i-tilde /ĩ/ and u-tilde/ũ/. Hence, the Kikuyu alphabet is; /a/ /b/ /c / /d/ /e / /g/ /h/ /i / /ĩ/ /j/ /k/ /m/ /n/ /o/ /r/ /t/ /u/ /ũ/ /w/ /y/ (Chanard, 2006; Kariuki, 2011). Some sources have noted that Kikuyu should generally be written using a version of the African reference alphabet, which was first proposed at a 1978 conference organized by UNESCO: vowels /a/ /e/ /i/ /o/ /u/ /ĩ/ /ũ/ and consonants, /b/ /c/ /g/ /h/ /k/ /m/ /mb/ /n/ /nd/ /nj/ /ng/ /ng'/ /ny/ /r/ /t/ /th/ /w/ /y/ (Ager, 2014). The sound system of Gĩkũyũ language has many

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[2]   The ethnic composition of the provinces may have become more heterogeneous since 2008. However, it is possible that with the current county devolution mandated by the new constitution, the Kenyan provinces may become more homogeneous in the future.

features in common with other Bantu languages. It is distinguished by pre-nasalized consonant phonemes and tones (Thompson, 2014). Gĩkũyũ language can be considered to have a consistent orthography (Kariuki, 2013). The language has a CV³ and VCV syllable structure (Macharia, 2013). The language does not use the CVC syllable structure (Kariuki, 2013).

Kiswahili

Kiswahili is a language of the Bantu group spoken in areas of East Africa, particularly Tanzania and Kenya, and it is taught in schools in Kenya and Tanzania and parts of Uganda. In addition, Kiswahili is a trade language in a wider area of East Africa, including some areas of Zaire, Burundi, Rwanda, Mozambique, and Zambia. However, use as a first language is limited to coastal areas of Tanzania and Kenya to an ethnic group known as the Waswahili (Abdullah, 2003). It serves as an official language in Tanzania and is spoken in parts of Northern Uganda (Mukuthuria, 2006). In Kenya it is now considered the second official language.

Kiswahili uses the Latin alphabet, with the exception of /q/ and /x/. /c/ is always followed by /h/ to form the sound /ch/ as in the English word "*church*"; for example, in the words *chui, chama* and *chakula*. The language uses five vowels; /a/ /e/ /i/ /o/ /u/, with each vowel counting as a syllable (Choge, 2009). Most of the syllables are open-ended, meaning that they end in a vowel. Kiswahili has 19 consonants in total; the alphabet is /a/ /b/ /ch/ /d/ /e/ /f/ /g/ /h/ /i/ /j/ /k/ /l/ /m/ /n/ /o/ /p/ /r/ /s/ /t/ /u/ /v/ /w/ /y/ /z/. Like the vowels, the Kiswahili consonants can be described by the place of articulation; /p/, /b/, /m/, /w/ are classified as bilabial, as they are formed by coming together of both lips. /s/, /z/, /t/, /d/, /n/, /l/, /r/ are known as alveolar, as they are formed by the tip or blade of the tongue coming into contact with the alveolar ridge. /f/ and /v/ are classified as labiodental, as they are articulated when the lower lip comes into contact with the upper teeth. Digraphs /dh/ and /th/ are known as dental, as they are formed by the tip of the tongue against the teeth. /k/ and /g/ are known as velar because they are articulated by the back of the tongue against the soft palate. The /h/ consonant is glottal because it is articulated by light narrowing of the passage between the vocal cords (Mohammed, 2001).

Kiswahili has one-to-one grapheme-phoneme correspondence, which means that it is possible to read the language using one-to-one simple grapheme-phoneme correspondences, with a few digraphs, but without any additional orthographic knowledge. Therefore, it can be classified as a transparent language. Studies have shown that children learning to read Kiswahili display the typical pattern for children learning to read a regularly spelled language; that is, they can decode all words including those they do not comprehend once they have grasped the grapheme-phoneme correspondences (Alcock et al., 2000; Alcock & Ngorosho, 2003). However, transcription from phoneme to grapheme

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3   'C' stands for consonant and 'V' stands for vowel.

is not perfectly regular because Kiswahili has a complex grammatical system in which many parts of a sentence must share markings that refer to grammatical class (a feature of the language similar to grammatical gender as it exists in many European languages).

In addition, dialect differences make certain phonological differences that are preserved in the orthography, but are irrelevant for beginning spellers. For example, younger speakers of Kiswahili and some Kiswahili speakers from Tanzania often confuse /l/ and /r/ (Alcock, 2005). Kiswahili words follow the CVCV structure, but there are various other syllable structures, including syllabic consonants such as [m] + [tu] (CCV) person and [n] + [chi] (CCCV) country; and combinations of two or three sounds, as in [ta] + [tu] (CVCV) three and [da] + [wa] + [ti] (CVCVCV) desk. A cluster of two consonants together and a vowel can also form a syllable such as [mwe] + [we] (CCVCV) '*hawk*' and [ng'o + mbe] (CC'VCCV) '*cow*', while three-segment clusters and a vowel can also form a syllable [ti] + [mbwa] (CVCCCV) '*booted*' (Mohammed, 2001). Kiswahili orthography is perfectly regular from the grapheme-phoneme and each grapheme maps only onto one phoneme, making it easy to learn to read and write. However, it is not a very easy language to spell, as highlighted in studies by Alcock and Ngorosho (2003, 2004, 2006).

1.3.6 Teaching methodologies in early reading acquisition

When teaching reading of alphabetic languages, teachers need to have spoken language competence and possess an understanding of the rules governing the writing systems of those languages (McGuiness, 2004). This will enable the teachers to employ appropriate teaching methodologies, especially for those children who display learning difficulties. In the past, teaching methodologies have not focused on phoneme-grapheme correspondences and English-based methodologies have usually been used to teach reading in other languages, which has led to children developing numerous learning difficulties (Ehri & McCormick, 1998). Early theories of learning acquisition assumed that children must learn the order of letters in words by rote memory and memorize every word separately; there was no role for phonological knowledge or generalizations (Alcock & Ngorosho, 2003).

One such methodology was sight word reading, which has its foundations in the look-and-say method (Wren, 2003). This method imposes a huge burden on the visual memory. Vellutino et al. (2004) and Ehri and McCormick (1998) elaborated that even methods such as sight word reading rely on the learners knowledge of grapheme-phoneme correspondences. When readers acquire sufficient knowledge of the alphabetic system, they are able to learn sight words quickly and to remember them in the long run; any word that is read adequately often becomes a sight word that is read from memory (Ehri, 2005). The most influential cause of difficulties in learning to read is the failure to acquire phonological awareness and skill in alphabetic coding (Vellutino et al., 2004). Therefore, in transparent languages in which it is avoidable to pose an unneces-

sary sight word load on the children, the synthetic phonics method is more appropriate in teaching early reading skills.

Phonetics is the study of the sounds that people make when they speak. Some languages match the sounds to the writing of the language so that every letter or symbol is always pronounced the same way. These languages are called "phonetic" languages and most consistent languages such as Kiswahili and Kikuyu fall into this category. Synthetic phonics or blended phonics is the method of teaching reading and writing by developing learners' phonemic awareness and knowledge, beginning with letter-sound knowledge and then to blending these sounds to achieve whole-word pronunciations (Chew, 2005). In some countries, such as Italy, teachers can choose whether they want to use a particular teaching approach to reading (European Commission: Directorate-General for Economic and Financial Affairs Economic Policy, n.d.). In Kenya, however, teachers do not have this option as they are not conversant with these teaching methods. Through guesswork, many teachers use a combination of teaching methodologies, such as the look-and-say method and the whole-word approach and use phonetics and conflicting codes to teach in class, accompanied by the use a combination of different languages (Kiswahili, English and in some cases the local languages, such as Kikuyu and Dholuo), as was evident in studies by Bunyi (2001), and Trudell and Piper (2014). In the PTE syllabus for teachers, the phonics method is mentioned as a methodology that can be used to teach early reading instruction to pupils. However, there is no emphasis on its significance in teaching reading skills in the transparent native languages (Bunyi et al., 2011).

1.3.7 The role of metalinguistic skills of teachers in pupils' early reading acquisition

Metalinguistic awareness can be defined as the ability to reflect on and manipulate the structural features of a language (Nagy & Anderson, 1995). It plays a vital role in literacy acquisition because it enables learners to competently select and discuss the use of processes and strategies appropriate to their needs in language learning. Because writing is a representation of speech, proficiency in language is required when learning and teaching reading (Schroeder, 2012). When children reach four years of age, they spend a significant amount of time exploring new sounds, new words, and new speech styles. As they reach their school years, metalinguistic development continues to improve as children gain an understanding of the specific meaningful units associated with a particular language (sounds, syllables, words, and sentences). This manipulation of language is significantly correlated to the successful use of language in socialization and future learning (Connolly, 2013). Therefore, metalinguistic skills include the awareness that language has a structure that can be manipulated. It is now generally accepted that phonemic awareness is also a type of metalinguistic awareness that is important in learning to read (NELP, 2010). Metalinguistic awareness is helpful in the transfer of linguistic knowledge across different languages. Therefore, teachers in bilingual and multilingual language settings

need to master this skill (Dillon, 2009; Kerper, 2009; Quareshi, 2005). Teachers who possess metalinguistic awareness of language are able to teach appropriate speaking and listening skills that are necessary in learning as a whole (Griggs, 2011).

In a multilinguistic environment such as Kenya, where learning in indigenous languages has been neglected, teachers generally lack an understanding of the multilinguistic skills involved in teaching and learning these languages, particularly the skills required in transferring from one language to another (Klaas & Trudell, 2011; Schroeder, 2012). This has proven to be a significant challenge because these teachers are now required to bridge a literacy gap that has existed for more than 40 years. It is clear that teacher training in Kenya falls short of providing the knowledge that teachers need about how to teach reading in more than 40 vernacular languages. In practical terms, the teachers do not have sufficient time to teach and also participate in in-service training. What makes the situation worse is that because the teachers did not learn to read in the local languages at the appropriate time, mastering the required skills in adulthood will require longer training periods. In the light of the above challenges, it becomes clear that the use of digital tools is the most appropriate solution to the literacy crisis in Sub-Saharan Africa. Although digital media are not preferred – for the obvious reasons of low internet connectivity, unavailability of electricity connections, etc. – they are the most efficient in training in literacy acquisition in the populous multilinguistic setting; the advantages completely outweigh the challenges. Teicher (2015) has stated that:

> 'In a post 2015 world, developing countries will have no practical alternative but to fully embrace ICT as a means of playing catch-up to address the educational needs of their youth population growth. Due to the magnitude of the challenge in sub-Saharan Africa, this will only be possible through fresh, practical solutions that also integrate ICT. For this to happen effectively, such efforts must be structured on models that provide for massive scale and sustainable action — and must include the majority of schools still without electricity.'

Other language issues also favor the use of digital tools. We have seen that phonemic awareness is a prerequisite for learning to read. Because of multilingual settings, many Kenyans from certain communities face various challenges in sounding out specific sounds because of the effects of their mother tongue phonology on a second language such as Kiswahili (Macharia, 2013; Muthwii, 1994; Ontieri, 2013; Ochola 2006). Common errors include substituting the [l] sound for [r] among Kikuyu speakers and substituting [s] for [sh] among Dholuo speakers. Most of these speech errors are very challenging to correct in adulthood (Halpern & Goldfarb, 2012). Digital tools that focus on teaching children the key issues of letter-sound connections will aid language teachers who struggle with sounding out and, more often than not, transfer these errors to their pupils. Therefore, in this case, digital tools will be useful for both teacher training and support and students' everyday learning.

1.3.8 Shortcomings of the Kenyan teachers' and pupils' syllabus on early reading instruction

Since the 1970s, the syllabus for training teachers about how to teach early reading in Kenya has been criticized for not comprehensively addressing the needs of Kenyan pupils. The overriding criticism has been that the content is irrelevant and inappropriate and that it emphasizes passing of examinations at the expense of the acquisition of knowledge and skills and developing attitudes appropriate for effective living. It also does not address the fact that the language of instruction has now been switched from English to Mother tongue/Kiswahili. The class textbooks begin with the examples of capital letters in the words '*embe*', '*unga*', '*askari*', '*ishrini*', '*ovaroli*', even though the teachers' syllabus states clearly that the teacher should begin with examples of simple words. The above words have complicated consonant structures of VCCV, VCCV, VCCVCV, VCCCVCV, and VCVCVCV, compared to the typical CVCV words such as '*mama*' (mother) that are most familiar to students. Although reading is highlighted throughout the syllabus, no reading passages are provided to the pupils' to practice reading (Wallah, 2007).

The first-grade primary school curriculum requires that the mother tongue be taught as a subject. Nonetheless, there is no syllabus available on how to teach reading or any other subject in the local languages except for Kiswahili. Furthermore, the Kiswahili syllabus fails to address the methodologies to be used in teaching early reading, given that Kiswahili is a language with a regular orthography (Ngorosho, 2011). An in-depth look at the Kiswahili syllabus (new syllabus) for grade 1 (Mchangamwe, 2006; Mchangamwe & Jamaadar, 2007) shows that children are required, at the start of their learning, to learn Kiswahili language using whole-word approach and more emphasis is put on using whole words than on learning letter-sound connections.

Although the early reading language policy requires that reading be taught in the indigenous languages, no syllabus or any kind of instruction is available to teachers on how to teach reading in these languages, except for Kiswahili. The teacher syllabuses available in Kiswahili show that the instructions available regard teaching and learning in general; they do not focus on specific instructions on how to teach initial reading skills (Mchangamwe, 2006; Wallah & Kobia, 2009). According to the syllabus, students are expected to meet certain requirements, including reading books, so that they can improve their reading skills. This is an unrealistic expectation; given that majority of children in Kenya lack reading material, as reflected in the studies below.

The main aim of the syllabus is to provide guidelines that teachers should keep in mind when guiding pupils in the first year (Mchangamwe, 2006). It further states that the focus should be on listening, speaking, reading, writing, and grammar. The syllabus emphasizes that one it is important for pupils to learn reading. Under the guidelines on teaching reading, the syllabus specifically highlights that the method it will focus on does not begin with consonants or letters, but with simple words that the children already know or are familiar

with. In the first two weeks of learning, few words should be taught, but they should be taught repeatedly until the students have learnt how to read them.

In contrast, the same syllabus states that Kiswahili is very easy for children to learn because each syllable has only one consistent way of being pronounced or written; that is, it has a consistent letter-sound connection. Although it has been pointed out that Kiswahili is a consistent language, the syllabus mentions in general that there are letters and syllables in Kiswahili, without emphasizing either the importance of teaching letter-sound connections or the methodology; that is,. the use of phonics. The syllabus by Wallah and Kobia (2009) provides a very brief explanation, stating that teachers should teach the children to write capital and small letters. It also states that by the end of the first lesson, the pupils should be able to read and write the capital and small vowels. The teacher is instructed to try as much as possible to pronounce vowels and consonants appropriately. The syllabus immediately provides examples of words that begin with vowel sounds that the teacher can show to the pupils, such as '*askofu*' (bishop), '*asali*' (honey), '*ajuza*' (elderly woman), '*eropleni*' (airplane), and '*inspekta*' (inspector). These are very difficult words for children to read and some ('*Inspekta*' and '*Eropleni*') are loan words from English.

1.4 Digital enhanced learning in early education

Digital media are any media that exist in machine-readable format and can be created and preserved using computer programs and related software. They include audio and video images in technology-readable format on websites. Recent developments in technology have helped reduce computing costs, which have contributed to increased use of digital media in education, especially with the advent of mobile devices such as tablets and phones (Thrive Networks, 2006). There are certain theories with varying perspectives that have been associated with the use of digital media in education (Christ & Potter, 1998). These theories examine the use of digital media in education, including how people relate to texts. Potter (2004) gives the most accurate description of the use of digital media in education by explaining how digital media should help to build effective knowledge structures among pupils. The use of technology in early years can help children develop better foundational skills (Daugherty et al., 2014). It is important that principles of development and learning be applied when considering the use of digital media in language learning and development (NAEYC, 2012).

It is essential that educationists consider the warnings raised by various researchers that exposing children to digital media too early may cause them to develop attention deficit disorder, obesity, and irregular sleep patterns (Brooks-Gunn & Donahue, 2008). This can help to minimize any adverse effects and respect and apply the rights of children (International Social Net-work and Service, 2014). Nonetheless, there are advantages to using technology media in early education, which should be explored and developed. Their effectiveness can

be improved by investigating and resolving barriers that may hinder their efficiency (Mdlongwa, 2009). Teachers are an important factor in the digital age regarding education because they ensure that the technology is used effectively in the classrooms, especially when dealing with young students. When teachers lack confidence in their abilities to use technology effectively, they may not be receptive to incorporating it into their daily class-room activities (Ertmer et al, 2012; Ottenbreit-Leftwich et al., 2010). More research should be conducted to establish how, if at all, teachers are using digital media to enhance literacy in their classrooms (Keengwe, Onchwari & Wachira, 2008).

1.5 GraphoGame™[4]: A plausible solution to the early reading skills acquisition gap in Kenya

GraphoGame is the name given to all of the language adaptations of the Finnish literacy game known in Finland as 'Ekapeli'. Based on major findings of the Jyväskylä Longitudinal study of Dyslexia (JLD) (for a review of the results of the JLD, see Lyytinen, Erskine, Ahonen, Aro, Eklund et al., 2008), a digital training game called GraphoGame was developed to help children to learn to read (for a description of the game and its development, see Lyytinen, Erskine, Kujala, Ojanen and Richardson, 2009). Ekapeli was originally intended as a research tool into reading acquisition in the Finnish language because it offers an efficient way to observe the basics of reading by focusing on the main foundations of learning to read; that is, the learning of connections between spoken and written language. It was discovered during the research process that the game had the potential to prevent reading difficulties in children.

The game works on a multi-platform computer environment. It uses phonics, which is universally accepted as the most effective method to teach reading skills in both non-transparent English (e.g., Ehri, Nunes, Stahl & Willows, 2001) and in transparent writing systems such as German (e.g. Landerl & Wimmer, 2008). The game has been developed for use by children from 6.5 years of age, as research shows that children below this age tend not to be mature enough to benefit from phonics instruction. Phonics instructions are based on systematic building of the connections between sub-lexical written and spoken units. The game systematically introduces spoken sounds (phonemes) with the written counterpart, then syllables, and then words. The child should ideally play the game for 5–15 minutes, several times a day, until he or she has mastered the principles of letter-sound connections in the given language (spoken communication by Heikki Lyytinen). In Finland, more than 200,000 children have played the Ekapeli game and successfully learnt the letter-sound connections (Hautala et al., 2013).

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[4]   GraphoGame is the registered trademark of the University of Jyväskylä and Niilo Mäki Foundation for a noncommercial computerized game aimed at teaching early reading skills.

The actual game is based on a clear and simple idea. When the child starts the game, he/she hears speech sounds (it is preferred that a child wears headphones to ensure clarity in sound) and sees a selection of written symbols moving across the screen. The headphones worn by the child should always be of good quality so that there is clarity in the sounds the child hears. At the same time, representations of the speech sounds in print format appear on the screen. The child is expected to select the written symbol that corresponds to the speech sound. In the mobile phone version of the game used in the GraphoGame pilot study (Study II), which is a part of this research and is described in chapter 3, the child selects the items using the arrow keys and the 'enter' button. In the Android version of the game, which was used in GraphoGame Kiswahili adaptation study (Study III; also described in chapter 3), the child selects the correct items using his or her fingers on the tablet touch screens. When the child makes a correct selection, he or she receives a score. If the choice is incorrect, the same target item appears again so that the child gets another chance to play that particular item. Items are repeated in different order, with different distractor (incorrect) options until the child is able to choose the correct symbols without any errors. The game adapts to the child's performance level in order to prevent children playing from getting frustrated due to lack of progress, which can easily lead to negative associations with the game and learning reading skills in general. A child with a slow learning tendency will have a slower game with fewer options on the screen. Each game level introduces new items, which get gradually more complex until the child is able to play with real words.

The game has additional features that analyze the player's data. A player's turn is recorded via game logs on the server, which can be analyzed further and assist in understanding the challenges a child (player) may be facing in learning the letter-sound connections. The game logs can be analyzed using several computer programs, each of which have different features and methods of measuring. The general way of interpreting the game logs is that 60 percent performance is equivalent to guessing, while performance at or above 95 percent is considered to be a sign of real knowledge. The performance level is set this high because the items the children are using for learning are based on phoneme-letter correspondences, which should ideally be learned automatically once a child is at least 6.5 years or older. The program also has Graphotable, a feature that summarizes the playing process into percentage scores. A diagram of Graphotable can be seen in Figure 3. Graphotable counts the correct and incorrect answers the child has made from each trial in each playing session; this information provides statistical information on the child's performance. Graphotable was developed by Kimmo Teerimäki (2004). Ojanen (2007) used an additional feature of the Graphotable that made it possible to analyze player performance level-wise. The level scores draw a simple graph of the performance percentages of playing sessions on each level. The graph illustrates the level of the difficulty the child (player) has experienced in getting through a level. It is assumed that the game is easy at the beginning and gets more difficult as the

child progresses in the levels. However, the recent versions of GraphoGame application do not use the Graphotable feature for analysis.

Another feature of the game is the Daisygraph, a diagram of which can be seen on Figure 4. The Daisygraph illustrates the phonemic space of a player within the game. It provides a clear analysis of the player's ability to differentiate between the correct print symbols and the distractors, after hearing the speech sounds. The Daisygraph figure has four circles, which represent 0 percent, 50 percent, 75 percent and 100 percent performance levels. Each target-distractor pair makes its own tiny "petal" on the graph, which shows the probability of understanding the difference between these two options. When the player prefers the distractor, the petal is close to the center of the picture, showing a 0 percent or 50 percent performance. When the player has chosen the target item correctly, the petal is near the outer 100 percent performance circle. The petals are colored so that green refers to good performance, red to poor performance and brownish to unclear. When there have been fewer than five trials, the Daisygraph cannot calculate the probabilities of the performance. The Daisygraph was developed by Janne V. Kujala (Kujala, Richardson & Lyytinen, 2010). The target item (auditory stimulus) is at the center and the letters outside the center represent the incorrect written alternatives (distractor items). Additional information on interpreting Daisygraph can be found at https://graphogame.com/files/pdf/daisy_manual_en.pdf

Results

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
a	-	V	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O
b	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O
c	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	V
d	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O
e	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-
f	-	-	V	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-
g	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O
h	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-
i	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O
j	-	-	V	-	-	O	-	-	O	-	-	V	-	-	O	-	-	O	-	-	V	-	-
k	V	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-
l	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-
m	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	V	-	-	O	-	-	O	-
n	V	-	-	O	-	-	V	-	-	O	-	-	O	-	-	O	-	-	O	-	-	V	-
o	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-
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s	V	-	-	O	-	-	V	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-
t	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-
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y	-	-	O	-	-	O	-	-	V	-	-	O	-	-	O	-	-	O	-	-	V	-	-
z	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-	O	-	-

FIGURE 3   A diagram of a Graphotable. (**0** indicates the correct answer; **V** indicates the incorrect answer).
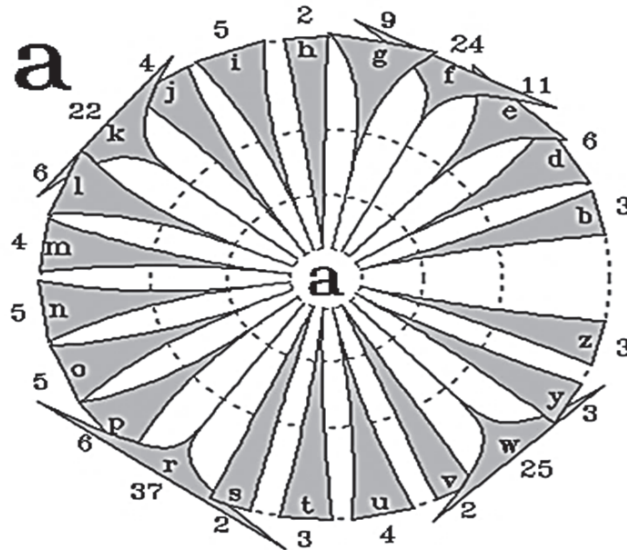
FIGURE 4   Diagram of a Daisygraph (GraphoGame Kiswahili study, 2013).

In principle, GraphoGame adaptations should be effective at providing support for teaching reading in African Bantu languages, given that these languages have a regular orthography, as does Finnish. Likewise, they are consistent on grapheme-phoneme correlations (that is, each grapheme – letter or letter combination – corresponds to one phoneme and each phoneme has its own grapheme; in other words, they are consistent at the grapheme-phoneme level in reading and spelling). In Africa, research into the GraphoGame Cinyanja adaptation was piloted in Lusaka, Zambia where Cinyanja/Nyanja is commonly spoken. According to research conducted by Chilufya (2008) and Ojanen, Kujala, Richardson and Lyytinen (2013), first-grade children who received at least two hours of intervention improved in spelling and orthographic skills. Based on these results, GraphoGame Kikuyu and Kiswahili adaptations were developed for further research in Kenya.

1.5.1   GraphoGame Kiswahili[5] and GraphoGame Kikuyu[6] adaptations

The first versions of the GraphoGame Kikuyu and Kiswahili adaptations were developed in 2010 and 2011, respectively. In both adaptations, the game content begins by introducing the alphabets of the languages. As the child learns the sounds of the alphabet, the game introduces syllables and eventually words. The words contained in the game have the consonant-vowel (CV) structure. The

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[5]   Recording of the content of the GraphoGame Kiswahili adaptation was done by a proficient speaker and teacher of the standard Kiswahili language, and was developed for research use in both Kenya and Tanzania.

[6]   Recording of the GraphoGame Kikuyu content was done by a native speaker of Kikuyu language.

Kiswahili version of the game has words with one syllable (CV) structure (for example, *'na'* (and), two-syllable CVCV structure (for example, *'mama'* (mother), and three-syllable CVCVCV structure (for example, *'barafu'* (ice), and longer words with four-syllable CVCVCVCV structure (such as *'badilika'* (change).

We have theoretical knowledge about the role of language in early reading and we know that early reading instructions should employ appropriate methodologies that consider the language structure. Therefore, a key question is: Why is the level of literacy and level of early reading so low in Sub-Saharan Africa, and in this case Kenya? The Kenyan Ministry of Education policy requires that first-grade pupils be taught in the local language they speak or in their mother tongue. However, this policy exists more in theory than in practice because the teachers have little if any training on how to teach early reading in local languages. In addition, there is neither teaching materials for teachers nor reading materials for pupils in the indigenous languages. Hence, GraphoGame Kikuyu and Kiswahili adaptations can be used to aid first-grade teachers and their pupils in learning the orthographic skills that are the initial skills required for learning to read in transparent languages such as the Bantu languages, and in this case Kikuyu and Kiswahili.

2 AIMS OF THE RESEARCH

This research was divided into three studies. The overall objective of the first study (Study I) was to establish what attitudes the teachers had about teaching early reading in local languages versus English, their attitudes towards children with and at risk for developing reading difficulties and disabilities, their perceptions of their own teaching competence, and the availability of teacher guidebooks and reading books for their pupils. Study I also examined the teachers' level of language competence in Kikuyu and Kiswahili languages. Study II aimed to investigate the early literacy skills (orthography recognition and spelling recognition) of the pupils in Kikuyu and Kiswahili languages. Study II also sought to explore the use of GraphoGame adaptations as a digital tool that can help enhance pupils' early reading skills. Study III sought to explore the spelling skills of first grade pupils in Kiswahili and the efficiency of GraphoGame Kiswahili adaptation as a tool to enhance early reading acquisition in Kiswahili as a second language (L2).

Overall, the research aimed to find out:

a) the current situation facing early grade teachers in the classroom with the aim of developing appropriate methodologies that can help them optimize early reading acquisition in multilingual classroom environments; and

b) the level of early literacy skills of the pupils and explore how digital learning environments can be used to enhance early literacy acquisition in the classrooms, both in the mother tongue (L1) in the case of Kikuyu and second language (L2) in the case of Kiswahili.

As highlighted earlier in this introduction, literacy levels of early learners in Kenya remain low and are continuing to deteriorate. Language of early instruction appears to be at the center of the problem of poor literacy. In an attempt to help solve this problem, the Kenyn government, through the Ministry of Education, issued a directive that early instruction should be taught

in the student's mother tongue (The Star, 2015). However, there are no courses or instructions offered to the teachers on how to offer early instruction in those mother tongues that are African indigenous languages. This has led to challenging situations in the classroom, whereby teachers are using conflicting language codes to teach early literacy. This has led to children developing learning difficulties that stem from inappropriate teaching methodologies.

The following section provides in-depth descriptions and analysis of the three studies that were conducted as part of this research. The studies were conducted in order to gain a practical understanding of the school and class-room situations regarding teacher knowledge, teaching practices of early grade class-rooms, and the availability of teaching support resources such as guide-books and in-service courses. Furthermore, the study aimed to acquire knowledge about the level of students' early reading skills in Kikuyu and Kiswahili languages, as well as the availability of books for early grade pupils to practice their reading skills.

I hypothesized that GraphoGame Kikuyu and Kiswahili adaptations would help children improve their letter-sound recognition, orthographic awareness skills, and spelling recognition, both in Kikuyu and Kiswahili.

3 METHOD

3.1 Study I: Teacher knowledge and perceptions about teaching early reading: A focus on Kikuyu and Kiswahili languages

3.1.1 Introduction

The Kenyan Ministry of Education requires that teachers teach children early reading skills in African indigenous languages. However, as highlighted by Gacheche (2010) and Trudell and Piper (2014), the teachers have no knowledge or training about how to teach early reading in these languages. The Teachers' Service Commission (TSC) has attempted to address this issue by posting teachers to schools depending on whether a teacher's mother tongue is the language of the school's catchment area (Kenya Institute of Curriculum Development (KICD).

3.1.2 Specific aim of the study

In order to gather the necessary data, I designed a questionnaire that was distributed to Kikuyu and Kiswahili early-grade teachers. The objective of the teacher questionnaire was to gather information that would help analyze the teachers' language knowledge and competence in Kikuyu and Kiswahili, which were the languages they were required to use to teach early reading skills to their pupils. As Richards (2011) explained, teacher language knowledge and skill is fundamental in understanding the effectiveness of teaching and the best approaches to use in teacher language education during teacher training.

The questionnaire analysis also examined the teachers' perceptions about teaching early reading and about languages use regarding the teaching of early reading skills, as well as their attitudes towards their pupils. Understanding the teachers' perceptions is very important for the purpose of evaluating whether teacher training and competence had any influence on creating a positive or negative attitude towards teaching in early childhood classrooms in Kenya.

Furthermore, this analysis investigated the availability of teacher guidebooks during reading lessons, as well as the availability of reading material for pupils, both inside and outside the classroom learning environments. In addition, the questionnaire investigated whether the teachers' language background (that is, their mother tongue(s) influenced their language skills in the respective language(s).

The study was guided by the following questions:

I. What is the perception of teachers towards teaching early reading in local languages (Kikuyu and Kiswahili) in Kenya?
II. What is the attitude of teachers towards their pupils with regard to early reading?
III. Do teachers have sufficient language competence to teach early reading in Kikuyu and Kiswahili?
IV. Does language background (mother tongues) determine the teachers' language skills in the respective languages?
V. Do the teachers have access to guidebooks on teaching early reading instruction in the indigenous languages?
VI. Is reading material available for students for further reading during lessons and outside class?

3.1.3 Ethical considerations

To maintain ethical considerations, the teachers who answered the questionnaire were provided with written information summarizing the main aims of collecting the questionnaire data. In addition, they were assured that the information they provided would remain anonymous and would be used for research purposes only. Secondly, research permission was sought from the Ministry of Education Science and Technology in Kenya (MOEST). Additional permissions were provided by the City County Council of Nairobi, the Provincial Education Office of Nairobi, the Kasarani Education Office, the Kiambu County Council, and the Kiambu Education Office.

3.1.4 Participants

The background characteristics of participating teachers are shown on Figure 5, Table 3, and Table 4. The participants were teachers of early-grade classrooms (including the two teachers whose pupils played the GraphoGame Kikuyu and Kiswahili adaptations). The teachers were from 100 primary schools that (ideally) taught early reading skills in Kikuyu and 92 primary schools that (ideally) taught early reading skills in Kiswahili. In total, 213 teachers answered the questionnaires. Of these, 102 ideally taught early reading in Kikuyu and 111 teachers taught early reading in Kiswahili. Ninety-three percent of the Kikuyu teaching teachers were native speakers of the Kikuyu language. None of the Kiswahili teachers were native speakers of Kiswahili language. Eighty five per-

cent of the 213 teachers who answered the questionnaire had received some form of teacher training while 15 percent had no training at all. Ninety seven percent of the teachers were female (it is uncommon to find male teachers of early-grade classes in Kenya). Forty-one percent of these teachers had between six and 10 years of teaching experience, while 30 percent had between 11 and 20 years of teaching experience. Only 9 percent had over 20 years of experience. Twenty percent of the teachers did not indicate their teaching experience. Forty-two percent of teachers were aged between 30 and 39, while 32 percent were 40–49 years of age and 26 percent were below 30 years old. Most of the teachers (70 percent) received their training from TTCs. Eighty percent of all the teachers who participated in this study had received in-service teacher training during their teaching careers.
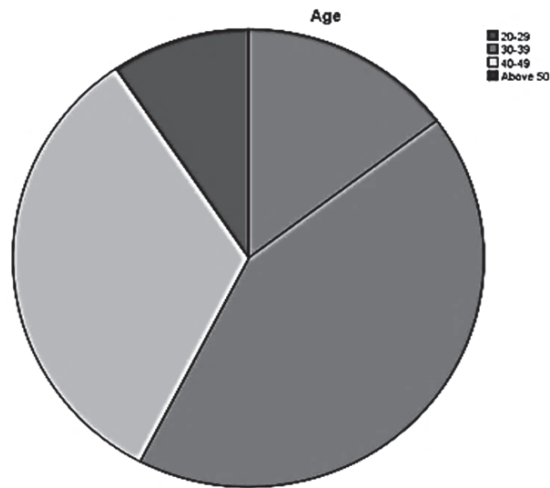
FIGURE 5   Teachers' age group (Teacher Knowledge and Perception Study, 2011).

TABLE 4   A summary of teachers' work experience.

	Teaching early reading in Kikuyu	Teaching early reading in Kiswahili
Teaching experience (years)		
1	2	None
2–5	4	30
6–10	38	51
11–20	45	21
Over 20	21	None

TABLE 5   Summary of teachers' language use.

Teacher's mother tongue	Language in which teachers learned reading	Teaching in Kikuyu (%)	Teaching in Kiswahili (%)
Kiswahili	English	0	0
Kikuyu	English	93	35
Kimeru	English	5	39
Dholuo	English	2	14
Abagusii	English	0	2
Luhya	English	0	4
Turkana	English	0	1
Kalenjin	English	0	2

3.1.5   Context of the study

The teacher questionnaire analysis was conducted with teachers of primary schools in Nairobi and Kiambu Counties. In Kiambu County, the questionnaire survey covered the schools in its Githunguri, Kiambaa, Kabete, Limuru, Lari and Gatundu constituencies. These constituencies have a total population of 903,601 based on the Kenya National Population Census (2009) and cover an area of 1,443.5 square kilometers. These constituencies are predominantly rural and the most commonly spoken language is Kikuyu. In the market centers, Kiswahili is also spoken and some form of Sheng' is spoken in general among children and youth. The main economic activity in the constituencies is agriculture; specifically, growing tea, coffee, and horticultural products as well as dairy and poultry farming (My Aspirant Leader, 2014). School enrolment in Kiambu County has generally been declining over the past ten years despite the introduction of free primary education (Education Policy and Data Center, n.d.). Figure 6 is a map of Kiambu County.

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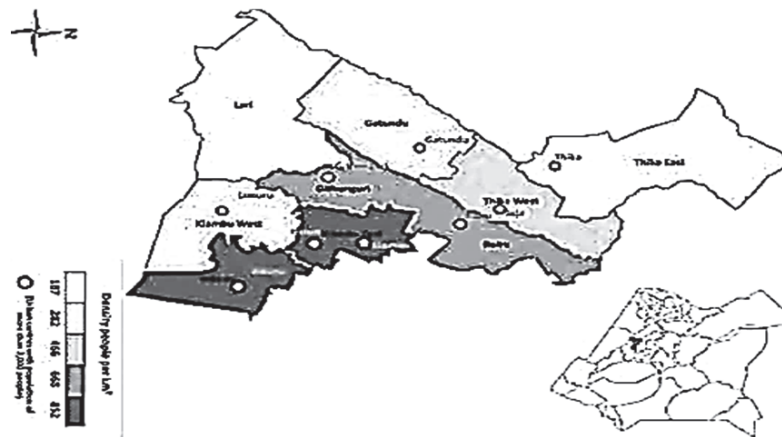
FIGURE 6   Map of Kiambu County (Google Maps, 2014).

In Nairobi County (see Figure 7 for a map of the county), the questionnaire survey covered the schools in Kasarani, Roysambu, Embakasi, Kamkunji, Mathare and Dagoretti constituencies. According to All About Kenya (2013), these constituencies have a combined total area of 1,358.05 square kilometers and a total population of 1,676,170 people, as per the Kenya National Population Census (2009). The Nairobi area includes people from numerous diverse ethnic groups and is multilingual (CIA The World Fact Book, 2013). Almost all of Kenya's 68 ethnic languages are spoken in Nairobi. Kiswahili is widely spoken for general communication (East African Living Encyclopedia, n.d.). English is spoken in offices and Sheng' is the language of many children and urban youth, especially in the constituencies where this study took place (Kang'ethe-Iraki, 2004). The primary school enrolment rate in Nairobi is 97.8 percent (Kenya Open Data Survey, 2014).

FIGURE 7.   Map of Nairobi County (Nairobi Tourist and Travel Guide, 2014).

The primary schools in Kiambu and Nairobi Counties whose teachers answered the questionnaire in this study are located in the lower-middle-class, poor, and slum areas. These areas were selected because they reflect the practical situation affecting majority of children in primary school early learning. Fifty percent of the Kenyan population lives below the poverty line (CIA, 2013).

3.1.6   Research design

For purposes of documentation, the names of the schools were indicated using the respective schools' rubber stamps. The questionnaires investigated the teachers' knowledge and perceptions of teaching reading with regard to the language use of Kikuyu and Kiswahili. Certain sections of the questionnaire specifically investigated the teachers' metalinguistic skills in Kikuyu and Kiswahili. The questionnaires were written in English because the teachers receive teacher training in English at the TTCs and/or universities.

3.1.7   Data Collection

The data was collected using a questionnaire, which, as Robson (2002) noted, provides a simple and straight-forward way to study attitudes, values, and beliefs. They are also adaptable in terms of collecting generalizable information from diverse human populations. The Kiswahili and Kikuyu questionnaires were reviewed independently in 2011 by two Kiswahili and two Kikuyu grade 1 primary school teachers, two educational psychology lecturers, and two educationists in Kenya. In her examination of questionnaire evaluation, Oslon (2010) concluded that "the average expert ratings successfully identify questions that had higher item nonresponse rates and higher levels of inaccurate reporting." Therefore, the reviewers of the Kikuyu and Kiswahili questionnaires assisted in excluding and/or rephrasing questions that would not help gather the information required in this study. The teachers who reviewed the questionnaires were not part of the sample included in questionnaire study.

The Kikuyu and Kiswahili teacher questionnaires each had 84 questions. The questions were divided into sections that focused on questions concerning the teachers' perceptions about language issues in early reading, and attitudes and perceptions about the use and importance of the English language in early reading. Additionally, the questionnaire investigated language use in and around the schools to ascertain the teachers' access to guidebooks about early reading instruction, as well as the availability of reading material for the pupils. The questionnaire helped assess the level of teacher competence in Kikuyu and Kiswahili, specifically letter-sound knowledge, syllable knowledge, and spelling. For more details, see Appendices 1 and 2 of Study I.

The teacher questionnaires were distributed by research assistants to 100 Kiswahili-speaking schools and 100 Kikuyu-speaking schools. They were left with the head teachers, who then passed them on to the early-grade teachers in their respective schools. There was no contact between the research assistants and the early-grade teachers in order to minimize bias towards any answers.

The head teachers and research assistants agreed on the date that the questionnaires would be available for collection from the schools. The questionnaires were collected by the research assistants

3.1.8 Data analysis

The data analysis of the teacher questionnaires was divided into two distinct parts. Part 1 analyzed the teachers' perceptions of their teaching competence in early reading, their perceptions of the appropriate early teaching methods in Kikuyu and Kiswahili, and their views on the availability of teachers' guidebooks and reading material for their pupils. The questions in Part 1, ("Statements about reading experiences") were scored as: strongly agree = 5, agree = 4, disagree = 3, strongly disagree = 2, and don't know = 1. The focus of these questions was divided into four categories: teachers' perceptions of their teaching competence, preference of early reading teaching methodologies between whole word approach and the phonics approach, teachers' attitudes towards the abilities of different kinds of pupils learning to read, and teachers' perceptions of what language is most appropriate to teach early reading. Part 2 of the questionnaire analyzed the teachers' linguistics knowledge in Kikuyu and Kiswahili languages. These questions were divided into four focus areas: assessment of letter-sound knowledge using the questionnaire; assessment of syllable knowledge using the questionnaire; assessment of spelling using the questionnaire and assessment of word formulation by identifying the roots and prefixes of words using the questionnaire.

3.1.9 Psychometric properties

The means of the responses to the questions were combined and their reliability was examined. The Cronbach's alphas were as follows: .857 for questions assessing the teacher perception to their teaching competence; .667 for attitudes towards ability of different kinds of pupils learning to read; .722 for perceptions of what language is the most appropriate for teaching early reading; and .747 for preference of early reading teaching methodologies between whole word approach and phonics approach. The means of the untrained vs. trained teachers and Kiswahili teachers were compared using the independent samples t-test. The Cronbach's alpha reliability was .834 for questions assessing spelling recognition; .754 for word formulation (identification of roots of words); and .711 for prefix word identification. The analysis of the comparison of grade 1 Kikuyu teachers and grade 1 Kiswahili teachers was done using the independent sample t-test. Seven Kikuyu teachers were excluded from this analysis because they were non-native speakers of the Kikuyu language. The comparison of trained and untrained teachers was also analyzed using the independent samples t-test.

3.2 Study II: GraphoGame Kikuyu and Kiswahili adaptations pilot study

3.2.1 Introduction

Based on the questionnaire results, as well as previous research findings, it seems that teachers' knowledge of basic language skills in indigenous languages of Kikuyu and Kiswahili is relatively poor. In addition, reports of early reading assessments conducted in Kenya (such as EGRA, 2010; NASMLA, 2010; PRIMR, 2012; Uwezo, 2012) show that the level of early literacy skills, especially in reading, is very low. This has necessitated the development of plausible solutions to enhance early reading in the classrooms. In order to offer appropriate intervention measures to the pupils, it was necessary to understand the level of the early literacy skills of the grade 1 pupils learning to read in Kikuyu and Kiswahili.

3.2.2 Specific aim of the study

The aim of this study was to investigate the orthography knowledge of first-grade pupils learning early reading in Kikuyu and Kiswahili. The study also explored whether Kikuyu and Kiswahili adaptations of the GraphoGame could help children learn letter sounds and syllable sound knowledge in Kikuyu and Kiswahili. Furthermore, it explored whether learning letter-sound knowledge improved other literacy skills such as spelling. This study was a pilot model on how to investigate the challenges facing first-grade pupils learning to read in multilingual settings, such as that in Kenyan classrooms, where reading instructions are plagued by code-switching and conflicting teaching methodologies.

There is no evidence that code-switching is due to a lack of training. Therefore, the study focused on examining the pupils' orthographical awareness in print in Kikuyu and Kiswahili languages, both of which are Bantu languages spoken in Kenya. It further investigated the children's spelling awareness via a spelling recognition test. The objective of the study was to determine whether intervention of Kikuyu and Kiswahili adaptations of GraphoGame improved the pupils' orthographical awareness and spelling awareness in print.

The study was guided by the following questions:

I. What level of early literacy skills (reading and spelling) do first-grade learners have?
II. Does training using Kikuyu and Kiswahili adaptations of GraphoGame improve children's early literacy skills in letter-sound knowledge, orthographic awareness, and spelling recognition?

3.2.3 Ethical considerations

Because the participants of this study were children, the parents were asked to sign a written consent allowing their children to participate in the intervention study. The written consent forms provided background information on GraphoGame and why its use was being studied in Kenya. RGF (2005) affirms the need for valid informed consent for participation, which should be given by the participants voluntarily, without coercion, and the information they require should be offered to them clearly. The children participated in the studies voluntarily and were always provided an option to withdraw from the study if they no longer felt comfortable. None of the children withdrew from the study. Additional permissions were sought from the Ministry of Education Science and Technology and the Nairobi County Education Office, as in Study I above.

3.2.4 Participants

The participants were grade 1 pupils (n = 196) from two schools in the Nairobi and Ndenderu areas. Eighty-five pupils were from primary school A, which was located in a Kikuyu-speaking area and 111 pupils were from primary school B, which was located in a Kiswahili-speaking area. Due to limited availability of equipment, 18 children received GraphoGame Kiswahili intervention and 16 children received GraphoGame Kikuyu intervention. A further limitation to this study was that, due to absenteeism, not all the data of the 196 pupils was available for analysis and comparison. The ages of the pupils in this study differed because the school enrolling age is not strictly followed in Kenya. In addition, the free primary education has enabled older children, who were otherwise at home, to go to school.

   The children who participated in the Kiswahili study were (ideally) receiving early reading instructions in Kiswahili because the school is located in an urban area. The children who participated in the Kikuyu research were from a rural community in the Central Province of Kenya and had been receiving reading instruction in Kikuyu, but were 1 month into receiving reading instruction in English at the time of this study. (Due to pressure from parents, the teacher had changed the language of early reading instruction from Kikuyu to English.) Most of the children in the Kikuyu study spoke Kikuyu at home, but some of the children had mother tongues other than Kikuyu.

   The Kiswahili early readers spoke Kikuyu as their mother tongue. Only 1 percent of this group spoke other indigenous languages as their mother tongues. This is a practical situation, showing that even when children in an urban area primary school predominantly spoke a certain mother tongue(s), there were no programs available within the schools' curriculum, offering early reading instruction in the respective indigenous languages. The teachers were required to follow the language policy and teach early reading in Kiswahili. More details on the children's mother tongues are summarized in Table 6.

TABLE 6   Pupils' mother tongues

| Language | No. of children speaking language as mother tongue | |
	Kikuyu study	Kiswahili study
Kikuyu	60	160
Kamba	3	8
Meru	1	4
Embu	0	1
Luhya	2	4
Dholuo	2	4
Taveta	0	1

3.2.5   Context of the study

There were two research areas in this study. The first was the Kikuyu-speaking school located in Ndenderu, a small rural town located in Central Kenya, approximately 19.4 kilometers from Nairobi city center. Its economy is driven by agriculture and trade. Young people in the area help create employment by exporting paintings, carvings, and African musical instruments like the *darama* (Kikuyu drum). The teacher-pupil ratio in the study was 1:45 in the study. A map of Ndenderu area can be seen in Figure 8.

FIGURE 8   A map of Ndenderu area (Google Maps, 2014).

The Kiswahili speaking school was located in the 'Kilomita Moja' slum, popularly known by its residents as 'KM', in the Kahawa constituency of Nairobi. Although the school is considered a Kiswahili-speaking school, Kikuyu is the predominantly spoken language in this area. The teacher-pupil ratio per class in the study was 1:50. A map of Kahawa constituency can be seen in Figure 9.
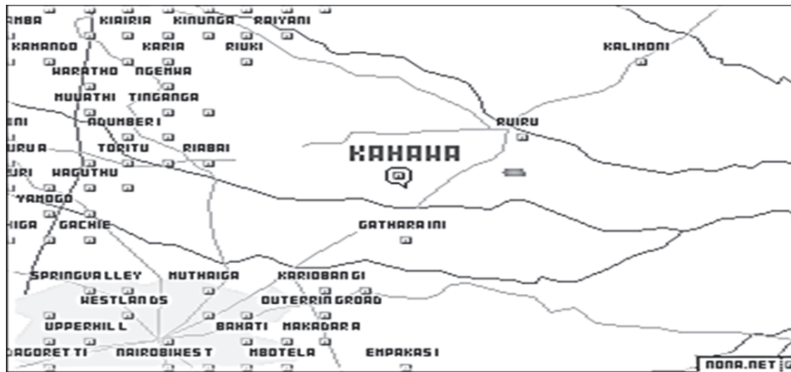
FIGURE 9   A map of Kahawa area (nona.net, 2014).

3.2.6   Research design

The 85 pupils from the Kikuyu-speaking school and the 111 pupils from the Kiswahili-speaking school received pre- and post-assessment tasks: an orthography assessment task and a spelling recognition task in Kikuyu and Kiswahili. In the orthography tests, the children were required to put a circle around all of the items that they considered orthographically appropriate in the respective languages. In the spelling recognition task, the teacher read out the sounds, syllables, and words to the pupils and the pupils were required to select the correctly spelt sound, syllable, and word. Two tests were administered for each measure as pre-tests (that is, pre-test 1 and pre-test 2 for the orthography test, and pre-test 1 and pre-test 2 for the spelling recognition task). The items started from legal/illegal letters and continued in small steps to word/non-word items. The aim of the orthography test was to assess the children's orthographic awareness in print and the instructions were to identify the items (letters, syllables, words) that were correct in the relevant language.

In the spelling recognition task, the children were required to choose (by underlining or circling) the items that corresponded to the sounds they heard. These sounds started with single phonemes and became increasingly difficult, ending in words. They were sounded out by the pupils' class teachers, who had received three hours training in sounding out prior to the assessment tasks. The children received orientation on both tasks for a total of one hour (30 minutes each day for two consecutive days) before the assessments. The orientation involved explaining the instructions to the pupils and giving them a mock orthographic recognition and a mock spelling recognition test to establish whether they understood the instructions. The selected sample (n = 34) of children based on the orthography recognition and spelling recognition tasks received the GraphoGame intervention in Kikuyu or Kiswahili, as appropriate.

3.2.7   Data collection

The Kikuyu and Kiswahili orthography recognition tests were similar in that the children were required to choose items that were orthographically correct in the respective languages (see Appendices 3 and 4 of Study II). The orthography recognition test in Kiswahili had a total of 80 items comprising letters, syllables, words, non-words, pseudo words, incorrect letters, incorrect syllables, and incorrect words. The Kikuyu orthography test had a total of 107 items, comprising letters, syllables, words, non-words, pseudo words, and incorrectly spelled words.

The Kikuyu and Kiswahili spelling tests (see Appendices 5 and 6 of Study II) had a total of 25 item rows. It started with letters, then progressed to syllables, then to CVCV (consonant, vowel, consonant, vowel (e.g., *baba*, meaning father) words and CVCVCV (e.g., *baridi*, meaning cold) words. Each correct (C) response was awarded 1, while items that were not correct (NC) were awarded 0. From each item row, the children were to choose one item from five choices presented.

The children were given two pre-tests (orthographic recognition 1 and 2 and spelling recognition tests 1 and 2) and a post-test (orthographic recognition test 3 and spelling recognition test 3) after the intervention period, which took a total of five days (at least four hours of playing time). There was a difference of only 1 day between the two pre-tests in both the Kiswahili and Kikuyu studies. The orthographic recognition test was given first, followed by the spelling recognition. The tests were administered on the same day; that is, orthography recognition test 1 was followed by spelling recognition test 1, and then, after two days, orthography test 2 was followed by spelling recognition test 2.

After the intervention period, orthography test 3 and spelling test recognition 3 were given on the same day. The tests were assessed and the top 25 percent scorers based on the performance in the tests were removed from the group by adding the total scores of the pre-tests (orthography recognition tests separately and spelling recognition tests separately), and then determining the means. In the Kiswahili study, participants (n=73) were the children who scored equal to or below 21.5 in the spelling recognition test and equal to or below 12 in the orthography test. In the Kikuyu study, participants (n=54) were children who scored equal to or below 23.5 in the spelling recognition test and equal to or below 12 in the orthography test.

In the Kikuyu study, the GraphoGame players (n=16) who were the lowest performers in the group were selected from the 54 participants. In the Kiswahili study, the GraphoGame players (n=18) who were the lowest performers in the group were selected from the 73 participants. The GraphoGame players received the intervention while the others were added to a waiting list to receive GraphoGame intervention later.

The intervention groups played GraphoGame for periods of 15 minutes, four times a day for five days. In total, both the Kikuyu and Kiswahili groups played GraphoGame for at least four hours each. The playing time was orga-

nized in such a way that the intervention group played indoors during break times while the other children (non-players) were playing outside in the school playing field. The intervention was administered via Nokia 3110 Classic mobile phones while the control group was in a waiting list to receive GraphoGame Kiswahili and Kikuyu adaptations intervention later.

3.2.8 Data analysis

Data analysis was done using the Statistical Package for the Social Sciences software (SPSS Statistics 20). In the orthography recognition tests in both Kikuyu and Kiswahili, each item was considered separately. The test items were scored as correct (C) = 1 or not correct (NC) = -1; in other words, the children were penalized for choosing an incorrect item because doing so meant they lacked orthographic awareness in the particular language. The absolute minimum score for the Kiswahili orthography recognition test was -52, and the maximum score was 28. The absolute minimum score for the Kikuyu orthography recognition test was -67 and the maximum score was 40. The Kiswahili and Kikuyu spelling recognition tests had six rows, each with five items each of letters; six rows, each with five items of syllables; then 10 rows, each with four items of CVCV words; followed by three rows, each with four items of CVCVCV words. The items were scored as correct (C) = 1 or not correct (NC) = 0. From each row of items, the children were to choose one of the five items in print. The correct item was the one that corresponded to the sounds they heard (the sounds were represented in print using letters, syllables, and words). They were sounded out by their teachers (who had received at least three hours of training in sounding out the items, prior to administering the tests). The maximum score for the spelling tests was 25 and the minimum score was 0.

3.2.9 Psychometric properties

The Cronbach's alphas for the orthography recognition test in Kikuyu was.79, compared to .82 for the orthography recognition test in Kiswahili. Cronbach's alphas for the spelling recognition were .88 for Kikuyu and .82 for Kiswahili. Analysis of the composite scores of the assessment tasks revealed that the orthography recognition tests and the spelling recognition tests in Kikuyu were significantly correlated: r= .50, p<.05. The Kiswahili orthography recognition tests and spelling recognition tests were significantly correlated as well: r =. 19, p<.05. Repeated measures MANOVA was used for the data analyses.

3.3 GraphoGame Kiswahili study

3.3.1 Introduction

An additional study was conducted based on the findings of Study II above, which show that GraphoGame Kikuyu and Kiswahili adaptations have the potential to assist children acquire initial reading skills, and the limitations of data storage of the equipment used to collect the GraphoGame data. Due to limited time and resources, this follow-up study focused on the GraphoGame Kiswahili adaptation only.

3.3.2 Specific aim of the study

This study used more advanced digital equipment to further investigate the GraphoGame Kiswahili adaptation as a tool that assists children learn the letter sound connections, syllables, and simple words, which are prerequisites for learning to read. The study also sought to establish whether pseudo-word recognition can be used to predict early reading skills of children in Kiswahili language. Pseudo-word reading shares a significant variance with spelling and word identification and is the best predictor of word identification for poor and normal readers (Rathvon, 2004).

The Android platform was used to store the player data. The pupils in the intervention group received an average of eight hours exposure/training time via Samsung Galaxy Tab 2 7.0 P3100 Android tablets. The pupils in the control group played the 'Snakes' mobile game via Nokia 3110 Classic mobile phones. In this study, important player data showing how the pupils engaged in GraphoGame Kiswahili adaptation was stored for further analysis. The study took place towards the end of the school year, by which time they were expected to have learned the oral basic knowledge of the Kiswahili language, which is a second language (L2) for all the pupils in this study. The pre- and post-assessments were done using pre-recorded items of pseudo-word and a single-word spelling task in Kiswahili. In addition, assessment tasks within GraphoGame Kiswahili adaptation, letter-sound knowledge and word recognition were used.

The study was guided by the following research questions:

  I.   Does GraphoGame Kiswahili adaptation help children improve in letter-sound knowledge, pseudo-word spelling, single-word spelling, and word recognition in Kiswahili?
 II.   Does language background (that is, mother tongue) directly affect children's early reading skills in a second language?
III.   Are there reading deficit patterns of children that are resistant to GraphoGame Kiswahili intervention?

3.3.3 Ethical considerations

As in the pilot study, the parents were required to submit consent forms allowing their children to participate in the study. Additional permission was sought from the Ministry of Education Science and Technology and from the Nairobi County Education Office.

3.3.4 Participants

The participants were first-grade pupils from two primary schools in the Nairobi Kibera area. They spoke diverse mother tongues at home; for more details see Table 6. The pupils were second- or third-language speakers of Kiswahili and many had learned the basic standard Kiswahili at school. They spoke some forms of Sheng', a colloquial language, when playing with friends. These children were generally from low-income homes and lived in the surrounding Kibera slums. The age distribution of these children was not clear, as most of them did not have birth certificates (even when this information was available on the school admission registers, it could not be verified because the children did not have birth certificates and some of the mothers did not have health cards as the children were delivered at home). The pupils had been in school for two-and-a-half school terms/semesters (approximately eight months). In total, n=269 pupils participated in the study. Kiswahili was the language used for early reading instructions in these two schools.

TABLE 7   A summary of pupils' mother tongues.

Language	No. of children who spoke language as mother tongue
Dholuo	109
Abagusii	15
Kalenjin	3
KiNubi	19
Somali	10
Kikuyu	17
Meru	1
Kamba	11
Taita	6

3.3.5 Context of the study

This study was conducted in the Kibera Slum, located five kilometers from the city center of Nairobi. As of 2009, Kibera had a population of approximately 170,000 people, according to the Kenya Population and Housing Census (2009) and covers an area of 2.38 square kilometers (Desgroppes & Taupin, 2009). The main ethnic groups found in Kibera include Luo, Luhya, Nubian, Kikuyu, Kamba, and Abagusii (Erukalr & Matheka, 2012). Living conditions in the Kibera Slum are extremely poor; according to giveachildlife.org (2013), children

in the area lack basic facilities such as running water, toilets, electricity, and heat (in the months from mid-May to July it is generally cold and in the night temperatures can drop as low as 10 degrees centigrade). Whether in school or at home, the children lack books and writing material (International Needs, 2013). The primary school gross enrolment rate is 100 percent because the primary schools in the area do not conduct entrance examinations. The teacher-pupil ratio per class is 1:90 as per this study. An aerial view of Kibera area can be seen in Figure 10.
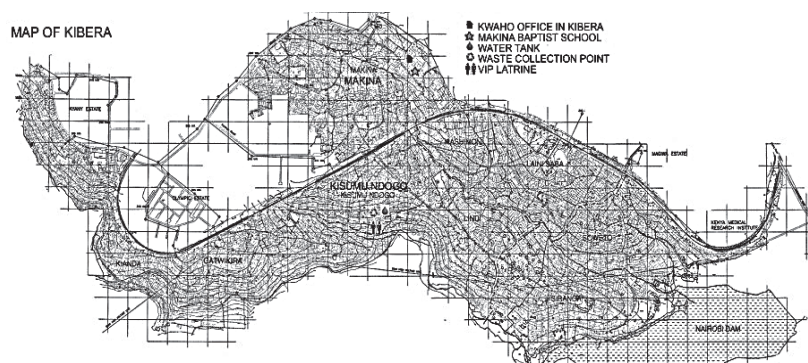
FIGURE 10 An aerial view of Kibera Slum from about 13,000 feet (Kenya Water for Health Organization, 2014).

3.3.6 Research design

The 269 pupils from Kibera and Ayany primary schools received pre- and post-assessment tasks: a pseudo-word recognition spelling task and a single-word spelling task in Kiswahili language. In both tasks, the pupils were required to listen to pre-recorded items via good-quality headphones and then write down the words they heard on a piece of paper. In each of the tasks, the assessors were required to end the assessment as soon as the pupils began to experience difficulty in spelling the items. The single-word spelling task consisted of correct Kiswahili words that began with simple words and progressed to complex words, such as *'mama'*, *'badilisha'*, and *'kiamshakinywa'*. The pre assessment tasks were scored and the pupils were divided into two groups that were equal in performance at the start of the intervention. The experimental group received GraphoGame Kiswahili intervention via Android tablets for at least one hour a day for 21 days. On average, the children received eight hours of training on GraphoGame intervention. The intervention group played another computer game via mobile phones for the same intervention period. All of the pupils (the experimental group and the control group) received the post-assessment tasks immediately after the intervention period.

3.3.7 Data collection

Pseudo-word spelling test: A pseudo-word is one that follows all the permitted sounds and letter and sound combinations, but possesses no meaning in the particular language (Rathvon, 2004). The pseudo-word spelling task in this study had a total of 29 items (see Appendix 7 of Study III for the pseudo-words list). It consisted of items that followed the structure of words in Kiswahili, but have no meaning in Kiswahili language; examples include '*fada*', '*mandazu*', '*midundanopuzu*', and '*enganeengana*'. The sounds became progressively more difficult as the children continued the tasks. Rathvon (2004) and Siegel (1998) argued that pseudo-words are the best predictors of early reading skills achievement because they show how well a child understands linguistic and grammatical rules in a particular language.

Single-word spelling task: The single-word spelling task had a total of 35 pre-recorded words in Kiswahili (see Appendix 8 of Study III for a list of the Kiswahili words). The words in the test followed the CVCV and VCV structure of the Kiswahili language and became progressively difficult as the children proceeded in the tasks. They began with two syllable words (such as *mama* (mother)) and progressed to more complex or compounded words (such as *kiamshakinywa* (breakfast; literally translated as first food in the morning). Because the children had been learning Kiswahili in school for more than seven months, it was assumed that they would be able to spell these types of words.

Letter-sound and word recognition tasks within GraphoGame Kiswahili adaptation: The letter-sound and word recognition tasks are found within the GraphoGame adaptation as one of the assessment levels. The GraphoGame Kiswahili game begins with the letter-sound recognition task, then proceeds to various game levels. After the child has progressed in the game, he or she proceeds to the word recognition task that contains Kiswahili words with the CVCV structure.

The pupils (n=269) received two external paper-and-pencil assessment tasks: the pseudo-word spelling task and the spelling word tasks, both in the Kiswahili language. Using the results from the external pre-assessment tasks (pseudo-word spelling and single-word spelling tasks), the pupils were randomly divided into two groups. The level of the performance for the two groups was equal at the start of the GraphoGame intervention. Due to absenteeism, not all of the children who participated in the pre-intervention tasks were available for intervention. Consequently, the intervention group of 133 pupils received the GraphoGame Kiswahili intervention via Samsung Galaxy Tab 2 7.0 P3100 Android tablets for three weeks, while the other group of 128 pupils (the control group) played the 'Snakes' mobile game via Nokia 3110 Classic mobile phones.

In the external assessment tasks, the children heard sounds from pre-recorded items installed to the tablets via good-quality Logitech Stereo Headset H110 headphones. They were required to write down (spell) the words that

they heard for both the pseudo-word spelling task and the single-word spelling task. The researchers were required to stop the assessments when the children were no longer able to spell the items. The pupils received the assessment tasks immediately before and after the intervention period.

In the assessment tasks within the GraphoGame Kiswahili adaptation (that is, the letter-sound knowledge task and the word recognition tasks), the children heard the speech sounds via good-quality Logitech Stereo Headset H110 headphones and were required to select the correct items by swiping their finger on the Android tablet. With the help of SIM cards from the Safaricom network, the results from these tasks were automatically transferred to the GraphoGame server for analysis.

3.3.8 Data analysis

Data analysis was done using the Statistical Package for the Social Sciences software (SPSS Statistics 20). The items in the external assessment tasks were scored as correct/incorrect. The analysis of the external assessment tasks was done using repeated measures MANOVA, one-way ANOVA, independent samples t-test, and a paired sample t-test. The items in the pseudo-word and single-word recognition tasks (the external assessment tasks) were scored as Correct = 1 and incorrect = 0.The tasks within GraphoGame Kiswahili adaptation were stored in the GraphoGame server for analysis. The results of these assessment tasks within GraphoGame Kiswahili (that is, letter-sound assessment and word recognition assessment) were analyzed by comparing the top score that each child received in the evaluation points with the pre-assessment score. In the letter-sound tasks, the results compare the 127 intervention group pupils with the 99 pupils in the control group. In the word recognition results, there were 127 pupils in the intervention group and 98 pupils in the control group; in the top score/final evaluation point, the intervention group 127 pupils were compared against 91 pupils in the control group in the letter-sound task and 126 against 91 in the word reading task.

3.3.9 Psychometric properties

The letter-sound knowledge and word recognition tasks within GraphoGame Kiswahili were significantly correlated; $r = .73$, $p = .001$. Additional correlations of the assessment tasks are given in Table 8. The Cronbach's alpha for the pseudo-word spelling was .93 and for the single-word spelling was .95. The pseudo-word spelling and single-word spelling tasks were significantly correlated ($r=.90$, $p< .001$ and $r = .93$, $p<.001$ in the pre-tests and post-test, respectively).

TABLE 8   Correlations of the assessment tasks.

Assessment tasks	Correlations
Letter-sound assessment & pseudo-word spelling pretest	$r = .15, p = .05$
Letter-Sound assessment & single-word spelling pretest	$r = .15, p = .05$
Word recognition task & pseudo-word spelling pretest	$r = .27, p = .001$
Word recognition & single-word spelling pretest	$r = .23, p = .01$

4 RESULTS

4.1 Teacher questionnaire survey

4.1.1 Language background of the teachers

In section A of the questionnaire, which focused on statements concerning perception of the teachers to various issues in early reading, the teachers were provided with statements and asked to choose whether they strongly agreed, disagreed, agreed, strongly agreed, or did not know what perceptions they held. The overall results show that teachers had difficulty in spelling and syllable knowledge and that the teachers and their pupils did not have sufficient guidebooks and reading material, respectively. The information obtained from this questionnaire analysis is especially useful when designing digital tools or applications for use in these multilingual classrooms so that technical and academic experts can discern the best way to use these digital adaptations; from GraphoGame Kikuyu and Kiswahili adaptations in first-grade classrooms in Kenya.

The general results of the language background information show that there is no clear structure on how language is used in the schools and during reading lessons. Besides, there appears to be code-switching during the reading lessons. Sixty-two percent of the teachers indicated that Kiswahili was the language most spoken in both the Kikuyu and Kiswahili schools. Although 70 percent of the teachers agreed that teaching a child to read in the child's mother tongue is more appropriate than teaching reading in a new language, they used both English and Kiswahili languages when teaching early reading skills in Kikuyu or Kiswahili. Forty-one percent of the teachers reported that parents were opposed to their children being taught early reading skills in indigenous languages and 77 percent indicated that parents prefer their children to be taught early reading skills in English. It is also clear that reading is not given individual focus in the early classrooms. All of the teachers felt that reading should be taught as part of a language lesson. Ninety-three percent of the Kikuyu teachers

evaluated their reading skills in Kikuyu as proficient, while 98 percent of the Kiswahili teachers measured their reading skills in Kiswahili as average. The results also show that the teachers' age group and working experience had no influence on their answers to questions assessing their perceptions. The age distribution of the teachers can be seen in Figure 5.

4.1.2 Teacher perception and attitudes to their teaching competence, teaching methodologies, their pupils and language of instruction

Table 9 summarizes teachers' perceptions regarding the most critical questions. Sixty-five percent of the teachers appeared to have confidence in their teaching ability, with 56 percent agreeing and 9 percent strongly agreeing with positive statements concerning their ability. Surprisingly, teacher training did not have a positive influence regarding their perception to their competence; an analysis using the independent samples t-test revealed that teachers without formal teacher training (M = 3.40, SD = 0.39) had more confidence in their teaching competence than trained teachers (M = 2.18, SD = 0.61), (t (21.08) = 10.99, p< .001).

An analysis conducted using an independent samples t-test showed that trained teachers (M=3.06, SD = 0.94) had significantly higher preference for phonics methodology in teaching early reading in Kikuyu and Kiswahili than untrained teachers (M= 2.03, SD =0.13), (t (163.79) = - 13.27, p< .001). Kikuyu teachers (M =3.64, SD = 0.45) favored the phonics method for teaching early reading significantly more than the Kiswahili teachers (M=2.37, SD = 0.87), (t (198) = 12.83, p< .001).

In general, the teachers lack confidence in their pupils' abilities to learn reading skills. There was a clear difference when the trained teachers' attitudes were compared to those of the untrained teachers using an independent samples t-test. The trained teachers (M = 2.36, SD = 0.86) had significantly more confidence in their pupils ability to learn early reading skills than the untrained teachers (M = 1.13, SD = 0.52), (t (26.20) = - 9.00, p< .001). Kiswahili teachers had more confidence in their pupils' early reading skills than the Kikuyu teachers (M = 2.18, SD = 0.71), (t (204) = 2.26, p = < .05).

Fifty-five percent of the teachers who answered the questions did not have any preference for English over Kikuyu or Kiswahili. A comparison of the perceptions of trained versus untrained teachers on the significance of using English to teach early reading showed no difference in opinion. Comparison of the Kikuyu and Kiswahili teachers using an independent samples t-test revealed that the Kikuyu teachers (M = 3.64, SD = 0.45) were more inclined towards using English for teaching early reading instruction than the Kiswahili teachers (M = 2.37, SD =0.87), (t (144) =-15.3, p< .001).

TABLE 9   Teachers' responses to the most critical statements about their perception to teaching early reading instructions, pupils reading ability and the influence of English (%).

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
I have sufficient training to teach phonics in Kiswahili	50	16	16	3	13
Girls are poorer readers than boys	21	33	19	25	1
Children with reading difficulties are not clever	16	58	18	8	1
I would be more interested in teaching reading in English than Kiswahili	9	22	18	51	1
I would get better results in children's reading instruction if it was focused on English	8	30	17	42	2
I would prefer teaching reading in Kikuyu/Kiswahili using whole-word approach over phonics-based instruction	12	26	18	40	3
It is better to teach early reading in English as it is the language of examination in the final grade	14	9	21	37	18
Only people who can read well in English can be considered literate	11	35	11	41	1
Ideally, Sheng' should be used to teach reading as it is the language the children would understand best	9	34	13	37	7

4.1.3 Teachers' linguistic knowledge of Kikuyu and Kiswahili

Letter-sound knowledge: In section F of the teacher questionnaire (see Appendix 1), the questions sought to establish the teacher knowledge of vowel sounds in Kikuyu and Kiswahili. The teachers' general letter-sound knowledge can be seen in Table 10. The results of the assessment analyzing the vowel sounds in Kiswahili and Kikuyu languages show that the vowels /o/ and /u/ were the most problematic. Eighty-eight percent of the teachers chose the English word 'university' as having the representation of the vowel sound [u] as sounded out in Kiswahili. Forty-two percent of the teachers chose the English word 'own' (a diphthong sound that can be considered to be formed from vowel sounds /o/ and /u/) as having the representation of the vowel sound [o] as sounded out in Kiswahili. An analysis using in-dependent samples t-test revealed that Kikuyu teachers had significantly better knowledge than Kiswahili teachers of the vowel sounds [a], [e], [i] as represented in Table 9. Kiswahili teachers (*M*= 0.17, *SD*= 0.38) had significantly better knowledge of the sound [u] than Kikuyu teachers (*M*= 0.00, *SD* = 0.00) (*t* (102) = 4.65, *p*< .001).

TABLE 10   Teacher knowledge in the vowel sounds.

Vowel	Teacher Language	*M*	*SD*	Comparison using independent sample t-test
[a]	Kikuyu	.95	.21	*t* (149.1) =. - 7.52, *p*< .001
	Kiswahili	.55	.50	
[e]	Kikuyu	.86	.35	*t* (188.9) =. -3.11, *p*< .01
	Kiswahili	.68	.47	
[i]	Kikuyu	1.0	.00	*t* (103) =.-8.69, *p*< .001
	Kiswahili	.58	.50	

An independent samples t-test showed that trained teachers had significantly better knowledge of the vowel sounds [i] and [o] than their untrained counterparts. Trained teachers (*M*= 0.82, *SD*= 0.39) had better understanding of the sound [i] than untrained teachers (*M*= 0.40, *SD*= 0.51), (*t* (15.31)= 3.14, *p*<.001). Trained teachers (*M*= 0.51, *SD*= 0.50) had better understanding of the sound [o] than untrained teachers (*M*= 0.07, *SD*= 0.26), (*t* (23.36) = 5.81, *p*<.001).

Syllable knowledge: In section F of the teacher questionnaire (see Appendix 1), there were two questions in each of the Kikuyu and Kiswahili questionnaires that asked teachers to count the number of syllables in the words *mwaki* (fire) and *kûhûmûka (*to breathe) in Kikuyu and the words *mlima (*hill) and *kuzurura (*to walk around) in Kiswahili. An analysis using the independent samples t-test showed that Kikuyu teachers had better knowledge of the syllables. The Kikuyu teachers (*M* = 0.97, *SD* = 0.18) had better knowledge of syllables in the word *mwaki* than Kiswahili teachers (*M* = 0.56, *SD* = 0.50) in the word *mlima* (*t* (61.81) = -5.78, *p*< .001). The Kikuyu teachers (*M* = 0.99, *SD* = 0.14) also had better knowledge in the word *kûhûmûka* than the Kiswahili teachers (*M* =0.68,

SD = 0.47) did in the word *kuzurura* (*t* (63.72) = -4.59, *p*< .001) There was no significant difference in syllable knowledge when trained and untrained teachers were compared.

Spelling[7]: In general, the overall performance of the teachers in the spelling recognition task was poor. An analysis using an independent samples t-test revealed that the Kiswahili teachers had better overall knowledge in spelling, as seen in Table 11.

TABLE 11   Comparison of Kikuyu and Kiswahili teachers' knowledge in spelling.

Words				*M*	*SD*	Comparison using inde-
Kikuyu	Kiswahili	English translation	Teacher Language			pendent samples t-test
kîndû	*Kitu*	Thing	Kikuyu	0.0	0.0	*t* (104) = 59.40, *p*< .001
			Kiswahili	0.97	0.17	
mwana	*mtoto*	Child	Kikuyu	0.52	0.50	*t* (83) = 8.69, *p*< .001
			Kiswahili	1.00	0.00	
thîinî	*ndani*	Inside	Kikuyu	0.13	0.34	*t* (107) = 24.02, *p*<.001
			Kiswahili	0.99	0.10	
fungua	*hingûra*	To open	Kikuyu	0.44	0.50	*t* (94) = 10.89, *p*< .001
			Kiswahili	1.00	0.00	
nyamû	*mnyama*	Animal	Kikuyu	0.09	0.29	*t* (173.46) = 9.30,
			Kiswahili	0.62	0.48	*p*< .001

Kikuyu teachers (*M* = 1.0, *SD* = 0.0) had better knowledge of the correct spelling of the word *mûndû* than Kiswahili teachers (*M* = 0.74, *SD* = 0.44) did of the word *mtu* (person) (*t* (101) = - 6.03, *p*< .001).

Untrained teachers had significantly better knowledge of spelling than trained teachers; see Table 12 for further details.

TABLE 12   Comparison of trained and untrained teachers' knowledge in spelling.

Words				*M*	*SD*	Comparison using inde-
Kikuyu	Kiswahili	English translation	Teacher Qualification			pendent samples t-test
kîdû	*kitu*	Thing	Trained	0.40	0.50	*t* (189) = -15.28, *p*< .001
			Untrained	1.0	0.00	
mwana	*mtoto*	Child	Trained	0.77	0.42	*t* (176)= -7.29, *p*< .001
			Untrained	1.00	0.00	
thîinî	*ndani*	Inside	Trained	0.50	0.50	*t* (187)= -12.83, *p*< .001
			Untrained	1.00	0.00	
hingûra	*fungua*	To open	Trained	0.60	0.46	*t* (189)= -9.11, *p*<.001
			Untrained	1.00	0.00	

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7   The teachers were required to make a spelling recognition test of the correct spelling of English words given in Kikuyu and Kiswahili, respectively. The words had similar meaning in both Kikuyu and Kiswahili.

Word formulation: Please refer to the teacher questionnaire for more information on the word formulation instructions. Kiswahili teachers had significantly better knowledge of word formulation, as indicated on Table 13.

TABLE 13   Comparison of Kikuyu and Kiswahili teachers' knowledge in word formulation.

Kikuyu words	Kiswahili words	Teacher Language	*M*	*SD*	t-test
		Identification of roots of words			
kûhîtûka	*kukamata*	Kikuyu	0.00	0.00	*t* (104) = 6.30, *p*< .001
(To pass)	(To hold)	Kiswahili	0.33	0.47	
mûtungu	*mwanangu* (My	Kikuyu	0.00	0.00	*t* (104) = 6.75, *p*< .001
(Plump)	child)	Kiswahili	0.34	0.48	
teng'era	*kung'oa*	Kikuyu	0.00	0.00	*t* (104) = 6.90, *p*< .001
(Run)	(To extract)	Kiswahili	0.52	0.50	
		Identification of prefixes in words			
rûgano	*rutuba*	Kikuyu	0.0	0.0	(*t* (103) = 8.86, *p*< .001
(Tale)	(Fertility)	Kiswahili	0.73	0.45	
menamenîrera	*ndumilakuwili*	Kikuyu	0.83	0.37	(*t* (191) = 1.71, *p*< .001
(Dislike)	(Hypocrite)	Kiswahili	1.0	0.0	

The Kikuyu teachers (*M* = 1.0, *SD* = 0.0) had better knowledge of the formation of roots from the words *gima* (a type of food made from maize meal) than Kiswahili teachers (*M* =0.14, *SD* = 0.35) did regarding the word *gari* (car) (*t* (112) =.-17.10, *p*< .001). Untrained teachers (*M*= 0.93, *SD*= 0.14) had significantly better knowledge in the identification of the prefixes in words than trained teachers (*M*= 0.41,*SD*= 0.37), (*t* (33.83) = 11.74, *p*< .001)

4.1.4   Availability of teacher guidebooks and pupil reading material

Analysis of the questionnaire background information revealed that 64 percent of the teachers who answered the questionnaire have never received any instruction on how to teach reading from a teacher's guide book. In addition, none of the Kikuyu language teachers had received any instruction from a teachers' guide-book on how to teach early reading in Kikuyu. Furthermore, the children they taught did not have sufficient reading material in class during reading lessons, and did not have reading material to practice their reading after learning initial reading skills. Fifty-one percent of the teachers indicated that their pupils did not have any books at all in class and 55 percent indicated that their pupils did not have any books at all to practice their reading skills outside the classroom setting. Table 14 provides more details on teachers' views about the availability of books for pupils.

TABLE 14   Teachers' views on the availability of reading material to grade 1 pupils.

Availability of books for pupils	%
Three children sharing one book in class	15
Two children sharing one book in class	13
Availability of books in Kikuyu inside & outside class	0
Availability of books in Kiswahili outside class	1
Availability of books in English outside class	49

4.2   GraphoGame Kikuyu and Kiswahili studies

Analysis of the results, based on the assessment of the orthographic knowledge via the orthography reading test and on the spelling recognition test where children made selections on the basis of dictation, shows that many of the children are at risk of developing reading problems that stem from poor instruction and conflicting language codes.

Orthography awareness: In the orthographic reading, a comparison was made using a repeated-measures MANOVA of between-subjects' effects and of subjects in time effect. The mean of pre-tests 1 and 2 was used as the pre-test measure and contrasted to the post-test in Kikuyu of (38) pupils in the control group and (16) pupils who were GraphoGame Kikuyu players. The results show that both groups improved constantly: (F (1, 573.19) = 23.47, $\eta2$ = 0.31, p< .001). The GraphoGame players (M= 14.1, SD = 9.95) improved significantly more in the orthography recognition than the non-players; (M = 2.87, SD = 6.18), (F (1, 52) = 64.47 $\eta2$ = 0.55, p< .001. Similarly, in the Kiswahili orthography recognition, both the players and non-players improved over time, (F (1,65) = 131.04, $\eta2$=0.67, p< .001. The GraphoGame Kiswahili players (M = 9.78, SD = 5.96) improved significantly more than the non-players; (M = 0.96, SD = 7.94), (F (1, 65) = 36.41, $\eta2$ = 0.36, p< .001. The interaction of the players and non-players in the orthography tests in Kikuyu and Kiswahili can be seen in Figures 11 and 12, respectively.
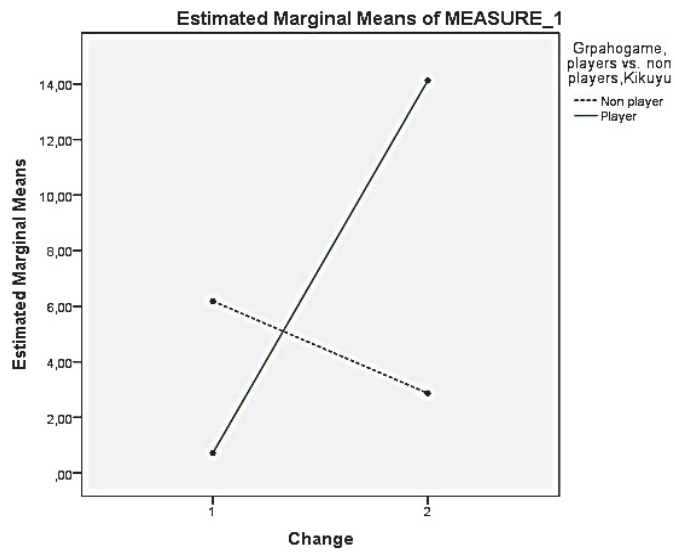
FIGURE 11 Interaction of GraphoGame Kikuyu players in the Kikuyu orthography recognition test.
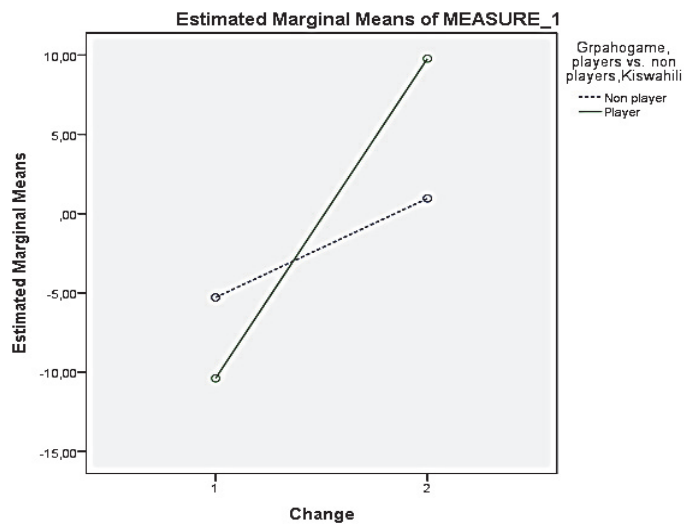
FIGURE 12 Interaction of GraphoGame Kikuyu players in the Kiswahili orthography recognition test.

4.3   GraphoGame Kiswahili study

The results show that the children who received the GraphoGame Kiswahili adaptation intervention improved in all of the post-assessment tasks; that is, pseudo-word spelling, single-word spelling, letter-sound knowledge, and word recognition. Due to absenteeism, data from 42 of the participants was missing and their results were excluded from the analysis. A total of 269 pupils participated in the study at the beginning; however, the final results are from a total of 220 pupils (131 girls and 89 boys).

Assessment tasks within GraphoGame; letter-sound knowledge and word recognition tasks: A comparison was done using a paired sample t-test of the gain scores against the top scores of the pre-assessment tasks of the intervention group of 128 pupils and the control group of 92 pupils. The results show that both groups improved over time; $(F$ $(1,$ $213)$ $=$ $413.67,$ $\eta2$ $=0.66,$ $p<$ $.001)$. The GraphoGame Kiswahili players $(M = 21.28, SD = 4.25)$ improved significantly more in the letter-sound knowledge task than the non-players; $(M = 12.32, SD = 5.03),$ $(F$ $(1,$ $213)$ $=$ $38.35,$ $\eta2$ $=$ $0.15,$ $p<$ $.001)$. The interaction of the players and non-players in the letter-sound knowledge and word recognition can be seen in Figures 13 and 14, respectively. The group effect was significant; $(F$ $(1,$ $213)$ $=$ $133.36,$ $\eta2$ $=$ $0.39,$ $p<$ $.001)$.
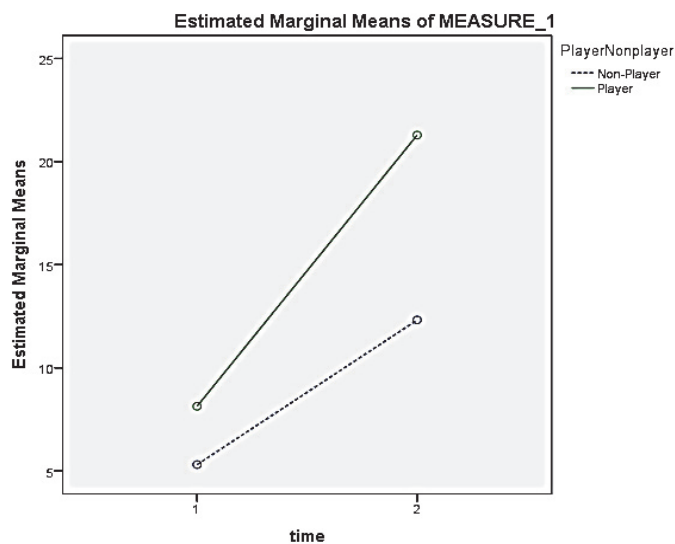
FIGURE 13 Interaction of GraphoGame Kiswahili players and non-players in letter-sound knowledge.
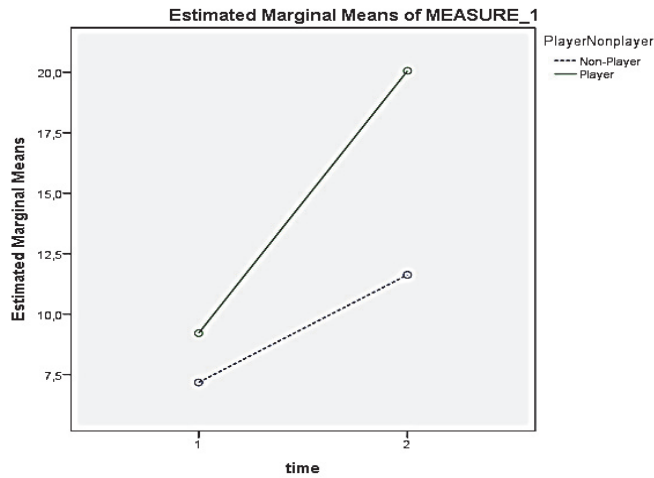
FIGURE 14 Interaction of GraphoGame Kiswahili players and non-players in word recog-
nition knowledge.

Further analysis of the overall performance of the children in the assessment
tasks within GraphoGame Kiswahili shows that the children's performance
started to decline after they had obtained the best possible scores (that is, the
top score from a total of 27 letter-sound knowledge and 21 word recognition
assessments). There was a clear difference when the last scores the children
obtained were compared to the top scores in the tasks within the GraphoGame
Kiswahili adaptation; that is, letter-sound knowledge and word recognition
tasks, as shown in Table 15.

TABLE 15 A comparison of the overall performance between the top score and the last
score.

Paired Samples Test

	Paired Differences		t	df	Sig. (2-tailed)
	M	SD			
Word reading Top Score - Last Score	5.841	6.460	10.149	125	.000
Letter-sound Knowledge Top Score - Last Score	3.800	6.093	9.145	214	.000

GraphoGame intervention-resistant pupils: Seven players had only a slight
improvement in performance in the post tests. Additionally, there were three

players whose performance did not change and four players whose performance declined in the post-assessment tasks. A further game log analysis of this group did not reveal any systematic patterns. The children had non-specific challenges. Figure 15 provides an example of a daisy graph from a resistant player.
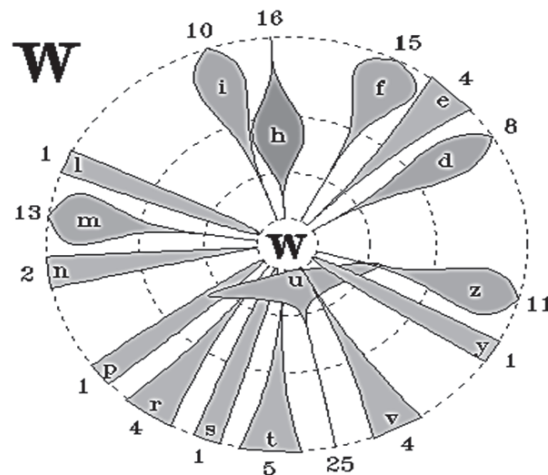
FIGURE 15 A daisy graph of a GraphoGame Kiswahili resistant player (GraphoGame Kiswahili study, 2013).

External assessment tasks: Pseudo-word spelling and single-word spelling assessment tasks: The progress of the players and non-players in the pseudo-word spelling and single-word spelling assessment tasks were compared using repeated measures MANOVA of between subjects and of subjects in time effects. The pre-test assessment tasks in the pseudo-word spelling of 128 pupils who were GraphoGame players were compared to 92 pupils in the control group. In the pseudo-word spelling assessment, the results showed that both groups improved; (F (1, 218) = 72.54, $\eta2$ = 0.25, $p<$ .001). The GraphoGame players (M = 13.75, SD = 7.28) improved significantly more than the control group (M = 12.04, SD = 7.68) in the pseudo-word recognition task, (F (1,218) = 11.81, $\eta2$ = 0.05, $p<$ .001). The interaction of the players and non-players can be seen in Figure 16.

Estimated Marginal Means of MEASURE_1
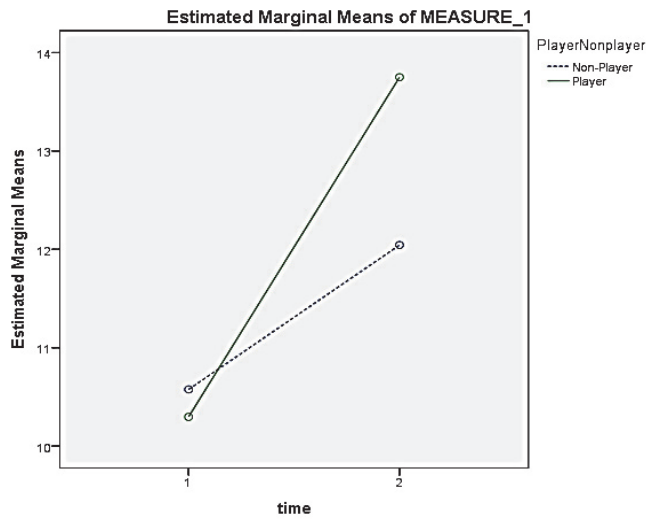
FIGURE 16 Interaction of GraphoGame players and non-players in pseudo-word and single-word assessments combined.

A similar comparison of the 92 pupils in the control group and 128 pupils who played GraphoGame Kiswahili was made in the single-word spelling assessment task. Similarly, both groups improved over time; (F (1, 218) = 138.94, $\eta2$ = 0.39, p< .001). The children who received the GraphoGame intervention (M = 18.04, SD = 9.16) improved significantly more than the children in the control group (M = 16.17, SD = 9.45) who played another computer game; (F (1, 218) = 18.99, $\eta2$ = 0.08, p< .001). Figure 17 shows the interaction of GraphoGame players and non-players in the single-word assessments.
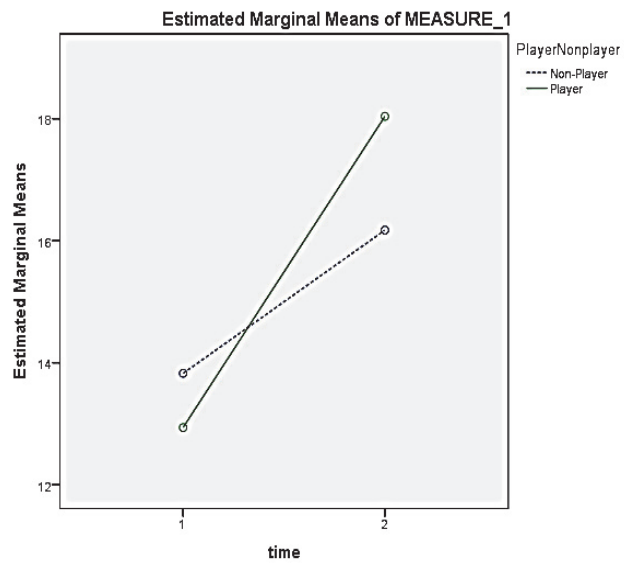
FIGURE 17 Interaction of GraphoGame players and non-players in pseudo-word and single-word assessments combined.

The children's individual mother tongue(s) did not have any influence on their learning performance in the pseudo-word and single-word spelling tasks, as highlighted in Table 16.

TABLE 16   Means and standard deviations of the pseudo- and single-word spelling tasks by children's mother tongue(s).

Descriptives

		N	M	SD	Std. Error	95 % Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
GainPseudoWordAss	Kikuyu	10	4.2000	4.73286	1.49666	0.8143	7.5857	-3.00	11.00
	Dholuo	64	3.9844	5.30795	0.66349	2.6585	5.3103	-7.00	21.00
	Abaluhya	17	3.0588	4.95569	1.20193	0.5108	5.6068	-11.00	11.00
	Abagusii	11	-0.1818	3.42982	1.03413	-0.4860	2.1224	-7.00	6.00
	Akamba	5	3.0000	3.60555	1.61245	-0.4769	7.4769	-1.00	8.00
	Taita	4	5.5000	1.91485	0.95743	2.4530	8.5470	4.00	8.00
	Kalenjin	2	3.0000	1.41421	1.00000	-0.7062	15.7062	2.00	4.00
	Nubian	15	3.0000	2.10442	0.54336	1.8346	4.1654	-1.00	6.00
	Somali	2	7.0000	1.41421	1.00000	-0.7062	19.7062	6.00	8.00
	Total	130	3.4538	4.68729	0.41110	2.6405	4.2672	-11.00	21.00
GainSingleWordAss	Kikuyu	10	4.3000	4.27005	1.35031	1.2454	7.3546	-1.00	13.00
	Dholuo	64	5.1563	6.17527	0.77191	3.6137	6.6988	-6.00	27.00
	Abaluhya	17	4.7059	4.87038	1.18124	2.2018	7.2100	-9.00	13.00
	Abagusii	11	4.8182	5.47391	1.65044	1.1408	8.4956	-7.00	13.00
	Akamba	5	5.8000	6.90652	3.08869	-0.7756	14.3756	-2.00	13.00
	Taita	4	7.0000	1.82574	0.91287	4.0948	9.9052	5.00	9.00
	Kalenjin	2	11.0000	2.82843	2.00000	-0.4124	36.4124	9.00	13.00
	Nubian	15	4.4667	3.56304	0.91997	2.4935	6.4398	-1.00	11.00
	Somali	2	6.0000	2.82843	2.00000	-0.4124	31.4124	4.00	8.00
	Total	130	5.1077	5.38768	0.47253	4.1728	6.0426	-9.00	27.00

Further analysis using one-way ANOVA revealed that the children's moth-er tongue(s) did not have any influence on the children's performance, even when grouped to form the larger language groups (Bantu, Nilotic and Cushitic) in the pseudo-word spelling and single-word spelling assessment tasks of the GraphoGame Kiswahili players (intervention group); ($p > .05$). Due to absenteeism and consequent missing values, the results of 37 participants are excluded from this analysis. The details are available in Table 17.

TABLE 17   Effect of mother tongue on performance in the assessment tasks.

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Gain in Pseudo Word Assessment	Between Groups	57.287	2	28.643	1.310	.273
	Within Groups	2776.936	127	21.866		
	Total	2834.223	129			
Gain in Single Word Assessment	Between Groups	2.997	2	1.499	.051	.950
	Within Groups	3741.495	127	29.461		
	Total	3744.492	129			

5 DISCUSSION

5.1 Summary of the findings

5.1.1 Teacher questionnaire survey

This study involved the distribution of questionnaires to 102 teachers of early reading in Kikuyu language and 111 teachers of early reading in Kiswahili language. The questionnaire was divided into two parts. The first part asked the teachers to answer questions that would provide background information about teachers' perceptions regarding early reading acquisition, background information on language use in their schools, and the availability of teacher guidebooks and reading books for pupils. The second part asked the teachers to answer questions that measured their language competence as teachers of early reading in Kikuyu and Kiswahili languages.

The background information collected using the teacher questionnaire revealed that the teachers did not have sufficient guidebooks and their pupils did not have enough reading material to use in class. Almost 70 percent of the teachers indicated that their pupils did not have reading material outside the classroom setting. It is also clear that reading is not given individual focus in the early classrooms. All the teachers concurred that early reading instruction was taught as part of a language lesson and not as a lesson by itself. Although 70 percent of the teachers agreed that teaching a child to read in the child's mother tongue is more appropriate than teaching reading in a new language, they used both English and Kiswahili and the local languages when teaching early reading skills. Forty-one percent of the teachers reported that parents were opposed to their children being taught early reading skills in indigenous languages, and 77 percent indicated that parents prefer that their children be taught early reading skills in English.

The general results of the language background information indicate that there is no clear structure on how language is used within the schools and during the early reading lessons. The teachers reported that they used both English and Kiswahili languages when teaching early reading skills in reading lessons that were supposed to be exclusively in Kikuyu or Kiswahili. The results also

show that the age group of the teachers and the length of their working experience had no influence on their perceptions. Ninety-three percent of the Kikuyu teachers evaluated their reading skills in Kikuyu as proficient, while 98 percent of the Kiswahili teachers measured their reading skills in Kiswahili as average. Compared to the Kiswahili early reading teachers, the teachers of early reading in Kikuyu felt that teaching children early reading using the phonics method would be appropriate in terms of enabling them to acquire early reading skills optimally. Kiswahili teachers had more confidence in their pupils' early reading skills than the Kikuyu teachers did. However, the Kikuyu teachers were more inclined to use English for teaching early reading instruction than the Kiswahili teachers.

A comparison of the trained and untrained teachers showed that teacher training did not have a positive influence on teachers' perceptions of their teaching competence. Teachers without formal teacher training had more confidence in their teaching competence overall than trained teachers did. Questions about what teaching methodology the teacher viewed as most appropriate in teaching early reading instruction revealed that trained teachers had a significantly higher preference for phonics methodology than untrained teachers did. Additionally, trained teachers had significantly more confidence in their pupils' ability to learn early reading skills than the untrained teachers did. Furthermore, teacher training had no influence on the teachers' preference for using the English language over the indigenous languages in early reading instruction. Trained teachers did not use Sheng' language to teach early reading instruction to their pupils.

The overall results show that teachers had difficulty in spelling and syllable knowledge. The results of the assessment analyzing the vowel sounds in Kiswahili and Kikuyu languages show that the vowels /o/ and /u/ were the most challenging vowels for the teachers. Kikuyu teachers had significantly better knowledge of the vowel sounds, syllables, and spelling than Kiswahili teachers did. Kiswahili teachers had significantly better knowledge of word formulation than the Kikuyu teachers. Trained teachers had better knowledge of the vowel sounds compared to the untrained teachers, while the untrained teachers had better knowledge of spelling and word formulation than the trained teachers. More than 60 percent of the teachers who participated in the questionnaire survey revealed that they have never received any instruction on how to teach reading from a teacher's guidebook. None of the Kikuyu language teachers had received any instruction from a teachers' guidebook on how to teach early reading in Kikuyu.

5.1.2 GraphoGame Kikuyu and Kiswahili study

This study investigated the pupils' level of orthographic awareness and knowledge of spelling in Kikuyu and Kiswahili languages. It also explored the GraphoGame adaptations as tools that enhance orthographic awareness and knowledge of spelling of the pupils in Kikuyu and Kiswahili. The results based on the spelling and orthographic recognition tasks show that many of the chil-

dren are at risk of developing reading problems. Both the player and non-player groups improved during the period of the study. However, the Grapho-Game players of both the Kikuyu and Kiswahili adaptations improved significantly more in the orthography recognition than the non-players. The results from the spelling recognition tasks were inconclusive.

5.1.3 GraphoGame Kiswahili study

This study investigated the pupils' knowledge of spelling Kiswahili Pseudo words and ordinary words. It explored the GraphoGame Kiswahili adaptation as a tool that could be used to help pupils improve their early spelling skills. The general performance of the pupils in the pre-assessment pseudo-word spelling and single-word spelling tasks was very poor. The pupils who received the GraphoGame Kiswahili adaptation intervention improved in all the post-assessment tasks; that is, letter-sound knowledge, word recognition, pseudo-word spelling and single-word spelling. Further analysis within the Grapho-Game data showed that the pupil's performance started to decline after they had obtained the best possible scores (top scores). There were three players whose performance did not change and four players whose performance declined in the post-assessment tasks. More analysis of the game logs of the pupils did not reveal any methodic challenges. Additional analysis showed that the children's individual mother tongue(s) did not have any influence on their performance in the pseudo-word and single-word spelling tasks.

5.2 Limitations of the studies

The three studies explained above faced several restrictions. In Study I, the data was collected using questionnaires. The questions were generally divided into two parts. The questions in Part 1 aimed to gather background information of the teachers, information on teacher perceptions to early reading acquisition, background information on language use in their schools, and the availability of teacher guidebooks and reading books for pupils. The findings were important in order to gain an understanding of the teachers' perceptions to early reading acquisition with regard to language, the language background of the teachers, and language use within the schools. This information provided insights into how the teachers' perception, language use, and availability of reading material might affect teaching and learning in the early classrooms.

The questions in Part 2 investigated the teachers' language competence in knowledge of vowel sounds, syllable knowledge, spelling, and word formulation. It was necessary to establish the teachers' level of language knowledge, as teachers of early reading in the two languages of Kikuyu and Kiswahili. Adequate teachers of reading, writing, and spelling should have a proper comprehension of metalinguistics of language, as lack of this knowledge may cause them to create learning problems in their pupils (Fielding-Barnsley& Purdie,

2005). The letter sound analysis provided some knowledge base, but failed to establish the exact teachers' knowledge of letter-sound knowledge of Kikuyu and Kiswahili vowel sounds.

Although the questionnaire instrument was piloted before the actual study and the teachers answered the questions on the vowel sound knowledge, further analysis revealed that the answers were not reliable enough to be used to measure the actual knowledge in the vowel sounds. The method that was used based its measurements on the English language pronunciations, which vary in terms of American,British,and numerous other pronunciations such as New Zealand, Irish, Australian, Scottish, Canadian, etc. (McHugh, 2014). Further still, English pronunciations differ in Africa depending on the country and mother tongue a person speaks (Reis, 2009). The teachers' individual English language pronunciations may have affected the answers they selected. Njoroge (2008) explains that primary school teachers in Kenya speak various phonological and grammatical variations of the English language. A better measure should have been to record the teachers sounding out the vowels and then analyze whether the sounds were consistent with the Kiswahili language. Furthermore, the teachers did not receive the GraphoGame Kiswahili and Kikuyu intervention, which meant it was not possible to compare their letter sound knowledge before and after the intervention.

In Study II, data was collected using an orthographic awareness test and a spelling recognition test. The findings from these two tests were to be used to measure early literacy skills of the pupils in grade 1 in Kikuyu and Kiswahili. The spelling recognition test failed to show any conclusive results, mainly because it requires a longer time to train spelling recognition than orthographic awareness, and the pupils in the intervention group received only four hours of intervention. Additionally, the Nokia 3110 Classic mobile phones used in the GraphoGame intervention did not store detailed player data, so it was not possible to analyze how the children engaged in the game. The player data collected in the GraphoGame server enables researchers and teachers to clearly see the letters, syllables, or words that may be problematic for the pupils. This enables additional intervention measures to be designed to assist the pupils at their point of need. The short amount of intervention time (approximately four hours) made the Kiswahili and Kikuyu pupils' progress less reliable when analyzed scientifically in comparison to other GraphoGame studies that have intervention time of at least six hours.

In Study III, the data was collected using a pseudo-word spelling task and a single-word spelling task. The findings from these two assessment tasks were necessary in order to measure the pupil early reading skills in Kiswahili. Additionally, the children were given the assessment tasks within the GraphoGame Kiswahili adaptation. These were a letter-sound recognition task and a word recognition task. A small group of children did not improve in the external assessment tasks, despite showing learning progress within the game. The test results from the game's assessment are not an entirely authentic way to assess the learning process of the player. This is because, in most cases, children are

bored by the time they reach the final assessment within the game and they often fail the final assessment within the game even when they have shown improvement in the external assessment tasks. One way to address this shortcoming would be to design the game to stop when the optimal level of letter -sound knowledge or word recognition has been achieved. Another way would be to link the GraphoGame fluency game (currently under development) to the letter-sound and word recognition game so that children would automatically move to the fluency training after completing the basic reading skills training. Overall, the GraphoGame intervention studies did not compare GraphoGame against any other learning game. This is mainly because there are no appropriate evidenced-based learning games that can be used in research and exposing the pupils to games that use conflicting methodologies would have been unethical and would only have confused them further.

5.3 General overview

As reflected in the UNESCO EFA (2013/4) global monitoring report, teachers are seldom prepared for the challenges of multilingual classrooms. The findings from the teacher questionnaire survey above provide a glimpse into the complexities facing the teachers of early reading acquisition in indigenous African languages. Although the teachers were receptive towards teaching early reading acquisition in the children's mother tongue, in this case Kikuyu, they were not able to teach in the language because they had not received any practical training from the teacher training colleges on how to offer initial literacy acquisition in Kikuyu. Furthermore, there were no teachers' guidebooks that provide any knowledge on how early reading skills can be taught in Kikuyu.

A look at the answers the teachers provided shows that they lack basic language knowledge of Kikuyu and Kiswahili in general. Although the Kikuyu teachers had better knowledge of the letter sounds, syllables, spelling, and word formulation, the combined results show that almost half of the teachers do not have a clear knowledge of phonics or a clear knowledge of basic linguistic skills such as the roots of the Kikuyu and Kiswahili words. Worse still, many of the teachers made spelling mistakes, such as adding non-existent vowel sounds: 12 percent of teachers selected the spelling of *Mtu* as *Mutu*, while 52 percent selected the spelling of *Mnyama* as *Munyama*. This may be due to influence of the mother tongue languages of the teachers. It is important to note that none of the Kiswahili teachers of early reading were native speakers of Kiswahili.

The results clearly show that the teachers have poor syllable knowledge and are not able to recognize the correct spelling of simple words in Kikuyu and Kiswahili. Teachers of early reading acquisition must be sensitized to the negative effects these types of errors may have on the reading skills of their pupils. It is challenging to understand how teachers who exhibit incompetence in

the basic knowledge of syllables and spelling can teach pupils initial literacy skills optimally. As explained by Jones (2009), learning to spell enables readers to build the connection between letters and their sounds; therefore, teachers should be capable of teaching spelling systematically if they are to efficiently teach their pupils to spell.

Despite the shortcomings of the measurement of the teachers' letter sound knowledge, the results suggest that teachers may be confused about the vowel sounds [o] and [u]. Almost half of the teachers selected the English word 'own' as having the [o] sound in Kiswahili, while 70 percent chose the English word 'university' as having the sound [u] in Kiswahili. The sounds in these words are English sounds. This may be explained by the fact that these vowels have various sound differences within the African languages, which further highlights the need for teacher training and sensitization to the differences in letter-sounds. Using prerecorded sounds, as the GraphoGame training does, is the optimal way to minimize mother tongue influence.

The results clearly show that the teachers of early reading in Kikuyu had better overall language knowledge than the Kiswahili teachers. This could be because these teachers were native speakers of Kikuyu language and may explain why the Teacher Service Commission in Kenya (TSC), the body responsible for posting teachers to schools, generally posts teachers based on their mother tongues. It also shows why it is important to offer the Kiswahili teachers methodological training on teaching and learning Kiswahili as a second language (L2). Our results suggest that untrained teachers have better language knowledge than trained teachers. This shows that the training the teachers have received so far does not improve their language competence in the two languages. Therefore, additional training offered to the teachers must address the key issues regarding early literacy acquisition; that is, letter-sound knowledge and orthographical awareness.

The situation regarding Kiswahili is slightly different from Kikuyu. The Kiswahili teacher syllabus exists because Kiswahili has been taught as a subject in Kenya since 1964, based on the recommendations by the Ominde Commission. However, the syllabus provides no information to guide the teachers in teaching early reading skills to the pupils. In the absence of such instructions, most of the teachers revert to teaching early reading in Kiswahili using English letter names and conflicting methodologies such as the look-and-say and whole-word approaches. The resulting guesswork often leads to conflicting methodologies that negatively affect pupils' early learning process.

It is clear that the pupils' knowledge in early reading skills is below average. This is reflected in the results from the orthography recognition test and the pseudo-word and single-word spelling tasks, on which most pupils scored below 40 percent in the pre-tests. Their spelling omits and adds vowels where they do not exist in the Kiswahili words. The children also switch consonants, with the most common confusion being between /r/ and /l/. For example, most children spelt the word *nuru* (light) as 'nulu'; the word *rubani* (pilot) as 'lubani', and the word *vuruga* (mix) as 'vuluga'. Again, this may be attributed to

the errors made by the teachers, as shown above, because further analysis revealed that the children's mother tongues did not have direct influence on their performance in the pseudo- and single-word assessment tests. The low performance in the pseudo-word assessment test is a clear indication that the children are at risk of developing reading difficulties. Clark et al. (2011), Jeon (2012), and López-Escribano (2013) have highlighted that pseudo-word recognition is a good predictor of early reading skills; therefore, poor performance in this task means that these pupils are at risk of developing poor reading skills associated with inappropriate teaching methodologies.

The results from the GraphoGame intervention studies provide a knowledgeable base of possible ways that research into early reading can be conducted in multilingual Sub-Saharan settings such as Kenya. In Kenya, research into the area of early reading acquisition, especially in the indigenous languages, is undermined and is seldom conducted and/or documented. The results in these studies have supported the expectation that GraphoGame adaptations can be used to enhance early reading acquisition of Kenyan pupils. However, the technology innovation used in African classroom settings should be examined further in order to establish how they can be incorporated into the populous Kenyan classrooms. The fact that GraphoGame Kiswahili intervention helped students improve their early reading skills is an advantage in a country like Kenya, because Kiswahili is a second or even third language to the pupils. Also, most pupils cannot learn how to speak Kiswahili correctly because neither their parents nor teachers are speakers of the standard Kiswahili that is accepted as the correct way to speak the language.

When pupils in early-grade classrooms face so many problems, one can only imagine the plight of slow learners or children with learning disabilities. Fifty-eight percent of the teachers agreed and 16 percent strongly agreed that children with reading difficulties are not clever. This shows a lack of understanding of the root causes of reading difficulties in pupils. Who can even define a child with a reading difficulty when studies such as UWEZO show that 80 percent of children on average are not competent readers. Alidou and Brock-Utne (2011) have noted that the inability of African teachers to effectively assess student learning is due to a lack of adequate training. While this is true, it is necessary to add that there are no standardized assessment tools available to teachers that they can use to assess the reading progress of their pupils and establish standardized norms. It is important to ask how there can be standardized assessment instruments when nobody knows the appropriate methodologies of early instruction that teachers should use. Also, digital learning tools such as GraphoGame should be explored as assessment tools that can help teachers measure their pupils' progress in learning early reading skills.

5.4 The way forward

Teaching early reading in multilingual environments, such as Kenya, remains a great challenge. Many of the indigenous languages that are supposed to be used to teach early reading have complex structures. Additionally, there has not been sufficient research into appropriate methodologies that can be used to teach early reading in these languages. The problems are compounded by the lack of reading material for pupils and teachers to use, both inside and outside the classroom in general and in indigenous languages specifically. Adding the complexities of the English language into the equation only serves to make the classroom learning situations more difficult, for both teachers and pupils. These complexities associated with the language situation will not change in the near future, but measures can be put in place to provide possibilities for children to be taught early reading skills in their mother tongue. First, teachers and teacher trainers and teacher supervisors must become involved in overhauling the existing teacher education programs in Kenya. Alidou and Brock-Utne (2011) observed that teacher trainers and supervisors in Africa are generally not included in the development of training programs, even though they are expected to promote educational reforms.

Secondly, practical ways of reinforcing the mother tongue language policy need to be implemented. In most African countries, children have great difficulty learning because they do not understand what the teacher is saying (Alidou & Brock-Utne, 2011). In Kenya, for example, teachers are generally teaching early classrooms in English and Kiswahili, both of which are 'foreign' languages to the pupils. Kiswahili is only spoken as a mother tongue by about 112,000 people in Kenya. Even in urban areas such as Nairobi, fewer than 0.5 percent of people speak standard Kiswahili. Most Kiswahili speakers in Kenya speak it as a second language or as a lingua franca (Jenkins, 2008; NALRC, 2011). In a situation where there is no option but to teach in a lingua franca, there need to be realistic effective methods that should be employed in the literacy acquisition process. For instance, children can be introduced to standard Kiswahili orally in their preschool years so that they are familiar with the language by the time they reach the first grade, when early reading is introduced.

Another factor that needs careful consideration is the status accorded to the African indigenous languages in Kenya. These languages are generally considered as inferior to English and many of them lack written material for children to use when practicing reading. Sensitization should be done both at school and family level regarding the importance of the indigenous languages in early reading acquisition for the pupils. Furthermore, the promotion of indigenous African languages helps African people preserve their cultural heritage and helps both children and adults learn reading skills at their point of need. For these reasons, it is necessary to find ways to train teachers optimally to have the necessary skills and knowledge in the languages they are assigned to teach reading in, even when they speak the languages as their mother tongue.

Being a native speaker of a language does not automatically guarantee early reading teaching competence in the same language.

Indigenous African Bantu languages such as Kikuyu and Kiswahili are similarly transparent in terms of their consistent grapheme-phoneme correspondence, meaning that each sound is represented by the same symbol. In this type of language system, early reading skills should be taught using the phonics method, in which students learn to read by developing their ability to recognize letter-sound connections. As elaborated by Aro (2005), acquisition of reading skills in transparent orthographies is based on letter-sound knowledge, which is also known as orthographical awareness. Therefore, children learning early literacy skills in transparent orthographies should be taught reading skills by starting from letter-sound knowledge; that is, using the synthetic phonics approach, as in the GraphoGame training game. The language situation in Kenya is somewhat complex, and children speak diverse mother tongues in their homes. Even when they do speak a lingua franca such as Kiswahili, it is usually a non-standard form of the language. Consequently, the reading instructions offered by the teachers should be very clear on letter-sound correspondence to prevent any confusion to the pupils that would stem from the conflicting language codes of the transparent versus the tonal non-transparent languages, as well as English.

Further challenges stem from the use of colloquial languages such as Sheng', which is becoming increasingly popular, especially in the urban areas (Makay & Bosire, 2006). Sheng' continues to develop as a result of code-mixing of different languages (for more details about Sheng', see www.theteamkenya.com). The use of Sheng' is said to be undermining the effective use of Kiswahili language, a fact supported by early-grade teachers in Kenya (Kombe, 2013; Mutiga, 2013; *The Standard*, 2014). There are instances where teachers are forced to use Sheng' because the children cannot entirely understand the standard Kiswahili.

The complexities related to the acquisition of reading in English also adversely affect the Kenyan classrooms. English has a huge influence on education in Kenya, as it is the language of all the national examinations (KCPE and KCSE). In general most parents and teachers alike aspire to have their children speak and read fluently in English. Therefore, great emphasis is placed on learning in English from the first grade. However, most of the teachers are not native English speakers and most are not conversant with the appropriate methodologies that should be used to teach children to read in English. McGuiness (2005) described English as an opaque language; that is, it has an inconsistent writing system. It uses letter names as well as letter sounds and many of the letter sounds vary depending on the words (Essberger, 2001). English is a foreign language for most of the population in Kenya, and most first-grade children do not speak or understand English. Therefore, training in appropriate methodologies that factor in all the language issues, including English, should be incorporated into the Kenyan primary school teacher training curriculum if the pupils are to learn appropriate early reading skills optimally in local languages and English thereafter (Ragnarsson, 2011).

It is clear that there is a scarcity of reading material and that teaching in indigenous languages will require the development of new material. Digital media should be examined as one way to provide reading material because it will help to bridge the early literacy gap in terms of reaching more children while using fewer resources. Kenyan schools generally have large classrooms and the teacher-pupil ratio is on average 1:50 (Bailey, 2010). Therefore, potential digital tools should be designed to support group learning activities because this is the most efficient way to teach in large classrooms. The goal of using digital learning environments in multilingual settings should be to enable pupils to acquire the appropriate reading skills in initial literacy and transfer the skills that they need to switch to learning a second language while minimizing the negative effects resulting from mismanagement of multilingual learning environments. Because of this, further research should be undertaken in order to understand how such a focused and theory-based technological tool as GraphoGame can efficiently provide learners and teachers with the learning support they require in this type of environment where the children speak various mother tongues in their homes and 'foreign' languages at school. It is also necessary to involve parents in the teaching of early literacy skills, as this process will be more effective if the environment both at home and at school supports reading acquisition. It is necessary to promote the culture of reading in Kenya so that children are exposed to literate environments before starting school. Studies have shown that reading to very young children, even before the children have started to identify letters, can form an important foundation for vocabulary development and help create momentum in pre-literacy development that can benefit children as they acquire literacy skills as preschoolers. Besides, the level of development of a child's mother tongue is a strong predictor of the child's second-language development (Cummins, 2001; Raikes et al., 2006).

Policy makers: Policy makers in Kenya should put in place programs that support early learning in multilingual settings. To date, most of the methodologies employed in Kenyan classrooms are based on learning early reading in English, which is a second language to almost all Kenyans. Programs that focus on reading should be designed together with local teachers and other stakeholders so that all parties can fully participate in the process. There is a clear need for the curriculum planners and developers to address the language issues facing education more closely. As highlighted by Semali and Kincheloe (1999), Bunyi (1999, 2001), Kioko and Muthwii (2003, 2004), the failure to accommodate language issues into the curriculum has had negative pedagogical implications in the area of early reading acquisition in Kenyan classrooms.

The existing language policy in early reading is implemented under the mandate of the Ministry of Education, which is also responsible for creating educational curricula through the Kenya Institute of Curriculum Development (KICD). The policy mandates the use of indigenous African languages in the classroom (KICD, 2014). It states that the medium of instruction in linguistically homogenous school neighborhoods should follow the indigenous language

spoken around the school's location. In linguistically heterogeneous school neighborhoods, like those in many urban areas, the national language (Kiswahili) or the official language (English) is to be used depending on the socioeconomic level of the neighborhood in which the school is located. Where indigenous languages or Kiswahili are used as a medium of instruction from grade 1 to grade 3, a switch to English is made at the beginning of grade 4.

Teacher training of early-grade teachers in Kenya needs to focus on methodologies of bilingual teaching and second- (L2) and third-language (L3) acquisition. These methodologies need to clearly emphasize the role that the mother tongue plays in early reading skills and its benefits in transfer skills when the children move to the upper grades and need to learn in a foreign language such as English. As stated in the UIL Teaching personnel report (2012), "quality provision of basic literacy skills should be made a priority for significant progress to be made in literacy in Kenya." There also needs to be more research conducted on early reading processes in African indigenous languages. In the absence of documented evidence, it will be very challenging for the teachers to offer effective early reading instruction to the pupils. In Africa, there seems to be a lack of understanding that language plays a direct role in teaching early literacy acquisition (UNESCO, 2011). African countries currently rely heavily on research evidence from foreign sources. While such studies provide a knowledgeable base, their methodologies – especially in the teaching of languages such as English – are generally not applicable to African languages.

5.5 Conclusions

Teaching a child to read in languages that have consistent orthography – such as Kiswahili and Kikuyu – should be relatively straightforward, as we have seen in the discussions above. The results of this research have established that teachers' metalinguistic skills, especially in syllable knowledge and spelling in Kikuyu and Kiswahili, are poor; the teachers do not have a clear understanding of the methodologies they should use to teach early reading, even though they do understand the importance of teaching a pupil to read in the pupil's mother tongue. What makes the situation unfavorable is that very little reading and instructional material is available in the schools that focuses on reading acquisition. Worse still, the teacher training does not offer instructional methodologies on teaching reading acquisition, especially in the local African languages.

When the language environment is complex, teachers must be conversant with the methods that are appropriate when teaching early reading skills. Additionally, when planning reading lessons, they need to identify the appropriate instructional strategies to ensure their pupils learn to read optimally. The teachers should guide the pupils to develop the acquisition and use of grapheme-phoneme correspondences in reading, orthographic awareness skills, basic phonological processing abilities, and phonemic awareness, all of which are

necessary for the development of appropriate reading skills (Backman et al., 1984; Barker et al., 1992; Cunningham, 2002; Deacon, 2012; Ideguchi, 2008; Share, 1995). Teachers should also develop efficient assessment and diagnostic tools, such as the use of pseudo words for determining whether a pupil may have reading problems (Clark et al., 2012; Grainger et al., 2003; Holcomb et al., 2002). Teachers can also use repeated reading-based instruction to train pupils who may have challenges related to reading fluency and comprehension. Repeated reading intervention has enabled pupils to improve their reading fluency (as seen in, for example, Han and Chen, 2010; Martens and Jong, 2008; Ruskey, 2011).

Because Kiswahili is a second language for majority of pupils in Kenya, teachers should help the children develop their oral language skills in Kiswahili. Where this is not possible, GraphoGame can be used; for example, in the development of picture vocabulary content that children can use to build their vocabulary knowledge in pre-school years. The transfer of reading skills from one language to another is also an important subject in reading acquisition in Kenya. Teachers need to be knowledgeable on issues related to second-language acquisition so that they can help children transfer their reading skills from one language to another. Studies such as Elbro et al. (2012), Engel de Abreu and Gathercole (2012), Francois et al. (2012), Palmer et al. (2010), and Parsons and Lyddy (2009) have shown that children tend to develop different strategies and display various skills when learning in two or more languages that possess different orthographies. Furthermore, reading disabilities tend to be more challenging to diagnose in a second language. Therefore, a teacher who is aware of these reading outcomes is in a better position to assist pupils learning to read in multilingual language environments.

GraphoGame intervention studies have had scientifically significant results in terms of its effectiveness in teaching reading skills in several different language contexts (for example, Finnish, English, and German) and, based on the present study, Kikuyu and Kiswahili. It is important to (a) further develop the tool to provide an appropriate learning environment for learners in different cultures, (b) make it a multiplatform application, (c) develop it further so that it will provide learning support also after learning the basics of reading skills, enabling a solid basis for fluent reading, and (d) find ways to disseminate the tool widely so that all the learners who might benefit from playing have access to it. This dissemination may require a joint effort from various different policymakers and stakeholders in order for it to happen in the near future.

I believe that the studies described herein have provided data to support scientific evidence on the efficiency of training with GraphoGame so that first-grade pupils in the Kenyan public primary schools will be able to start using the Kiswahili adaptation of GraphoGame. In addition, the data collected from these studies will allow the GraphoGame developers to understand which areas of GraphoGame need to be developed so that they are more culturally sensitive to African children (given that GraphoGame was initially developed in Finland for Finnish children). Heikki Lyytinen has proposed that this will be done via a

public procurement made by the Kenyan Government through the Kenya Institute of Curriculum Development (KICD) so that the GraphoGame is free for the end users (grade 1 pupils). Through the more extensive dissemination of GraphoGame in Kenya, the literacy game will promote the acquisition of early literacy skills in Kenya, which is a child's right and addresses the basic element of the second Millennium Development Goal to provide universal primary education in an effective way that is supported by evidence-based results.

Moreover, teachers can use GraphoGame and its related content (for example, providing information and practical examples on reading instruction) to receive the training they require in order to teach early reading effectively. In this way, their capacity as competent teachers will be increased. This process will broaden our understanding of the practicalities involved in collaborative research and implementation that involves two different continents and cultures (in this case Europe and Africa) and adapting products developed in one cultural environment to another environment. It will also help us understand what is involved when working with African governments for public procurement in education.

There are two main challenges of such a procurement model. Firstly, teachers must embrace digital tools such as GraphoGame as a tool that will help them teach early reading skills efficiently and effectively, given the large class sizes in Kenya. Some teachers may view the use of technology to teach pupils as a process that renders them redundant in their teaching profession. Secondly, not all governments have made education a top priority. In countries such as Kenya, where there is an increasing emphasis on technology (for example, with the proposed laptops for schools project), governments face many challenges, such as not being in a position to afford the best products for the children. Accordingly, they may not be willing to invest heavily in what they may consider only one component of education (reading) at the expense of math and other sciences. In the African context, the significance of early reading acquisition as the most important skill in literacy acquisition continues to be undermined.

YHTEENVETO (SUMMARY)

Lasten tulisi saada lukutaito- ja muu alkuopetus kielellä, jota he puhuvat ja ymmärtävät. Lähes aina tämä tarkoittaa lasten äidinkieltä (UNESCOn raportti, 2011). Tutkimukset ovat osoittaneet, että lapset oppivat parhaiten lukemaan ja myöhemmin myös pystyvät siirtämään oppimiaan taitoja toiseen kieleen, kun taidot on opittu äidinkielisessä opetuksessa. Monissa Afrikan maissa on kuitenkin huutava pula alkuperäiskielisestä lukumateriaalista, koska lähetyssaarnaajien saapumisen myötä alettiin suosia muun muassa englantia ja ranskaa alkuperäiskielten kustannuksella. Myös lingua franca -tyyppisiä kieliä, kuten esimerkiksi swahilia Keniassa, suositaan, mutta muiden lingua francojen tapaan swahilikin on 99 %:lle kenialaisista toinen tai vieras kieli, jota pitäisi opettaa asianmukaisella tavalla lapsille ensimmäisinä kouluvuosina. Maan monitahoinen kielitilanne on haitannut alkuopetusta Keniassa, ja lukemaan oppimisen vaikeuksista kärsivien lasten suuri määrä hämmentää yhä enenevässä määrin valtion hallintoa.

Jokapäiväiseen kielenkäyttöön olennaisesti kuuluva koodinvaihto tekee kenialaisesta kieliympäristöstä hyvin monimutkaisen. Yleensä ihmiset eivät juurikaan kiinnitä huomiota kieleen, koska he ovat sopeutuneet monikieliseen ympäristöönsä. Kielitilanne on kuitenkin vaikuttanut tuntuvasti erityisesti alkuopetukseen. Kouluissa ja virastoissa virallisena kielenä käytetyn englannin vaikutus liittyy myös kiinteästi oppilaiden huonoon lukutaitoon. Opettajat nimittäin käyttävät yleensä englannin kielen opetusmenetelmiä paikalliskielten opetuksessa. Esimerkiksi opettaessaan lapsille kirjaimia opettajat käyttävät äänteiden sijasta kirjainten englanninkielisiä nimiä. Tämän tutkimuksen kolme osatutkimusta pyrkivät selvittämään niin opettajien kuin oppilaidenkin kieli- ja oppimistaitoja kikujun ja swahilin kielessä.

Tutkimuksen tulokset vahvistavat, että huoli opettajien ja oppilaiden alkuopetuksessa kohtaamien haasteiden vakavuudesta on aiheellinen. Tutkimuksen ensimmäisessä osassa tehty kysely opettajille paljasti, että heiltä puuttuu peruskielitaito niin kikujussa kuin swahilissakin. Tämän lisäksi opettajilla ei ole välttämättömiä perustietoja siitä, miten tukea ja ohjata lasta, jolla on vaikeuksia oppia lukemaan, koska he eivät ole saaneet koulutusta alkuperäiskielten lukutaito-opetuksen menetelmistä. Tehty selvitys osoittaa myös, että niin opettajilta kuin oppilailtakin puuttuvat materiaalit, joita voisi käyttää luokassa. Opettajilla ei ole oppaita, joiden pohjalta opettaa lukemista kikujussa. Sen sijaan swahili on yksi alakoulun oppiaine, ja siksi sen opettamiseen on käytössä oppaita. Nämäkään oppaat eivät kuitenkaan anna neuvoja tai opastusta siitä, miten lukutaidon alkeita voisi opettaa. Lähinnä ne tarjoavat ylimalkaisia ohjeita opettajien ja oppilaiden rooleista swahilin oppitunneilla.

Tutkimuksen toinen, kirjaintietoisuuteen keskittynyt osa osoitti, että ensimmäisen luokan oppilaiden tiedot kikujun ja swahilin kirjaimista olivat yleisesti ottaen vähäiset. Tämä tarkoittaa, että lasten lukemaan oppimisen kannalta välttämättömät taidot eivät olleet kehittyneet toivotulla tavalla. Tässä tutkimuksen osassa selvitettiin myös, voisiko GraphoGamen kikujun- ja swahilin-

kielisiä versioita käyttää interventiossa, jossa pyritään edistämään lasten kirjain-tietoisuutta. GraphoGame-interventioon osallistuneet lapset edistyivät merkit-sevästi kikujun ja swahilin kirjaintietoisuudessa. Myös tutkimuksen kolman-nessa osassa saadut tulokset puhuvat GraphoGamen tehokkuuden puolesta. Interventiota edeltäneen arvioinnin tulokset osoittivat, että lasten taidot niin oi-keiden kuin pseudosanojenkin lukemisessa olivat heikkoja. Ne lapset, jotka osallistuivat swahilinkielisellä GraphoGamella tehtyyn interventioon, edistyivät merkitsevästi enemmän kuin lapset, jotka samaan aikaa pelasivat toista mobii-lipeliä. Nämä tulokset vahvistavat odotuksia siitä, että GraphoGame voi auttaa oppilaita saavuttamaan perus- lukutaidon sekä äidinkielessä (kikuju) että toi-sessa tai vieraassa kielessä (swahili).

Saadut tulokset GraphoGamen tapaisten digitaalisten oppimisympäristö-jen käytöstä ovat lupaavia, ja niitä pitäisi ehdottomasti hyödyntää myös jatkos-sa. Vaikka monissa kenialaisissa kodeissa ja kouluissa käytettävissä oleva infra-struktuuri ei vielä tuekaan digitaalisten oppimisympäristöjen käyttöönottoa, isoja edistysaskeleita on kuitenkin jo otettu esimerkiksi matkapuhelinten osalta. Onkin arvioitu, että 82 % Kenian väestöstä omistaa matkapuhelimen (Pew Re-search Center, 2014). Oppimisinterventiot olisikin hyvä aloittaa käyttämällä juuri matkapuhelimia, koska melkein jokaisessa kenialaisessa taloudessa on ainakin yksi puhelin. Tämän lisäksi urbaanin kouluympäristön kielellinen mo-ninaisuus voidaan ottaa huomioon vain käyttämällä sellaisia teknisiä laitteita, joissa sovelluksia voidaan muokata yksilöllisiksi mahdollisimman halvalla. Tämä onnistuu vain hyödyntämällä kenen tahansa saatavilla olevia laitteita.

Digitaalisten sovellusten käyttöä olisi tärkeää tutkia myös esikouluvai-heessa. GraphoGamen kaltainen väline on hyvin hyödyllinen sanaston oppimi-sessa. Esimerkiksi swahilin tapauksessa tämä auttaisi sekä oppilaita että opetta-jia. Koska swahilin äidinkielisiä puhujia on vain alle prosentti väestöstä eli val-taenemmistölle se on vieras kieli, useimmat kenialaiset eivät ole perehtyneet swahilin standardimuotoon. Tämän takia swahilin käyttö opetuskielenä luke-maan opetuksessa on haastavaa, mikä näkyy alhaisissa lukutaitotuloksissa maanlaajuisesti. Siksi on hyvin tärkeää antaa opettajille metodiopetusta siinä, kuinka opetetaan lukemaan sellaisella toisella tai vieraalla kielellä, jolla on säännöllinen ortografia. Myös siinä GraphoGame voi olla avuksi, kuten Sambi-assa on osoitettu (Jere-Folotiya, ym., 2014).

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APPENDIX 1: STUDY I – KIKUYU TEACHER QUESTIONNAIRE

Graphogame Kikuyu- Teacher questionnaire

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

SCHOOL STAMP _____

Name of school _____

County _____

Zone _____

Class _____

Questionnaire Serial NO.: __/__/__/__/__/__/__/__/__/__/__

Dear Respondent,

My name is Carol Suzanne Adhiambo Puhakka. I am a PhD candidate at the University of Jyväskylä, Finland. I am currently conducting a study which involves "early reading teaching practices of first grade class teachers"**. There may be some technical terms and concepts used please do not worry if they are unfamiliar to you.** *The purpose of this questionnaire is to collect data for this study from the teachers who will later participate in the Graphogame-Kikuyu literate training game.* The information you provide will remain strictly for academic purposes and will be treated with utmost confidentiality and the respondents (you) will remain anonymous. This information will only be used to develop better ways to provide teachers with more effective instructions and material on how to teach early reading. The questionnaire will take approximately 30 minutes to complete. Kindly give your honest answers.

Thank you in advance for your kind cooperation.

SECTION A (Statements about reading experiences)

Please tick in the box you feel is most appropriate. Kindly observe the scale as illustrated below

1. DON'T KNOW 2.STRONGLY DISAGREE 3.DISAGREE 4. AGREE

5. STRONGLY AGREE

		1	2	3	4	5
1	I feel that I have sufficient training to teach phonics in Kikuyu language					
2	I am able to answer pupils questions competently during a Kikuyu reading class					
3	I am able to competently improvise examples in Kikuyu reading class					
4	I am able to translate basic words from English to Kikuyu language without difficulty					
5	Children with reading difficulties are not clever					
6	Girls are poorer readers than boys					
7	Some children cannot learn to read at all					
8	Learning to read in English is more important than learning to read in Kikuyu					
9	Only the best pupils in the class are able to learn to read					
10	A word is spelled correctly if you can guess what the pupil has tried to write					
11	Everyone who knows how to read is able to teach reading					
12	If you can speak any Kenyan Language then you can teach initial literacy in any Kenyan language					
13	Reading acquisition is faster in Kikuyu language than in English language					
14	I prefer teaching reading in Kikuyu language than in English language					
15	I would be more interested in teaching reading in English than in Kikuyu					

16	I am better able to teach reading in English than in Kikuyu					
17	I would get better results in my reading instruction if it would be focused on English.					
18	I would prefer teaching reading using whole word approach over phonics-based instruction.					
19	Whole word instruction leads to better results among many children compared to phonics approach.					
20	I prefer to teach reading in Kikuyu language than in English language					
21	It is better to teach early reading in English as it is the language of examination in the final grade					
22	It is better to teach early reading in English because it is the official language and the language used in offices in Kenya					
23	It is better to teach early reading in English as it is the global business language of the world					
24	Only people who can read well in English can be considered literate					
25	Ideally Sheng' should be used to teach reading as it is the language that the children would understand best					

SECTION B: (Personal details)

Please answer the following questions by ticking in the appropriate box

1) What is your gender

Female   Male

☐   ☐

2) How long have you been teaching?

1 year   2-5 years   6-10 years   11-20 years   over 20 years

☐   ☐   ☐   ☐   ☐

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

3) How old are you?

Below 19	20-29	30-39	40-49	Above 50
☐	☐	☐	☐	☐

SECTION C (Professional education)

Please answer the following questions by ticking in the appropriate box

4) What is your highest level of education?

Class 7	Class 8	Form 4	College	University
☐	☐	☐	☐	☐

5) Are you a teacher by profession i.e. have you received teacher training?

Yes	No
☐	☐

6) If **YES** where did you receive your teacher training education?

Teacher Training College (TTC)	In-Service Training	University	Other
☐	☐	☐	☐

7) If **NO** what is your original profession? _____

8) What was the duration of your teacher training education?

6 months	1 year	2 years	3 years	4 years
☐	☐	☐	☐	☐

9) What type of teacher qualification certificate did you obtain?

P1	P2	P3	Diploma	Degree
☐	☐	☐	☐	☐

Other (Specify) _____
☐

10) Have you ever received In-service training education?

Yes	No
☐	☐

11) What institution offered the In-service education/course

KIE   KISE   CICECE   KBC Radio

☐   ☐   ☐   ☐

University (Specify) _____

☐

Other (Specify) _____

☐

12) What was the duration of the In-service course?

2 weeks   1 month   6 months   1 year

☐   ☐   ☐   ☐

13) How much training have you received to teach reading in Kikuyu language?

None   Less than 5   (5-20 hours)   More than 20 hours

☐   ☐   ☐   ☐

14) If you have training in Kikuyu reading instruction, from which institution did you receive the training?

Teacher training College (TTC)   KIE   KISE

☐   ☐   ☐

University (Specify) _____ Other (Specify) _____

☐   ☐

15) Have you received training to teach reading in English?

Yes   No

☐   ☐

16) If you have received training to teach in English, from which institution did you receive the training?

Teacher Training College (TTC)   KIE   KISE

☐   ☐   ☐

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University (Specify) _____   Other (Specify) _____
☐   ☐

SECTION D (Language use in and around the school)

Please answer the following questions by ticking in the appropriate box

17) What is the language most commonly spoken in the area surrounding your school?

English   Kiswahili   Kikuyu   Other (Specify) _____
☐   ☐   ☐   ☐

18) What language is most commonly spoken in the school among the pupils?

English   Kikuyu   Kiswahili   All the three
☐   ☐   ☐   ☐

English and Kikuyu   Kiswahili and Kikuyu
☐   ☐

19) What language is most commonly spoken between teachers and pupils?

English   Kikuyu   Kiswahili   All three
☐   ☐   ☐   ☐

Kikuyu and Kiswahili   Kikuyu and English
☐   ☐

20) What language do you use to teach in class during the reading lesson?

Kikuyu   Kiswahili   English   All the three (Kikuyu, English & Kiswahili)
☐   ☐   ☐   ☐

Kikuyu & Kiswahili   Kikuyu & English
☐   ☐

21) Is reading taught as a subject?

Yes   No
☐   ☐

22) Is reading taught as part of the language lesson?

Yes ☐   No ☐

23) How frequently are the reading lessons taught in class 1?

Everyday ☐   Every 2 days ☐   Twice a week ☐   Once a week ☐

24) How long is each reading lesson in class 1?

15 minutes ☐   30 minutes ☐   45 minutes ☐   60minutes ☐   Other (Specify) _____

25) How many hours in total of reading lessons do you have in a week for class 1

_____

26) In what language do you teach reading?

Kiswahili ☐   Kikuyu ☐   English ☐   Kiswahili & Kikuyu ☐

English & Kikuyu ☐   All ☐

27) Do you use English or any other language while teaching reading in Kikuyu?

Yes (Specify) _____ ☐   No ☐   Other (Specify) _____

28) Do the pupils speak another language during Kikuyu reading lessons?

Yes (Which) _____ ☐   No ☐

29) Is Kikuyu language your mother tongue? Please specify

Yes ☐   No (Specify your mother tongue) _____

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30) Did you learn to read in your mother tongue while you were in school?

Yes   No

☐   ☐

31) Do you speak other languages in addition to your mother tongue?

No   Yes (Specify) _____

☐   ☐

32) While you were in primary school what language was used for learning?

English   Kiswahili   Kikuyu   Other (Specify) _____

☐   ☐   ☐   ☐

33) In which language are you most comfortable to teach reading?

English   Kikuyu   Kiswahili

☐   ☐   ☐

34) In your experience as a first grade teacher in your school do you agree that teaching reading in Kikuyu to the pupils in your school helps them to

     a) Learn reading faster than teaching them reading in English?

        Yes   No

        ☐   ☐

     b) Pronounce English words more accurately after they learn reading skills?

        Yes   No

        ☐   ☐

35) Do you feel that teaching a child to read in a language they speak and understand at home is faster than teaching them in a new language?

Yes   No

☐   ☐

36) What is the position of parents in your school regarding teaching early reading in Kikuyu instead of English?

Supportive   Non-supportive   Against   I don't know   None

☐   ☐   ☐   ☐   ☐

37) What is the position of parents in your school regarding teaching early reading in English instead of Kikuyu?

Supportive   Non – supportive   Against   I don't know   None

☐   ☐   ☐   ☐   ☐

38) Do you prefer to teach reading to

☐ Pupils who are already speakers of English and can therefore learn reading in English? or

☐ Pupils who are already speakers of English who can then learn to read Kikuyu using English letter names? or

☐ Pupils who speak Kikuyu and can therefore learn reading in Kikuyu using the phonics approach? or

☐ Pupils who speak Kikuyu and can therefore learn reading in Kikuyu? or

☐ I don't know

39) Kindly list all the subjects the children are taught in class 1.

_____,_____,_____

_____,_____,_____

_____,_____,_____

SECTION E (Reading material)

Please answer the following questions by ticking in the appropriate box

40) Is there any reading material available for the pupils in class 1 during the reading lesson?

Yes   No

☐   ☐

41) Is there a book available for each pupil during the lesson?

Yes   No

☐   ☐

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42) If the answer to no. 41 above is No, how do the pupils share the books?

One book for every two pupils ☐
One book for every four pupils ☐
One book for every five pupils ☐
Other (Specify) _____

43) Is there any other reading material available in Kikuyu for the pupils of class 1 for reading outside the lesson?

Yes, available to all

☐

Yes, available to many

☐

Yes, available to few

☐

No, not available at all

☐

44) Is there a book that is used to motivate pupils to read once they have learnt how to read in Kikuyu?

Yes   No
☐   ☐

45) Is there reading material available in any other language for class 1 pupils to read?

In English   Other language (Specify) _____
☐   ☐

46) Is there a teacher's guide book giving instruction on how to teach reading in Kikuyu during the lesson?

Yes   No
☐   ☐

47) Have you ever received instruction on how to teach reading in Kikuyu language from a teacher's guide book?

Yes (Specify the title) _____ No

☐ ☐

48) Have you ever read any other book that provides instruction on how to teach reading in Kikuyu?

Yes (Specify the title) _____ No

☐ ☐

49) Have you ever received instruction on how to teach reading in English from a teacher's guide book?

Yes (Specify the title) _____ No

☐ ☐

50) Have you ever read any book that provides instruction on how to teach reading in English

Yes (Specify the title) _____ No

☐ ☐

SECTION F (Phonics)

Please answer the following questions by ticking the box with the response you feel is correct.

51) Count the number of syllables in the word Kĩriaini

5 ☐   4 ☐   3 ☐   2 ☐   1 ☐

I don't know ☐

52) Count the number of syllables in the word 'Kûhûmûka'

5 ☐   4 ☐   3 ☐   2 ☐   1 ☐   I don't know ☐

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53) In which of the following English words can you hear the sounds of the letters as they are pronounced in Kikuyu?

a) Kikuyu **A**

| Mother | Father | Son | Daughter | Family | |
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

None of them
☐

b) Kikuyu **E**

| Elephants | End | Feel | Parliament | None of them |
| ☐ | ☐ | ☐ | ☐ | ☐ |

c) Kikuyu **I**

| Chair | Build | Avoid | Participant | None of them |
| ☐ | ☐ | ☐ | ☐ | ☐ |

d) Kikuyu **O**

| Order | Own | Ornament | Out | None of them |
| ☐ | ☐ | ☐ | ☐ | ☐ |

e) Kikuyu **U**

| Understanding | Up | University | Undo | None of them |
| ☐ | ☐ | ☐ | ☐ | ☐ |

SECTION G (In the following tasks please tick what you feel is the correctly spelt Kikuyu word)

54) Person

| Mûndû | Mûdû | Mudu | Mundu | Modo | Mondo |
| ☐ | ☐ | ☐ | ☐ | ☐ | ☐ |

I don't know ☐

55) Thing

Kîndû	Kîdû	Kîdu	Kidû	Kîndu	Kindu
☐	☐	☐	☐	☐	☐

I don't know ☐

56) House

Nyumba	Nyûmba	Nyûba	Nyomba	Nyoba	I don't know
☐	☐	☐	☐	☐	☐

57) Children

Ciana	Cîana	Ciena	Ciiana	Cîîana	Cena
☐	☐	☐	☐	☐	☐

I don't know ☐

58) Inside

Thîinî	Theinie	Thinî	Theini	Thiinî	I don't know
☐	☐	☐	☐	☐	☐

59) Open

Hingûra	Hîngûra	Hingora	Higûra	Higora	I don't know
☐	☐	☐	☐	☐	☐

60) Animal

Nyamû	Nyamu	Nyamo	Njamû	I don't know
☐	☐	☐	☐	☐

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SECTION H (Morphology (word formulation). Please tick what you feel is correct

61) How many Kikuyu words can be formed from the root 'gima'?

1 ☐   2 ☐   3 ☐   4 ☐   5 ☐ More than 5 ☐

I don't know ☐

62) Identify the root in the Kikuyu word kûhîtûka.

kû	hîtu	tûka	hîtuka	hîtû	ka
☐	☐	☐	☐	☐	☐

I don't know

☐

63) Identify the root in the following word 'mûtungu'

mû	ûtungu	utungu	tungu	ngu	I don't know
☐	☐	☐	☐	☐	☐

64) Identify the root in the following word 'teng'era'

te	ng'era	teng'era	teng'e	ra	I don't know
☐	☐	☐	☐	☐	☐

65) In the word 'rûgano' which part is referred to as the prefix?

rû	rûga	gano	rûgano	no	I don't know
☐	☐	☐	☐	☐	☐

66) Which part of the word 'menamenîrera' is the prefix?

mena	me	menîrera	îrera	I don't know
☐	☐	☐	☐	☐

SECTION I (Translation)

Can you please translate the following to Kikuyu language? Kindly give the translation you feel fits the most.

67) "Good morning children?"

_____

68) "Now we will have a reading lesson."

_____

69) "Take out your books"

_____

70) "Can you please read page 27"

_____

71) "Can you please read out page 10 loudly"

_____

72) "When I call out your names say present so that I can tick the register"

_____

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SECTION J (Teaching methodologies)

73) In your opinion, which is the best method to teach early reading in Kikuyu? Please describe how you would teach your first Kikuyu reading class. What items would you introduce at first and which ones would come later?

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

74) In your opinion, which is the best method to teach early reading in English? Please describe how you would teach your first English reading class. What items would you introduce at first and which ones would come later?

_____

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for answering the questionnaire!

Nî wega mûno!

APPENDIX 2: STUDY I – KISWAHILI TEACHER QUESTION-NAIRE

Graphogame Kiswahili – Teacher questionnaire

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

SCHOOL STAMP _____

Name of school _____

County _____

Zone _____

Class _____

Questionnaire Serial NO.: __/__/__/__/__/__/__/__/__/__/__/__

Dear Respondent,

My name is Carol Suzanne Adhiambo Puhakka. I am a PhD candidate at the University of Jyväskylä, Finland. I am currently conducting a study which involves "early reading teaching practices of first grade class teachers". **There may be some technical terms and concepts used please do not worry if they are unfamiliar to you.** *The purpose of this questionnaire is to collect data for this study from the teachers who will later participate in the Graphogame-Kiswahili literate training game.* The information you provide will remain strictly for academic purposes and will be treated with utmost confidentiality and the respondents (you) will remain anonymous. This information will only be used to develop better ways to provide teachers with more effective instructions and material on how to teach early reading. The questionnaire will take approximately 30 minutes to complete. Kindly give your honest answers.

Thank you in advance for your kind cooperation.

SECTION A (Statements about reading experiences)

Indicate by ticking in the appropriate box

1. **STONGLY AGREE** 2.**AGREE**   3.**DISAGREE** 4. **STRONGLY DISAGREE**

5 **DON'T KNOW**

		1	2	3	4	5
1	I feel that I have sufficient training to teach phonics in Kiswahili language					
2	I am able to answer pupils questions competently during a Kiswahili reading class					
3	I am able to competently improvise examples in Kiswahili reading class					
4	I am able to translate basic words from English to Kiswahili language without difficulty					
5	Children with reading difficulties are not clever					
6	Girls are poorer readers than boys					
7	Some children cannot learn to read at all					
8	Learning to read in English is more important than learning to read in Kiswahili					
9	Only the best pupils in the class are able to learn to read					
10	A word is spelled correctly if you can guess what the pupil has tried to write					
11	Everyone who knows how to read is able to teach reading					
12	If you can speak any Kenyan Language then you can teach initial literacy in any Kenyan language					
13	Reading acquisition is faster in Kiswahili language than in English language					
14	I prefer teaching reading in Kiswahili language than in English language					
15	I would be more interested to teach reading in English than in					

	Kiswahili					
16	I am better able to teach reading in English than in Kiswahili					
17	I would get better results in my reading instruction if it would be focused on English.					
18	I would prefer teaching reading in Kiswahili using whole word approach over phonics-based instruction.					
19	Whole word instruction leads to better results among many children compared to phonics approach.					
20	I prefer to teach reading in Kiswahili language than in English language					
21	It is better to teach early reading in English as it is the language of examination in the final grade					
22	It is better to teach early reading in English because it is the official language and the language used in offices in Kenya					
23	It is better to teach early reading in English as it is the global business language of the world					
24	Only people who can read well in English can be considered literate					
25	Ideally Sheng' should be used to teach reading as it is the language that the children would understand best					

SECTION B: (Personal details)

Please answer the following questions by ticking in the appropriate box

1) What is your gender

Female   Male

☐   ☐

2) How long have you been teaching?

1 year	2-5 years	6-10 years	11-20 years	Over 20 years
☐	☐	☐	☐	☐

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3) How old are you?

Below 19	20-29	30-39	40-49	Above 50
☐	☐	☐	☐	☐

SECTION C (Professional education)

Please answer the following questions by ticking in the appropriate box

4) What is your highest level of education?

Class 7	Class 8	Form 4	College	University
☐	☐	☐	☐	☐

5) Are you a teacher by profession i.e. have you received teacher training?

Yes	No
☐	☐

6) If **YES** where did you receive your teacher training education?

Teacher Training College (TTC)	In-Service Training	University	Other
☐	☐	☐	☐

7) If **NO** what is your original profession? _____

8) What was the duration of your teacher training education?

6 months	1 year	2 years	3 years	4 years
☐	☐	☐	☐	☐

9) What type of teacher qualification certificate did you obtain?

P1	P2	P3	Diploma	Degree
☐	☐	☐	☐	☐

Other (Specify) _____
☐

10) Have you ever received In-service training education?

Yes   No

☐   ☐

11) What institution offered the In-service training education/course

KIE   KISE   NACECE   CICECE   KBC Radio

☐   ☐   ☐   ☐   ☐

University (Specify) _____

☐

Other (Specify) _____

☐

12) What was the duration of the In-service course?

2 weeks   1 month   6 months   1 year

☐   ☐   ☐   ☐

13) How much training have you received to teach early reading in Kiswahili language?

None   Less than 5 hours   (5-20 hours)   More than 20 hours

☐   ☐   ☐   ☐

14) If you have training in Kiswahili reading instruction, from which institution did you receive the training?

Teacher training College (TTC)   KIE   KISE

☐   ☐   ☐

University (Specify) _____ Other (Specify) _____

☐   ☐

15) Have you received training to teach reading in English?

Yes   No

☐   ☐

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16) If you have received training in English, from which institution did you receive the training?

Teacher training College (TTC)　　KIE　　　　KISE
☐　　　　　　　　　　　　　　　☐　　　　　☐

University (Specify) _____ Other (Specify) _____
☐　　　　　　　　　　　　　　☐

SECTION D (Language use in and around the school)

Please answer the following questions by ticking in the appropriate box

17) What is the language most commonly spoken in the area surrounding your school?

English　　　Kiswahili　　Sheng'　　　Other (Specify) _____
☐　　　　　　☐　　　　　☐　　　　　☐

18) What language is most commonly in the school among the pupils?

English　　　Kiswahili　　Both are spoken equally　　Sheng'
☐　　　　　　☐　　　　　☐　　　　　　　　　　☐

19) What language is most commonly spoken between teachers and pupils?

English　　　Kiswahili　　Both English & Kiswahili are spoken equally
☐　　　　　　☐　　　　　☐

Sheng'
☐

20) What language do you use to teach in class during the reading lesson?

Kiswahili　　English　　Both English & Kiswahili
☐　　　　　☐　　　　☐

Sheng'　　　All the above (as long as the children understand)
☐　　　　　☐

21) Is reading taught as a subject?

Yes   No

☐   ☐

22) Is reading taught as part of the language lesson?

Yes   No

☐   ☐

23) How frequently are the reading lessons taught in class 1?

Everyday   Every 2 days   Twice a week   Once a week

☐   ☐   ☐   ☐

24) How long is each reading lesson in class 1?

15 minutes   30 minutes   45 minutes   60 minutes   Other (Specify)_____

☐   ☐   ☐   ☐   ☐

25) How many hours in total of reading lessons do you have in a week for class 1?

_____

26) In what language do you teach reading?

Kiswahili   English   Other (Specify) _____

☐   ☐   ☐

27) Do you use English or any other language while teaching reading in Kiswahili?

Yes (English)   Other (Specify) _____

☐   ☐

28) Do the pupils speak another language during learning reading instruction in Kiswahili?

Yes   Which_____   No

☐   ☐

29) What is your mother tongue?

Yes   No (Specify your mother tongue) _____

☐   ☐

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30) Did you learn to read in your mother tongue while you were in school?

Yes ☐   No ☐

31) What languages do you speak? Please specify

English ☐   Kiswahili ☐   Other (Specify) _____

32) While in school which language did you learn to read in?

English ☐   Kiswahili ☐   Other language (Specify) _____

33) In which language are you most comfortable to teach reading?

English ☐   Kiswahili ☐   Other (Specify) _____

34) In your experience as a first grade teacher in your school do you agree that teaching reading in Kiswahili to the pupils in your school helps them to

    a) Learn reading faster than teaching them reading in English?

    Yes ☐   No ☐

    b) Pronounce words more accurately than if they were learning reading in English?

    Yes ☐   No ☐

35) Do you feel that teaching a child to read in a language they speak and understand at home is more appropriate than teaching them early reading in English language?

Yes ☐   No ☐

36) What is the position of parents in your school regarding teaching reading in Kiswahili instead of English?

Supportive ☐   Non-supportive ☐   Against ☐   I don't know ☐   None ☐

37) What is the position of parents in your school regarding teaching reading in English instead of Kiswahili?

Supportive   Non-supportive   Against   I don't know   None

☐   ☐   ☐   ☐   ☐

38) Do you prefer to teach reading to

☐ Pupils who are already speakers of English and can therefore learn reading in English?

☐ Pupils who are already speakers of English who can then learn to read Kiswahili using English letter names?

☐ Pupils who speak Kiswahili and can therefore learn reading in Kiswahili using the phonics approach?

☐ Pupils who speak Kiswahili and can therefore learn reading in Kiswahili

☐ I don't know

39) Kindly list all the subjects the children are taught in class 1.

_____,_____,_____

_____,_____,_____

_____,_____,_____

SECTION E (Reading material)

Please answer the following question by ticking in the appropriate box

40) Is there any reading material available for the pupils in class 1 during the reading lesson?

Yes   No

☐   ☐

41) Is there a book available for each pupil during the lesson?

Yes   No

☐   ☐

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42) If the answer to **no. 41** above is **No**, how do the pupils share the books?

One book for every two pupils ☐

One book for every four pupils ☐

One book for every five pupils ☐

Other (Specify) _____

43) Is there any other reading material available in Kiswahili for the pupils of first grade for reading outside the lesson?

Yes, available to all

☐

Yes, available to many

☐

Yes, available to few

☐

No, not available

☐

44) Is there a book available to the children to practice their reading after they have mastered basic literacy skills?

Yes   No

☐   ☐

45) Is there reading material available in any other language for class 1 pupils to read?

In English   Other language (Specify) _____

☐   ☐

46) Is there a teacher's guide book giving instruction on how to teach reading available to the teacher during reading lesson?

Yes   No

☐   ☐

47) Have you ever received instruction on how to teach reading in Kiswahili language from a teacher's guide book?

Yes (Specify the title) _____ No

48) Have you ever read any other book that provides instruction on how to teach reading in Kiswahili?

Yes (Specify the title) _____ No

49) Have you ever received instruction on how to teach reading in English from a teacher's guide book?

Yes (Specify the title) _____ No

50) Have you ever read any other book that provides instruction on how to teach reading in English?

Yes (Specify the title) _____ No

SECTION F: Syllable knowledge

In the following tasks please choose the correct number of syllables in the given words

52) Count the number os syllables in the word 'mlima'

5☐   4☐   3☐   2☐   1☐   I don't know ☐

53) Count the number of syllables in the word 'Kuzurura'

5☐   4☐   3☐   2☐   1☐   I don't know ☐

54) In which of the following English words can you hear the sounds of the letters as they are pronounced in Kiswahili?

a. Kiswahili **A**

Mother   Father   Son   Daughter   Family

Teacher questionnaire 2011, Carol Suzanne Adhiambo Puhakka, University of Jyväskylä

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None of them
☐

b. Kiswahili **E**

Elephants	End	Feel	Parliament	None of them
☐	☐	☐	☐	☐

c. Kiswahili **I**

Chair	Build	Avoid	Participant	None of them
☐	☐	☐	☐	☐

d. Kiswahili **O**

Order	Own	Ornament	Out	None of them
☐	☐	☐	☐	☐

e. Kiswahili **U**

Understanding	Up	University	Undo	None of them
☐	☐	☐	☐	☐

SECTION G

In the following tasks please tick what you feel is the correctly spelt Kiswahili word

55) Person

Mtu	Mutu	Mtuu	Mto	Moto	I don't know
☐	☐	☐	☐	☐	☐

56) Thing

Kiti	Kitu	Kito	Kidu	Kiitu	I don't know
☐	☐	☐	☐	☐	☐

57) House

Nyumba	Nyûmba	Nyuba	Nyomba	Nyoba	I don't know
☐	☐	☐	☐	☐	☐

58) Child

Mtoto	Mtutu	Mtotu	Mtitu	Mtata	I don't know
☐	☐	☐	☐	☐	☐

59) Inside

Ndani	Dani	Ndaani	Deni	Ndini	I don't know
☐	☐	☐	☐	☐	☐

60) Open

Fungua	Fugua	Fingua	Figia	Ungua	I don't know
☐	☐	☐	☐	☐	☐

61) Animal

Mnyama	Munyama	Nyama	Njama	I don't know
☐	☐	☐	☐	☐

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SECTION H

Morphology (word formulation). Please tick what you feel is correct

62) How many Kiswahili words can be formed from the root 'gari'?

1 ☐   2 ☐   3 ☐   4 ☐   5 ☐   More than 5 ☐

I don't know ☐

63) Identify the root in the Kiswahili word 'kukamata'.

ku	ukata	kamata	kukata	ata	I don't know
☐	☐	☐	☐	☐	☐

64) Identify the root in the word 'mwanangu'

mwa	mwana	mwanangu	nangu	ngu	I don't know
☐	☐	☐	☐	☐	☐

65) Identify the root in the word 'kung'oa'

ng'oa	ku	ung'oa	goa	kung	I don't know
☐	☐	☐	☐	☐	☐

66) In the word 'rutuba' which part is referred to as the prefix?

ru	tu	tuba	rut	rutuba	I don't know
☐	☐	☐	☐	☐	☐

67) Which part of the word 'ndumilakuwili' is the prefix?

ndu	kuwili	ndumi	mila	I don't know
☐	☐	☐	☐	☐

SECTION I.

Translation

How would you tell the following sentences in Kiswahili to the children in a way that they will understand the meaning (Give the translation that fits the most).

68) "Good morning children?"

_____

69) "Now we will have a reading lesson."

_____

70) "Take out your books"

_____

71) "Can you please read page 27"

_____

72) "Can you please read out page 10"

_____

73) "When I call out your names say that you are present so that I can mark it on the class register"

_____

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SECTION J (Teaching methodologies)

74) In your opinion, which is the best method to teach early reading in Kiswahili? Please describe how you would teach your first Kiswahili reading class. What items would you introduce at first and which ones would come later?

_____

_____

_____

_____

_____

_____

_____

_____

_____

75) In your opinion, which is the best method to teach early reading in English? Please describe how you would teach your first English reading class. What items would you introduce at first and which ones would come later?

_____

_____

_____

_____

_____

_____

_____

_____

Thank you for answering the questionnaire!

Asante sana!

APPENDIX 3: STUDY II – KIKUYU ORTHOGRAPHY TEST

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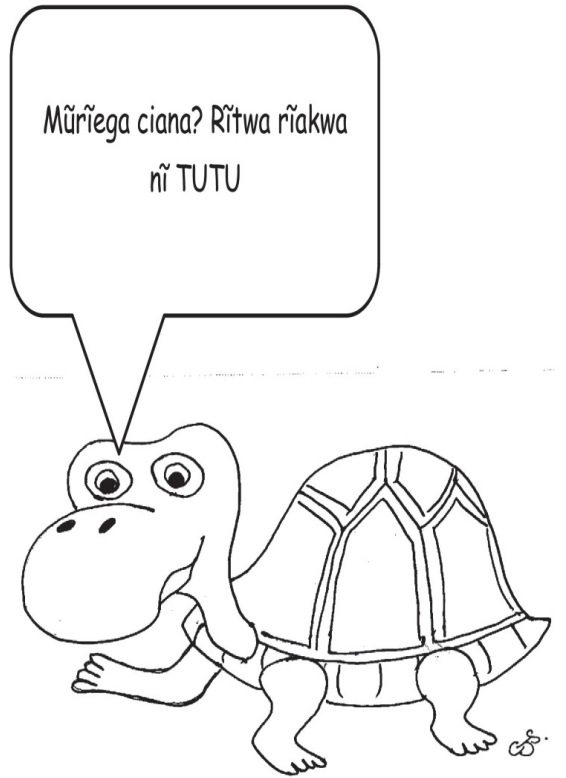
Rĩtwa _____

Cukuru _____

Kĩradhi _____

Muthenya _/_/___

b	m	k	ũ	Q	o
ĩ	p	x	ꝋ	e	v
w	£	ж	y	ꞷ	i
σ	β	∩	∞	⧺	ꓶ
ꓘ	z	ΩΩ	Ж	ꞌ	√▯
fu	sa	dũ	kĩ	ba	ma
ri	!	le	tu	hat	ho
kwĩ	otx	mwa	ura	mbũ	can
ogl	put	ndĩ	Gwv	kwo	but
ira	pro	oya	bun	ĩka	uma

TUTU Test – Kikuyu   Naba _/_/_/_/_/_/

baba	svma	rũma	sama	zxub	koma
hura	tati	tgla	rũhĩ	caca	amta
bafa	cũcũ	dĩtũ	cama	tavb	kana
ibuku	bulxi	boat	ngũkũ	book	dubĩy
Pũldo	Ng'ondu	babaa	rummĩ	luduo	irima
gacĩra	cagara	hũmũka	magita	hurũka	cook
hũnĩka	shed	ragama	maguta	cemũra	karima
cemĩra	Mũbblũ	kamũra	sharp	cagũra	kilapi
rugama	Huunĩka	ũcũrũ	nyeni	dhambia	mwana
mbwtla	kĩratũ	Tiildh	honoka	CdwirU	ihenya
karrima	gĩciko	HuurUkka	Tang'ara	mũdhuri	gacĩĩra
hihinya	kahinda	walking	mwanake	Rnmutu	running
Mũiretu	haraihu	kũgagata	gũteng'era	huruka	Kũrwara

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Nĩ mwĩka wega mũno

kũndeithia na wĩra wakwa

wa mũciĩ

APPENDIX 4: STUDY II – KISWAHILI ORTHOGRAPHY TEST
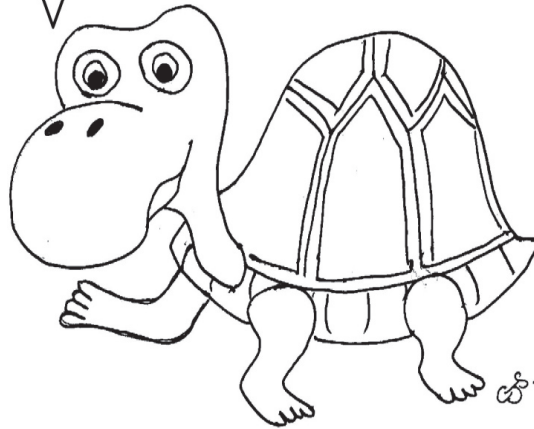
Illustrated by C J Smith

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Jina _____

Shule _____

Tarehe _____

Darasa _____

a	Q	e	£	›	†
π	c	⊐	g	Χ	Ω
k	μ	i	∞	¥	j
⌐	k	⋛	σ	n	⌒
Qx	sa	၈	kt	!	dn
ka	nm	bd	de	ju	as
pu	jro	car	hga	nyu	red
ona	vya	mti	mda	bus	ota
bat	nxa	nya	pQu	cat	Ng'o

TUTU Test – Kiswahili   Kodi _/_/_/_/_/_/_/_/

Jina _____

Shule _____

Tarehe _____

Darasa _____

ltga	mama	coat	kata	manu	jibu
galu	ntod	pesa	kiti	road	dami
zama	mepa	pmor	mihi	beba	hgtl
leha	Mmama	knife	cheza	spoon	Barua
akili	ball	chema	dammu	akiba	kitti
choka	mezza	Jioni	bbeba	kiatu	kimya
dawati	bahari	darasa	chokA	emach	Nyungu
kalamu	botiti	rasead	bahari	amahe	faraja
hashara	johari	rudisha	lakamu	daakika	damiti
bahasha	malikia	nywele	mchele	hadini	mfalme
sherehe	katini	watoto	dirisha	harusi	bahhari
waziri	hhattari	zahanati	furraha	karatasi	riziki
sakafuni	bahatti	wasiwasi	milango	ssababu	shahada

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Kwaheri watoto;
Asante kwa kunisadia
kufanya kazi ya
nyumbani

APPENDIX 5: STUDY II – KIKUYU SPELLING TEST

Kikuyu spelling /dictation test 1
Code __/__/__/__/__/__/__/__/

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Date: ___ / ___ / ___

School: _____

Class: _____

Name: _____

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

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Kikuyu spelling /dictation test 1
Code __/__/__/__/__/__/__/__/

1. a   l   b   d   g

2. d   e   g   m   i

3. c   a   e   r   u

4. î   b   t   n   o

5. g   m   v   h   k

6. n   d   w   û   g

7. ba   bi   bû   be   bu

8. cu   co   ci   ce   ca

9. do   da   di   de   dî

10. ge   gu   ga   gi   gî

11. ra   ri   re   ru   ro

12. ha   he   hi   hu   ho

13. hûna   hona   hûma   hûta

Kikuyu spelling /dictation test 1
Code __/__/__/__/__/__/__/__/

14.	wega	wîru	ritû	rûhî
15.	rûma	ruta	ruma	ritû
16.	hoya	hora	hura	hûra
17.	baba	bata	koma	duka
18.	gati	gûtû	guka	gîko
19.	tara	tene	tata	hata
20.	coka	cûna	cuka	cûcû
21.	homa	hûta	hûna	hûma
22.	ritû	riko	rûhî	rehe
23.	honoka	hûmûka	conoka	hîtûka
24.	karima	kûrîma	kûrûma	karîma
25.	mûrûme	mûnene	mûgate	mûgeni

APPENDIX 6: STUDY II – KISWAHILI SPELLING TEST

Mtihani wa kusikiliza na kuandika   Kodi _/_/_/_/_/_/_/_/

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

<u>Mtihani wa Kwanza</u>

Tarehe: ___ / ___ / ___

Shule:_____

Darasa:_____

Jina:_____

Mtihani wa kusikiliza na kuandika   Kodi _/_/_/_/_/_/_/_/

1.	a	l	b	o	g
2.	d	e	f	m	i
3.	s	a	e	r	u
4.	i	b	e	n	o
5.	g	m	v	h	k
6.	z	d	e	y	p
7.	da	pi	na	ka	bu
8.	tu	je	di	be	ga
9.	ko	ba	ni	ve	na
10.	te	vu	ha	ri	ma
11.	la	ri	ta	hi	ma
12.	cha	sha	chi	sh	ch

Mtihani wa kusikiliza na kuandika   Kodi _/_/_/_/_/_/_/_/

13.	dada	sita	baba	beba
14.	fuga	deni	vuga	fujo
15.	futa	dafu	deni	dada
16.	goma	goti	godi	hama
17.	mawe	mama	wika	cheka
18.	hata	jana	hama	haja
19.	jamani	kita	zamani	lakini
20.	bahati	tafuta	mafuta	dawati
21.	furaha	haraka	ruhusu	faraja
22.	dawati	dalili	kitabu	dakika
23.	bahari	bakora	barafu	bakari
24.	dakika	darasa	dhahabu	garama
25.	dalili	bakuli	halili	halali

APPENDIX 7: STUDY III – KISWAHILI PSEUDOWORDS LIST

Pseudo word spelling assessment

1. Fada
2. Hovu
3. Piatu
4. Muru
5. Mame
6. Keku
7. Njiane
8. Lahari
9. Vunana
10. Pahalu
11. Chikala
12. Zinala
13. Rubeka
14. Kasimili
15. Ng'arisho
16. Mandazu
17. Maskinuza
18. Kurahalapo
19. Zungupapa
20. Meremkaka
21. Purahishazi
22. Mlangonuka
23. Gurudududo
24. Hifadhidapa
25. Lawitianana
26. Sherehezoko
27. Enganeengana
28. Midundanopuzu
29. Kidolezilishapuza

APPENDIX 8: STUDY III – KISWAHILI WORDS LIST

Single word spelling assessment

1. Mama
2. Nuru
3. Tatu
4. Peke
5. Hofu
6. Rubani
7. Chakula
8. Kibanda
9. Zabuni
10. Vuruga
11. Sadiki
12. Barafu
13. Halahala
14. Hamamu
15. Linganua
16. Badilisha
17. Mnyama
18. Pekupeku
19. Konsonanti
20. Themanini
21. Gungumka
22. Zambarau
23. Fungutenzi
24. Sindikizwa
25. Ufurufuru
26. Jifurahishia
27. Upatikanaji
28. Kiokamikate
29. Lundikanika
30. Teremshana
31. Shetasheteka
32. Gurugushika
33. Uchepechepe
34. Mwanakondoo
35. Kiamshakinywa

APPENDIX 9: KIKUYU PARENT CONSENT FORM

CONSENT AND EXAMINATION FORM

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Graphogame Kikuyu
READING SUPPORT FOR CHILDREN– KENYA

Name of child:…………………………………………………………………………………
Age:…………………..Sex: ……………………Code……………………..
School:……………………………………………………………………………………...
Zone/District:…………………………………………………………………………….
School Code Number:…………………………………………………………………………
Postal address: …………………………………………………………………………...

Dear Parent/Guardian,

My name is Carol Suzanne Adhiambo Puhakka. I am a PhD candidate at the University of Jyväskylä in Finland. I am currently conducting a study which involves pupil reading skills assessment**.** The main aim of this research is to establish how best children in the first grade can be taught how to read effectively in the local Kikuyu language and local languages in general. The study also aims to identify factors in the learning environment, both at school and in the home that may affect early acquisition of reading skills.

Your child's school has been selected to take part in this study and we request your permission to enable your child to take part. Should you agree your child will be examined on what they will have been taught in the classroom by the teacher who will have received some training on how to teach how to read effectively.

Risks and Benefits: there are no risks involved in this study. Instead your child will benefit from knowledge that the teacher will have acquired through the research.

Participation Rights: your consent is being given voluntarily; you may refuse to allow your child to participate in the entire study or in any part of the study. You are also free to withdraw the child at any time during the study.

CONSENT AND EXAMINATION FORM

Declaration by parent/guardian:
I have read and understood this confidential request and I give consent for my child to take part in the Reading Support for Children research. I understand that I am free to withdraw my child from the study at any time.

Parent/Guardian's Name   Signature

_____   _____

Researcher/Research Assistant   Signature

_____   _____

Contacts: If you would like to ask any further questions about the research then you can contact the principal investigator:

Primary Investigator:

Prof Heikki Lyytinen
University of Jyvaskyla, FIN 40014
Jyvaskyla, Finland

Mobile in Finland: +358-055-24892

Email: heikki.lyytinen@psyka.jyu.fi

Secondary Investigator

Carol Suzanne Adhiambo Puhakka
University of Jyväskylä, FIN 40014

Jyväskylä, Finland

Mobile in Finland : +358451405810

Email : suzanne.puhakka@jyu.fi

APPENDIX 10: KISWAHILI PARENT CONSENT FORM

CONSENT AND EXAMINATION FORM

JYVÄSKYLÄN YLIOPISTO
UNIVERSITY OF JYVÄSKYLÄ

Graphogame Kiswahili
READING SUPPORT FOR CHILDREN– KENYA

Name of child:……………………………………………………………………………
Age:…………………..Sex: ……………………Code……………………..
School:………………………………………………………………………………...
Zone/District:………………………………………………………………………….
School Code Number:……………………………………………………………………
Postal address: …………………………………………………………………………...

Dear Parent/Guardian,

My name is Carol Suzanne Adhiambo Puhakka. I am a PhD candidate at the University of Jyväskylä in Finland. I am currently conducting a study which involves pupil reading skills assessment. The main aim of this research is to establish how best children in the first grade can be taught how to read effectively in the local Kikuyu language and local languages in general. The study also aims to identify factors in the learning environment, both at school and in the home that may affect early acquisition of reading skills.

Your child's school has been selected to take part in this study and we request your permission to enable your child to take part. Should you agree your child will be examined on what they will have been taught in the classroom by the teacher who will have received some training on how to teach how to read effectively.

Risks and Benefits: there are no risks involved in this study. Instead your child will benefit from knowledge that the teacher will have acquired through the research.

Participation Rights: your consent is being given voluntarily; you may refuse to allow your child to participate in the entire study or in any part of the study. You are also free to withdraw the child at any time during the study.

CONSENT AND EXAMINATION FORM

Declaration by parent/guardian:

I have read and understood this confidential request and I give consent for my child to take part in the Reading Support for Children research. I understand that I am free to withdraw my child from the study at any time.

Parent/Guardian's Name   Signature

_____   _____

Researcher/Research Assistant   Signature

_____   _____

Contacts: If you would like to ask any further questions about the research then you can contact the principal investigator:

Primary Investigator:

Prof Heikki Lyytinen
University of Jyvaskyla, FIN 40014
Jyvaskyla, Finland

Mobile in Finland: +358-055-24892

Email: heikki.lyytinen@psyka.jyu.fi

Secondary Investigator

Carol Suzanne Adhiambo Puhakka
University of Jyväskylä, FIN 40014

Jyväskylä, Finland

Mobile in Finland : +358451405810

Email : suzanne.puhakka@jyu.fi