Does the Literate Game help 3rd and 4th Grade Zambian Children Learn How to Read

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ABSTRACT

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Reading acquisition is based on phonological awareness, alphabetical mapping and phonological decoding. Reading is a deliberate process of understanding written language. Knowing the language of the text is clearly fundamental in helping the learners to read. Learning to read and write is to learn how to use the coding system in your own language. Children, who learn to read in a transparent language (Finnish), learn faster than those that learn in opaque languages (English). Most of the Zambian local languages are transparent, thus it should be easy for them to acquire reading skills..

During the colonial era, teaching of reading was in seven Zambian approved local languages and many acquired better reading skills. The introduction of English as Medium of instruction in all Primary schools by the new independent Government retarded reading in the country. After three decades of declining reading levels, Zambia piloted a programme known as New Breakthrough to Literacy, which returned the teaching of reading back into Local languages.

In this study four boys and four girls in the 3rd and 4th grades with compromised reading skills in their local language (Cinyanja) played an educative computer game for approximately 1-5 hours to train them in letter-sound correspondences. Their learning process was recorded by the computer and analyzed in detail for the purpose of finding explanation on difficulties in reading acquisition.

The findings showed that these children who had problems in discriminating vowels phonemes improved their spelling and orthography skills during the intervention. The implication is that literate game was useful and complements classroom instructions. There is need to improve teaching methods in Zambian schools. Further complementary research is required to review the current methods in reading.

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1.0 Introduction

Reading is the recognition of written words. It is a complicated process that involves a variety of skill and aptitudes. Efficient reading skill of English is not an event that cannot be learnt in a few years in school although the basic skills of reading in regular orthographies such as Finnish is learned by most children within few months if the instruction is appropriate.

Reading is more than a mechanical skill (Davies, 1972), it is a communication process. It involves the understanding of the print and recognition of symbols and the message it mediates to the reader's experience. Reading requires awareness and the ability to manipulate the phonological information contained in spoken language (Lyytinen et al (2004). In general this awareness of phonemes is acquired by all those who are exposed to reading instruction within the context of alphabetic orthography. We are not aware of phonemes unless they are properly taught. Further the study by Lyytinen et al (2004*)* says alphabetic unity system are based on symbols (letters) which represents the smallest meaningful and thus most important segment (phonemes) of a spoken language. Spelling means coding phonemes into letters and reading decoding letters back to phonemes. Reading and spellings are reversible processes and should be taught in tandem so that this reversibility is obvious (McGuinness 2004).

The relationship between the letter(s) or grapheme which represents each phoneme is either directly or inconsistently related to spoken language (Lyytinen, Aro et al, 2004). It is true to say that English language is an inconsistent orthography and board of many complexities in the mapping between its graphemes and phonemes. For example in the reading direction one grapheme may represent several alternative phonemes and the same is true in spelling – a phoneme may be represented by alternative letters while in regular (consistent) orthographies such as Finnish or Cinyanja each letter represents one phoneme and each phoneme one letter independent of the context where they occur in visual or spoken language. The number of connections one had to learn is close to the

number of different letter-sound connections because the context effects are few as is the case with most relatively recently developed orthographies representing languages which have not changed much after its writing system has been documented (Lyytinen 2005)

English therefore qualifies as a bidirectional inconsistent orthography and Finnish bidirectional consistent orthography (McGuinness, 2004). This shows that a child who is learning to read in English finds difficulties in reading because the total number of possible connections between written and spoken language is very large. In this case Finnish is a language that does not have these inconsistencies: that's why a child learning it, may not have any confusion and difficulties as one learning English language.

Since Cinyanja can be considered to be a bidirectional consistent orthography, this will help the reader appreciate that reading acquisition. Reading problems are not independent of the system of the connection between the system and written system of the language (Lyytinen, Aro, 2005).This is why methods of reading teaching need to be developed for each language and methods that have been developed for English might not work in other languages (Alcock & Ngorosho2003). We wanted to see if Finnish methods could work in Cinyanja context as the languages have many similarities. It is therefore with the above in mind that Cinyanja was chosen to be used in this research whose major aim was to find out ways to support the current curriculum in providing alternative instructional method (computer game) of teaching letter-sound correspondences that would help the children with compromised reading skills in Cinyanja to read.

1.1 Background of reading in Zambia

The issue of language and education in Zambia was fairly straightforward throughout the Colonial and much of the federal period from 1924, only three years after the colonial office took over the responsibility for what was then northern Rhodesia. The policy was consistent .mother tongue was used for the first two years of primary education ,followed by a dominant vernacular up to standard 5,and English thereafter was taught (UNESCO 1964).

Around 1911 to 1924 the Colonial Government ensured that education was given to all Natives, the colonial government established schools and teaching was done in local language and the method used was syllabic chart where phonemes were built. Children were able to construct sentences following the combination of consonants and vowels.

After independence the ministry of education made a number of changes in the education system. In 1926 research in language began in Zambia. It was found that there were seventy-three (73) dialects and seven official languages.

In 1969, the new Government slogan of "One Zambia One Nation" allowed the piloting of English in urban areas. It was taught as a subject in local languages through translations method. The approach was generalized to teaching modern languages. For example; Classes were taught in the students' mother tongue, with little active use of the target language. Vocabulary was taught in form of isolated word lists (Mora J.K.2002) Further its primary focus was on memorization of verb paradigms, grammar rules, and vocabulary. Application of this knowledge was directed on translation of literary texts, focusing of students' appreciation of the target language's literature as well as teaching the language. Activities utilized in to day's classrooms include: questions that follow a reading passage; translating literary passages from one language to the other; memorizing grammar rules; memorizing native language equivalents of target language vocabulary.

When they implemented it, it was discovered that by the end of grade two, pupils were able to read both in Zambian language and English, Manchinshi (2004). Emphasis was put in syllabic method and word building such that enough vocabulary was acquired by

most of the pupils in grade 5 (stardard5).Oral English was strongly taught from grade 1to 4 but writing was done in Zambian languages and pupils seemed to be doing very fine.

In 1972 the Zambia government gave a directive that English be used as an official language .The purpose for this move was that there were too many Zambian languages (73*)* which would bring disunity in the country and tribalism, therefore, the review to use of English as a medium of communication was meant to unite the country. To reinforce it teachers were trained to become teachers of English and English was made to be the media of instruction in schools. Pupils who failed in English despite getting very high grades such as distinction in a Zambian language would not be issued with certificates and were regarded as failures and could not continue to the next education level.
In the same year the government opened up the Curriculum Development Center (CDC) to be producing materials in English for all levels of education and the emphasis was to drill teachers and pupils to use English as a medium of communication. Their approach
was called communicative approach; an approach to teaching that emphases interaction as both the means and ultimate goal of learning a language. This is where the emphasis is not in reading but speaking. Pupils are able to communicate in both languages. This is natural way of learning to speak a foreign language. (Manchinshi P.C 2004).

1.2 Reading teaching methods in Zambia

Reading is a deliberate process of looking at and understanding written language Curriculum Development Centre (2000). Knowing the language of the text is clearly fundamental in helping the learner to read. It enables the learners to guess at the identity of words with or without using graphic clues, and it may also help them to guess the meaning of words from context.

The methods used in Zambia in teaching how to read are many, here are some of them
Phonic approach:
This an approach to reading that teaches the relation of letters (graphemes) to the sounds (phonemes) they represent to teach reading.(Halvorson1992) The theory behind the

phonic approach is based on two assumptions:

⇒ Most languages have consistent phoneme (sound) to grapheme (letter) correlation

⇒ Once learners have learned the relationships of the letters to the sounds, they can pronounce printed words by blending the sounds together;

⇒ For example: to learn to read the word 'bat' in English the learner would be introduced to the vowel sounds such as /a/ /e/ /o/ /u/ first, then word sounds follow later on /b/ /a/ /t/ before reading 'bat'. Similarly in Cinyanja, if the learner wanted to read the word 'atate' he /she will be required to know the vowel sounds /a/ /e/ /i/ /o/ /u/ and blend these sounds with the consonants i.e./a/ /ta/ /te/ . Phonic method is one of the main methods often used in by teachers in Zambia as remedial for children with reading problems as well as facilitating reading in young readers.

Whole - word approach: In this approach, a teacher presents one word on a flash card, expecting the children to 'say' the word in an instant or in a flash. This enables learners to recognize words by their overall shape. The brain imposes patterns on what we see. The Gestalt psychologists argued that mental process and behaviour cannot be analyzed into elementary units, and that human beings make sense of the world by recognizing patterns and whole things. For example, if you glance out of the window you can see 'houses' and 'trees' as whole things rather than just their component parts. A Gestalt psychologist might describe reading in terms of recognizing words as whole things. As more and more words are added to children's 'sight word' vocabularies, the children become better readers.(MoE 2006) In Zambia this method is widely used when teaching vocabulary to grades 3 and 4 in Zambian language.

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Syllabic: The syllabic approach is widely known in Zambia where it seems now to be used only rarely to teach reading in Zambian language. It is based on "consonant-vowel" sequences e.g. ba, be, bi, bo, bu; ka, ke, ki, ko, ku, etc. From these, teachers prepare written "syllable chart", in the following example:

A e i o u

La le li lo lu

Sa se si so su

Ma me mi mo mu

Ta te ti to tu

Ka ke ki ko ku

The chart provides the basis for various activities, particularly making up different words from the chart (e.g. kalulu, hare; sukulu, school; amai; mother). Such words play activity, alerts learners to the fact that words are composed of sounds, and sounds are (albeit not always in a perfect one-to-one relationship) represented by phonemes. This approach is well suited to the "consonant-vowel" phonological structure of Zambian languages.

Whole Word and Whole Sentence: This also referred to as the "look-and-say" method. Here learners are presented with the written versions of whole word phrases or sentences which are read aloud by the teacher often through the use of flash cards. Pupils are expected to memorize them through repetition. The claimed advantage of this is that it facilitates rapid recognition of whole units and as such that it approximates more closely to the fluent reading of a proficient reader. The disadvantage is that it does not help learners to work out for themselves words that they have not already met in print. Additionally in a second/foreign language situation there is a clear danger that learner may simply repeat without understanding. Adam and Huggins (1985) found out that reading accuracy was strongly affected by word frequency and only improves more when words are read in context than in isolation.

Language Experience: This is an integrated approach of which the best known version is Breakthrough to Literacy. It has been adapted by the South African based Molteno organization for indigenous language in various southern African countries and is currently the model for the breakthrough to icibemba initial literacy programme which was piloted in the Kasama district of Zambia by Irish Aid. A typical classroom procedure is first that the learner decides what to write - usually a single sentence. This is then constructed out of words already printed on card or provided by the teacher. The child

then reads the sentence copies it and then reads it again. Both the phonic and whole word methods may be incorporated into this approach.

1.3 Reading levels and learning across the curriculum in Zambia

From 1991 to1992, ODA funded research into reading levels in Zambia. Eddie Williams, of Reading University, carried out a comparative study of reading levels in Zambia and its neighbor Malawi. He returned in 1994 to broaden his investigation. His findings showed that Zambian children were failing to achieve adequate reading levels in English. He found that 85% of Grade 3 pupils, 84% 0f Grade 4 pupils and 74% of Grade 6 pupils are unable to read texts judged to be at their level. He concluded that: "The reading ability in English of most pupils is lower than that needed to cope with English course books, and lower than their teachers estimate it."(Sampa F. 2003;p16)

The research also looked at reading ability in Zambian Languages found that children's reading levels in Cinyanja (the officially designated language in the schools tested), were very low. This is attributable to neglect of these languages in most schools, and is also exacerbated by the fact that the variety of Cinyanja in which many Zambian children are competent is "town Cinyanja", a non-standard variety characterized by borrowings from English as well as other Zambian languages, rather than the "standard Cinyanja" of the Zambia language course books on which the tests were based, (Linehan etal 1999).
The research shed further light on the situation in Zambia through the comparisons that were made with Malawi. It was found that while reading levels in English differed very little between the two countries, Malawian children are very much more able readers in their local language. This suggests that despite educational conditions being vastly inferior in Malawi, children are learning initial literacy, due to the policy of teaching it in the local language. It should be noted that Zambian children read no better in English than Malawian children despite an extra four years of having the language as a medium of instruction (Kashoki1990)

The research carried out by Williams backs up research carried out before and by Zambian and international research teams such as Constable in 1983, the CDC in 1994

and teacher training colleges in 1995. The more recent SACMEQ report found that approximately 25% of grade six pupils could read to minimum standards while only about 33% reached desired standards. Informal interviews with teachers, and assessment of children carried out; on a visit to schools by members of the NRC and BDDCA education advisers added further weight to the research findings above. When asked, teachers estimated that as many as 50% of pupils left school at grade 7 unable to read. All teachers saw reading as something difficult that not all of the class would master. They agreed that use of English rather than local languages added to their problems of teaching reading particularly in Grades 1 and 2.

Given this low general level of English reading proficiency, it was difficult to see how the majority of pupils in Zambia can learn other subjects successfully through reading in English. This is supported by Focus on Learning (1993:48 paragraph 2, 3) which claims that:

"Too early an emphasis on learning through English means that the majority of children form hazy and indistinct concepts in language, mathematics, science and social studies. A number of studies in Zambia have confirmed that children's subsequent learning has been impaired by this policy."

Previous research in Zambia has come up with similar conclusions (e.g. Chikalanga, 1990).which says for the majority of children in both Zambia and Malawi there is a clear risk that the policy of using English as a medium of instruction may contribute to stunting, rather than promoting academic and cognitive growth.

1.4 What Zambia has done to improve reading acquisition in schools

The Primary Reading Programme, which began to be fully implemented in 1999, involved interventions at each of the seven primary levels. In Grade 1 the new Breakthrough to literacy NBTL course which is taught for one hour per-day is a version of the original Breakthrough to literacy that has been modified to better suit the Zambia

environment. This fast-track one year initial literacy course in each of the seven Zambia languages currently used in schools has had significant success. The evaluation report on the pilot programme carried out in Kasama during 1998 states: "The programme was an unqualified success; children in Breakthrough to literacy (BTL) classes were reading and writing at a level equivalent to Grade 4 or higher in non-BTL classes" (Kotze and Higgins, 1999, page 4). The review team further claimed at oral presentation of their findings to the Ministry of Education that in pilot schools in Kasama were performing in literacy test at a level above what they would expect of children of similar age in South Africa the UK and Ireland-areas with which they were familiar. (Kotze and Higgins 1999)

NBTL was developed by Primary Reading Programme from the original Breakthrough to make it more Zambian more teacher-friendly and more desirable. The modified course was piloted in two Zambia languages in four districts and found to be as effective as the original Higgins, (2000:4). This modified version has drawn a good deal of interest from countries surrounding Zambia and those further a field.

According to Linehan(2004 p4), the strategy at Grade 1 was to fast track reading and writing skills while building up to a level of spoken English that will allow the skills developed in a local language to transfer to English in Grade 2.

Six hour twenty minute per week might appear to be a modest amount of time for such a critical component of early learning. However over the years it has become an accepted view among Zambian educators that part of the reading problem has arisen from the Literacy that has been embedded within the Language syllabus and has therefore been treated as a relatively minor (though difficult) component of a large set of objectives rather than as a vital prerequisite to all learning in schools (Tambulukani G 2004:p7).

A decision was taken in the year 2000 through the Basic School Curriculum Framework produced by the Curriculum Development Centre (2000) to de-link Literacy from Languages, to better tackle Literacy by dealing with it as a subject in its own right. English Language and Zambian Language still appear on the school time-table, with a focus on the oral, lexical, and structural elements of the language. Because this was an unnatural separation to begin with, the language lessons cannot help but support and supplement the literacy work. For example, the weekly time-table allocation for Grades 1 and 2 that was being implemented in 2004 as part of a staged curriculum reform process was as follows:

Table 1 Core curriculum for grades 1-4 in literacy, Zambian language and English (MoE 2000)

Grade	Literacy	Zambian Language	English
Grade 1	ZNBTL course for literacy in Zambian languages (one hour per day)	Pathway to English G1: TG for Oral English (one hour per week).	The Zambia language course for Grade 1 (three hour per week).
Grade 2	Step in to English for literacy in English (one hour per day).	Pathway to English G2 TG for Oral English (half an hour per day).	The Zambia language course for Grade 2 (four hours per week).
Grades 3-4	Read On: A literacy course for teachers literacy in both English and the Zambia language of your school (one hour per day in Grades 3 and 4; two-and –a-half hours per week for Grades 5 to 7.	The English language course used in your school (three hours per week for Grades 3 and 4; four-and-a-half a hour per week for o hour per week for Grades 5 to 7).	The Zambian language course used in your school for Grades 3 to 7 (three hours per week for Grades 3 and 4; four-and-a-half hours per week for Grades 5 to 7).

The strategy at Grade 2 was to ensure the transfer of literacy skills from the Zambian language to English. Alongside this was the transfer of the child-centered methodology from Grade 1 to Grade 2 and from the Literacy lessons to all lessons. This transfer of methodology and classroom management was a key strategy of the PRP initiative and its

impact was evident from the beginning: 'There were clear indications that a significant new philosophy of education was evolving in Breakthrough to Literacy (BTL) classrooms; specifically, a growing child-centred, problem solving approach to teaching was apparent ….There was evidence of a transfer of the BTL method and teaching strategies to other curriculum areas' (Kotze and Higgins, 1999, page 4).

For Grade 3-7 PRP has developed a course called, Read on which provided for bilingual literacy development and consolidation in Grade 3 to 7. As a separate subject literacy now has allocated to it one hour per day in grade 3 and 4; and half an hour per day in Grades 5 to 7. NBTL uses language experience approach in both local languages and in English and that teachers are expected to form pace groups and do regular assessment and remedial work with children who are not progressing

1.5 Helping the poor readers

Failure to attain fluent reading skills is detrimental to the further development of reading. Current theories describing the acquisition of fully specified orthographic representation stress the role of accurate identification of words on a number of different occasions during next reading, via self- teaching mechanism (Seymour P.H.K.et a l, 2003). The core knowledge required for reading comprises grapheme-phoneme connections (Lyon, Shaywiztz and Shaywitz 2003) as letter naming seems to be different for those who fail to acquire reading at the expected age, this means that learning the letter-sounds is also more challenging. Infact, it has been observed that this initial learning among children with low initial letter knowledge and found that these children require much more intensive exposure to those connections in order to successfully start their reading (Alexander 2001). In transparent, consistent languages, such as Finnish, the most important skill is learning the letter-sound correspondences. After that, learning to read is very easy for the majority of pupils. Some children have specific reading difficulties (dyslexia) and need more extensive training in letter-sound correspondences than the average children.

Letter sounds are abstract and are not naturally of interest to children (Lyytinen Aro etal 2005). Consequently, introducing the learning of these sounds in a computer game

context can make this learning enjoyable and greatly assist those who are unable to master the connections without extensive repetition (Heikki Lyytinen, Jane Erskine, 2006). In a computer game context, developed within the remit of the Jyvaskyla Longitude Dyslexia research, each child receives training on items which he or she is just learning to master. The game adapts to the individual level of ability and ensures that players are supported by maximum positive feed back and the child's interests in further playing (and consequently, learning) is sustained. Such an early boost seems to assist children at familial risk for dyslexia and those who also show a developmental delay in phonological skills. The provision of vast members of well targeted repetition within a sufficiently enjoyable game environment may also aid learning of the connection between larger units of written and spoken language and also automatize the retrieval of those items to which a child requires speedy access in order to acquire fluent reading. McGuinness (2004) a computer is useful when you have to teach dyslexic children who need a lot of repetition of letter-sound connections.

1.5 What is the Literate game

Literate game is a computer game that helps children to learn to read. It was developed in the University of Jyväskylä, Finland; with the initiative of Professor Heikki Lyytinen. Playing this game helps the child to understand the connection between symbols and spoken sounds. The game gives a child a chance to practice at his / her own pace and gives positive learning experiences. The game starts with training letters and continues to syllables and words. The game is adaptive, meaning it is different for each person and does not let the child continue to more difficult levels before the easier ones have been learnt. Literate game works best with children who are just starting their schooling and with those who have learning problem (dyslexia) in reading (Lyytinen Hintikka S.and Mikko Aro 2005). Goal of the program was to enhance the accuracy of processing for phonemic sounds and to connect phonemes fluently with their orthographic equivalent (Lyytinen etal 2005). A single auditory stimulus was delivered (with high quality headphones) concurrently with a number of orthographic items (target and distracters) that appeared at the top of the screen embedded within balls. The balls immediately began to drop downwards on the computer screen and the player's task was to hone on

the relevant orthographic item and to 'catch' it by clicking the mouse. If the player did not catch the correct spelling prior to the target to the ball hitting the ground or erroneously click on the in correct spelling, the target item was repeated in the next trial and the correct response was color-highlighted. (Lyytinen etal, 2006). The game is adaptable, meaning that it makes the playing easier or more difficult, according to the player's skills so that the player would always be able to play on 80% performance level and thus be motivated to continue.

Research question

In this study, the matter of interest is helping the poor readers at grades 3 and 4 to improve their Cinyanja reading skills. As teaching of reading skills is related to language, it is reasonable to find models of teaching from similar languages and that Finnish methods could be beneficial as Finnish is similar to Zambian languages. The Literate Game is based on phonemic-synthetic method of literacy teaching which has been used in Finland for a long time and proved to be beneficial as Finnish children are among the best readers in the world. It is assumed here that poor reading skills might be related to poor knowledge of letter-sound correspondences and that specific training in this could be helpful. As this is a pilot study, it is also interesting to see what kind of characteristics Zambian children have in their reading problems.

2.0 Methodology

This study is a sub-study of a larger research which was conducted in autumn in Lusaka, Zambia. As a whole, there was a sample of 1300 pupils from grade 1-4 in three public schools whose literacy skills were studied either in Cinyanja or in English. In addition to these, one study was made in a private international school. The overall purpose of the research was to gather data of benefit of the literate game in Zambia and to observe the learning process and special characteristics of reading difficulties in Zambian children. The main aim of the research was to find ways to support of the current curriculum and to provide new possibilities to improve quality of literacy instruction and introduce a method of remedial teaching for children who have compromised reading skills. The particular study concentrates on case study of 8 participants, and the observation that can be made from their learning and usability of the pilot version of the Zambian literate game (Sewero la- ma- u) which was developed for this study.

2.1 Sewero La- ma- u – The Literate game in Cinyanja

A Cinyanja translation of Finnish Literate game (Ekapeli) was designed for this study. Cinyanja was chosen to be the language as it is commonly spoken in Lusaka city area (42% in the whole Zambia, Webb & Kembo-sure, and 2006b). The game was titled Sewero La- ma- u "Game with words" to promote importance of using Zambian language. The game involved 25 Levels: levels 1-6 introduced all phonemes used in Cinyanja, Levels 7-18 trained syllables and levels 19-25 trained words, starting with 3-letter words such as U-KA and O-NA, then 4-letter words like TA-TE and GA-LU, then 5-letter words (PHA-LA, MA-NJA), 6-letter words (MI-SI-KA, MA-KO-LO) and 7-8 letter words (NYE-NYE-ZI, KU-MBU-KA). The very last level had a small selection of 5 letter words which were introduce in pairs and which had one phoneme difference (MVEKA/MVERA). See Appendix 2 for list of game contents. The items were presented only in upper case.

The Sewero La-ma-u game version had two technical deficits:

(a) As there was small amount of items in the each level, the exposure time to the targets in the game was too short for some children to get enough training with them

(b) The targets had very relatively small amount of distractors which means that the information on player's differentiation skills are based on relatively small amount of alternative options, for example, phoneme A has only been presented with distractors I E T N S and L, so there is no information of whether the player knows the difference between A and Y, G, H or other phonemes.

Further the game did not allow the child to proceed to the next level if he did not score a 100% performance in a level. Thus 100% performance was reached if the child made correct choices in each target three times in a row. When a child made a mistake the level had to be repeated until he /she achieved the 100% performance. This game therefore meant that the child should recognize the requested target items at least three times without errors. The performance level is set this high because the items in study are phoneme letter correspondences which are supposed to be automatic, especially when the children of this study were supposed to have basic literacy skills already.

The presentation of the distractors is random so it is possible for children to collect three subsequent correct answers with easy distractors and move on to the next level, even if some distractors remain unlearnt. However, all the items are presented both as targets and distractors so that players will practise with all them during the game.

2.2 Participants

In July 2005, 103 pupils from grade 3 and 170 pupils from grade 4 were screened for reading problems at a school located in Lusaka (see the Appendix to get further information on general literacy levels at 3rd and 4th grade). Based on the spelling test results, a cut-off limit for 15% test score was set. The cut-off limit for Grade 3 was 3 points and for Grade 4 was 6 points meant that children with 0-4 points were selected as

potential participants from Grade 3 and children with 0-6 points were selected from Grade 4. Originally it was planned to have at least 10 players from both grades but due to the fact that intervention period was near Christmas holiday, many did not play long enough. The eight children whose playing is analyzed here were the ones who played the longest time.

Name	Grade	Intervention day	Playing time	Trials	Highest level
Seka	3	18	118 min	2261	Level 7
Gayi	4	19	163min	2775	Level 25
Njo	3	18	107 min	2431	Level 11
Ise	3	18	115 min	2408	Level 17
Siya	3	18	108 min	2306	Level 17
Mina	3	17	106min	1862	Level 10
Pape	4	19	127min	3009	Level 25
Pepe	4	19	127min	2331	Level 25

Table 2: Participants of the study

The case stories show the background information on each child and the detailed interventions. It also shows the initial skills, learning process and out comes of interventions.

2.3 Assessment method

The reading skills were assessed using a spelling test. The spelling test had 40 items including phonemes, syllables and words. Zambians designed the test according to the estimated grade level of performance of children. It was expected that children who were in grade 3 and 4 know how to spell words with more than 5 letters. Instructions were given in local languages and the class teacher conducted the assessment. Class teachers were preferred as testers because children knew them and they knew the teachers pronunciation. The pre-test word order was used in the July screening and October pre-test and the post-test word order was used in December post test and January follow up.

On orthography test children were instructed to underline all the words which were spelled wrong. Orthography means the legal structure of words in a certain language: it is by orthographic skills that we recognize if words are spelled wrong or are other than our own language. In the orthography test there were 170 items, starting from letters and syllables and ending with 6 letter words. 62 of them were misspelled (or there were impossible characters that do not belong to the alphabet) Children were supposed to underline the items that were wrong or impossible (such as wmana and jnoka). The pupils were given five (5) minutes to complete the tasks.

2.4 Gamelog analysis

The Literate game records all what a player does on the computer. The so-called gamelogs can be analyzed with several computer programmes. The general way of interpretation of gamelogs is this study is that 60% performance is equivalent to guessing and performance at or above 95% is considered to be a sign of real knowledge.

Daisygraph is a programme that shows if the children were able to connect the right sound to the right letter. It can also show if a child has wrong understanding of letter-sound connection, which means that the child has chosen a distractor instead of the target that was asked. Daisygraph shows how well or bad the player has known the difference

between the target and the distractors. There are four circles in the figure which represent 0%, 50%, 75% and 100% performance levels. Each target-distractor pair makes a tiny "petal" to the graph, which shows the probability of understanding the difference between target and distractor. When the player chooses continuously the distractor, the petal is very near the center of the picture presenting 0% or 50% performance. When the player chooses the target item correctly, the petal is near or at the outmost 100% performance circle. The petals are colored so that green refers to good performance, red to bad performance and brownish to mediocre. Daisygraph was developed by Janne Kujala. In this study the Daisygraph makes probability petal for each 20 trials of a target-distractor pair. Because of this, it is possible to see the development of player's performance when there are more than 20 trials. The small numbers outside the Daisygraph tell how many times the distractor has been presented with the target item. Usually trials less than 5 are meaningless because there's too little material for calculating the probabilities of performance.

3.0 Results

3.1 Pape 617

Pape was an 11 years old girl on 4th grade. Pape got 1 point in the screening spelling test and 12 points in the screening orthography test. Pre-test scores were 7 points in spelling and 19 points in orthography (see table 2). Pape was able to reach the 25th level in the game, meaning that she played through the whole game.

Most items in phoneme levels were played at very good performance level, but there were problems with targets A (distractor I), I (distractor A, see picture 1) and to lesser extent targets E (distractor S), N (distractors I, A and T). Also there were some errors between target U and distractor PHU (see picture 1) although U was played perfectly with distractors K, L, M, E, A, Z, O, P and T and all other syllable distractors.

Most syllables were played nicely, but there were some errors with syllables that had letter H in them, such as target KHA (distractor KA), PHU (distractors MPHU and PU) and MPHU (distractor PHU, see picture1), NKHA (distractor PHA, see picture1). Also, target NZI was confused with distractor ZI (see picture 1).

Pape was playing with words perfectly, except for some errors between target MANJA and MADZI (see picture 1).

Pape's problems seemed to be linked to sound /h/ in the syllables. This sound is difficult to record clearly, so some mistakes might have been due the sound quality. Sound /h/ is somewhat difficult in Cinyanja.

The difference between target I and distractor A was not learned. Also differences between target E and distractor S and target N and distractor A and T remained under 90%. The errors in the syllables were not corrected during the intervention, as the progression in the game was possible despite of these mistakes.

In the post-test Pape got 18 points in the spelling test and 43 points in the orthography test, improving from the pre-tests. Based on the assessment, the intervention was beneficial for Pape.

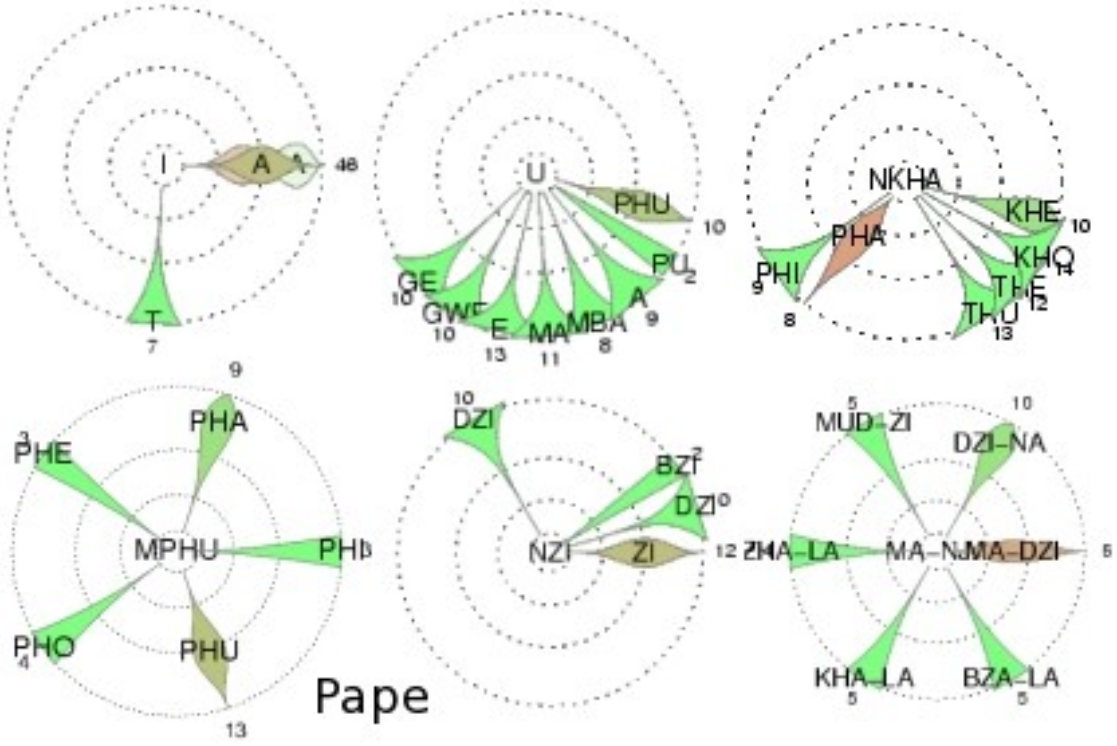

Illustration 1: Pape daisygraph targets I, U, NKHA, MPHU, NZI and MA-NJA

3.2 Pepe 694

Pepe was an 11 years old boy in 4th grade. Pepe got 4 points in the screening spelling test and 40 points in the screening orthography test. Pre-test scores were 7 points in spelling and 14 points in orthography (see table 1)

Pepe was able to reach the 25th level in the game, meaning that he played through the whole game.He had done 2331 trails in the 19 days he played the computer game. The performance on the items in the phoneme levels were played well, but there were few problems experienced with two of the following targets; Y did not differentiate well with H) and I (did not differentiate well with A) Pepe was a very good player on phoneme levels.

Most syllables were played nicely and the performance was above average, but there were some errors with syllables such as NDE (did not differentiate well with NYE), NE (with NYE), KA (with KHA) (see picture 2) and to the lesser extent KWA (did not differentiate well with KA)

Although Pepe played very well, he had problems with GWE (which could not differentiate well with GE*)*, NJU (with NZU, see picture 2) and NZU (with NKHU, see picture 2). However Pepe improved his performance reaching almost 100% with these items.

Pepe's problems seemed to be linked to sounds that are similar to each other. These sounds are difficult to differentiate clearly, so some mistakes might have been due the sound quality. The difference between target I and distractor A remained around 90% or so. Also differences between target Y and distractor H remained under 90%. The errors in the syllables were not corrected during the intervention, as the progression in the game was possible despite of these mistakes. In the post-test Pepe got 13 points in the spelling test and 48 points in the orthography test, improving from the pre-tests. Based on the assessment, the intervention was beneficial for Pepe.

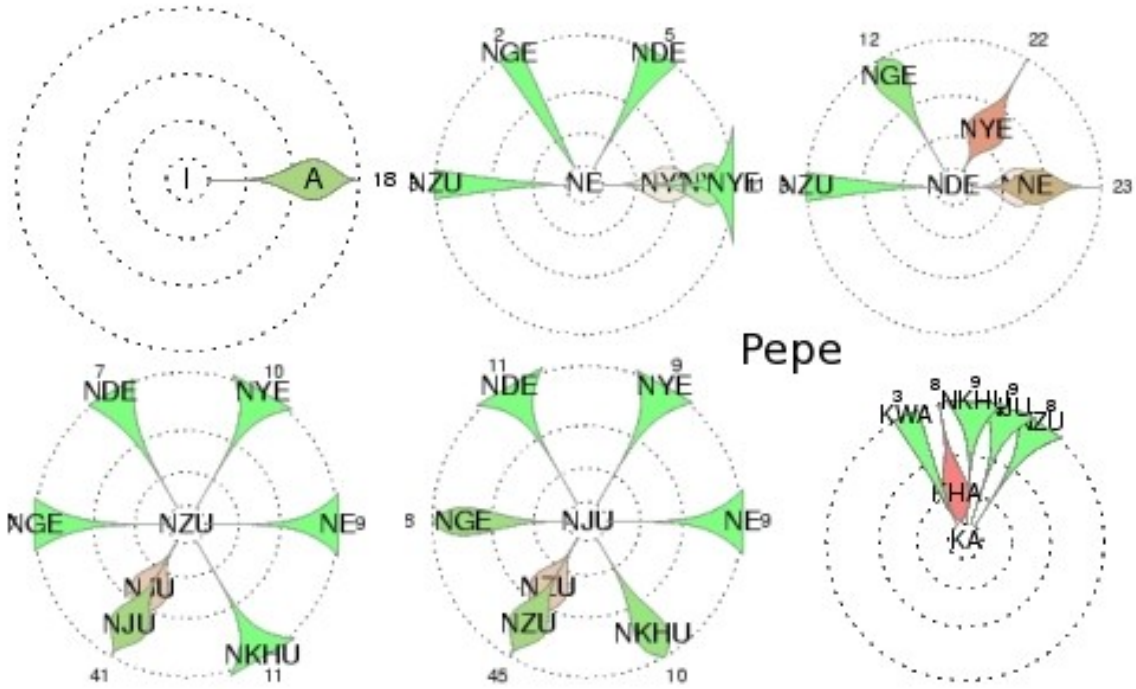

Illustration 2: Pepe daisygraph targets I, NE, NDE, NZU, NJU and KA

3.3 Seka 549

Seka was an 11 year boy who was in the 4th grade and was a Cinyanja speaker. In the spelling screening test he sored2 points and in orthography he scored 0. The pre-test scores were 2 points and 14 in pretest orthography while the post test results were 27 for the spelling and 36 for orthography.

Seka reached was able to reach the 7th level of game, the first syllable level of the game he played. At least no difficulties with phoneme A, I ,E, O,G and Y. But had difficulties with differentiating A/I, E/A, I/A, O/U, and G. He did 2261 trials and played the total hours of 1 hour 58minutes and 44 seconds.

In the level 7, the only syllable Seka played well was target MU. In all others there was much confusion, as can be seen in picture 5. Seka had a difficult in letter sound differentiation in the /U/ sounds. Seka's problems could not be resolved because of time

was not enough to give him an intervention in this area.

Seka did learn a lot as can be evident from the scores in the post spelling tests (see table2) and the post test orthography which were 27 in post spelling test and 36 in the post test orthography. Seka spent a lot of time in training with phonemes, especially vowels A and I and this is why he could not progress in the game as fast as the others (see picture 3) Even though Seka is at grade 4 he still does not recognise all the phonemes or know the difference between some letters. Based on the syllable pictures here, that knowing the syllables is very difficult if phonemes have not been learnt at automatical level.

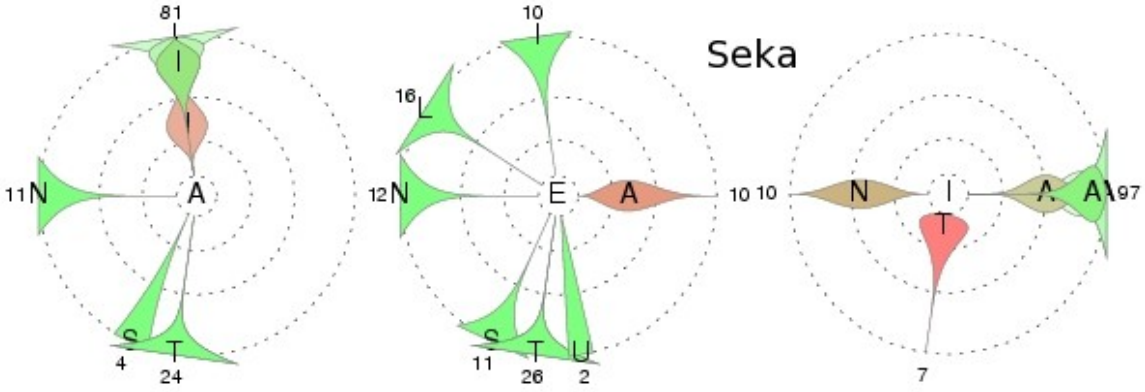

Illustration 3: Seka daisygraph targets A, E and I

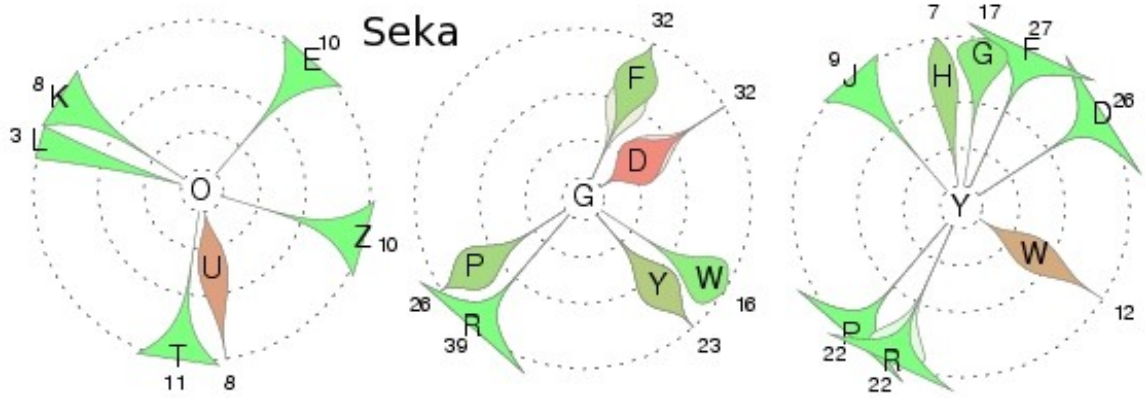

Illustration 4: Seka daisygraph targets O, G and Y

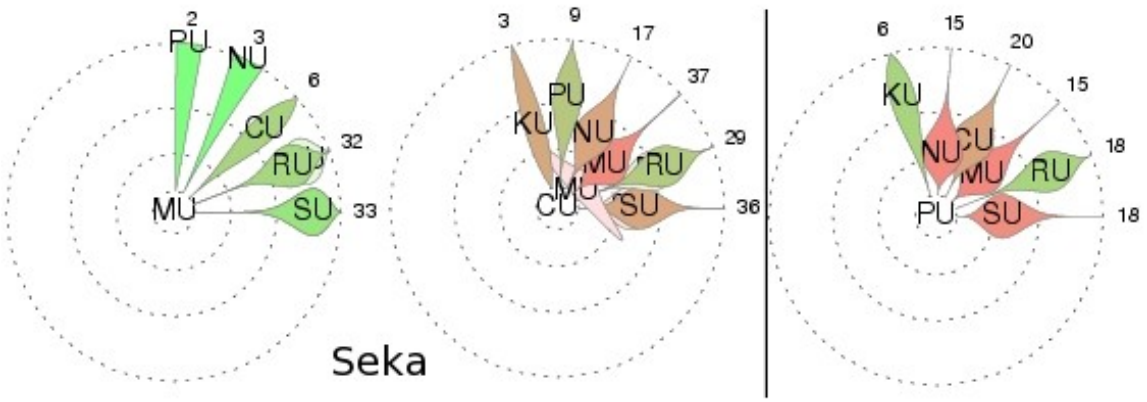

Illustration 5: Seka daisygraph targets MU, CU and PU

3.5 Njo 554

Njo was an 11 year old boy in the third grade .He got 2 points in the screening spelling test and 3 in the spelling pre test. For orthography he got 23 points for the screening test and 21 for the pretest. Njo was able to reach the 11th level in the computer game, meaning that he played little less than half of the game. He had done 2431 trials in the 18 days he played the computer game.

The performance on the items in the phoneme levels was not impressive as there were problems encountered. Target A was not differentiated from distractor I and even with 127 trials this phoneme was not learnt (see picture 6). Target E was not distinguished from distractor N (22 trials) or A (24 trials), there was also confusion between target E and distractor I, but this was overcome (see picture 6).

Target I was not differentiated from distractor A (171 trials), N (14 trials) or T (30 trials, this was learnt well in the end). Target I and distractor A were not completely learnt but the performance improved steadily during the game. Further in the phoneme levels target B was not differentiated well from distractor D (7 trials, 60% performance). Target D was not differentiated well with distractor B (9 trials). Target N was not differentiated well from distractor A (45 trials, 70% performance) and there was initial confusion with distractor T but this improved, also there was confusion with distractor I but it was learnt 100% in the end.

On the syllable level target NU was not differentiated well from MU (13 trials). Target KU was not differentiated well from distractor CU (10 trials) or MU (10 trials). Target FI was not differentiated from distractor TI (16 trials). Target VE was not differentiated from YE (9 trials, 56% performance) and vice versa, target YE was not differentiated from distractor VE (55%) performance (see the picture 8). The playing time ended before these were learnt. Also, target NGE was not differentiated from NYE (13 trials) or from NDE (6 trials). Target NDE was not distinguished well from distractor NYE (13 trials) and NE (18 trials).

Njo had problems with some letters and phonemes. He has a problem of combining phonemes together. His major problem may be linked to sound identification, but he also did not have much time to play. Problems like this on 4th grade are rather serious as children are expected to read two languages fluently by then.

In the post-test spelling test Njo got 3 points and in the post spelling test he got 26, gaining 23 points. In the orthography pre-test he got 23 points and in post-test he got 21. Despite of the orthography results, game intervention was beneficial to him. The orthography test was about speed, it is possible that Njo wanted to read the test paper more slowly to prevent mistakes and this is why he did not have time to mark all the answers.

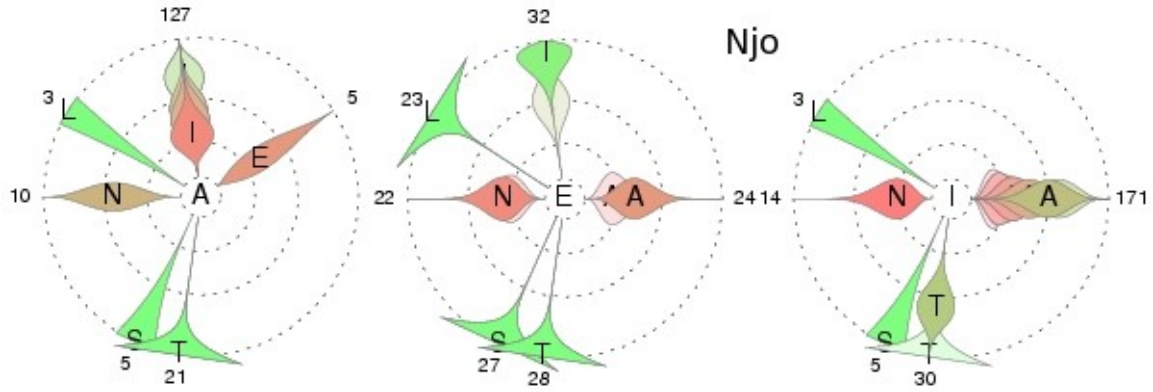

Illustration 6: Njo daisygraph targets A, E and I

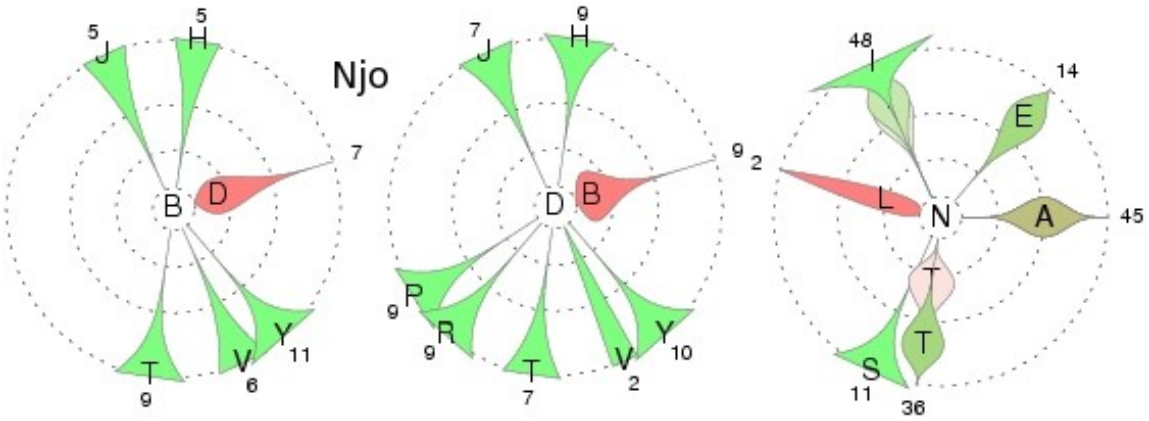

Illustration 7: Njo daisygraph targets B, D and N

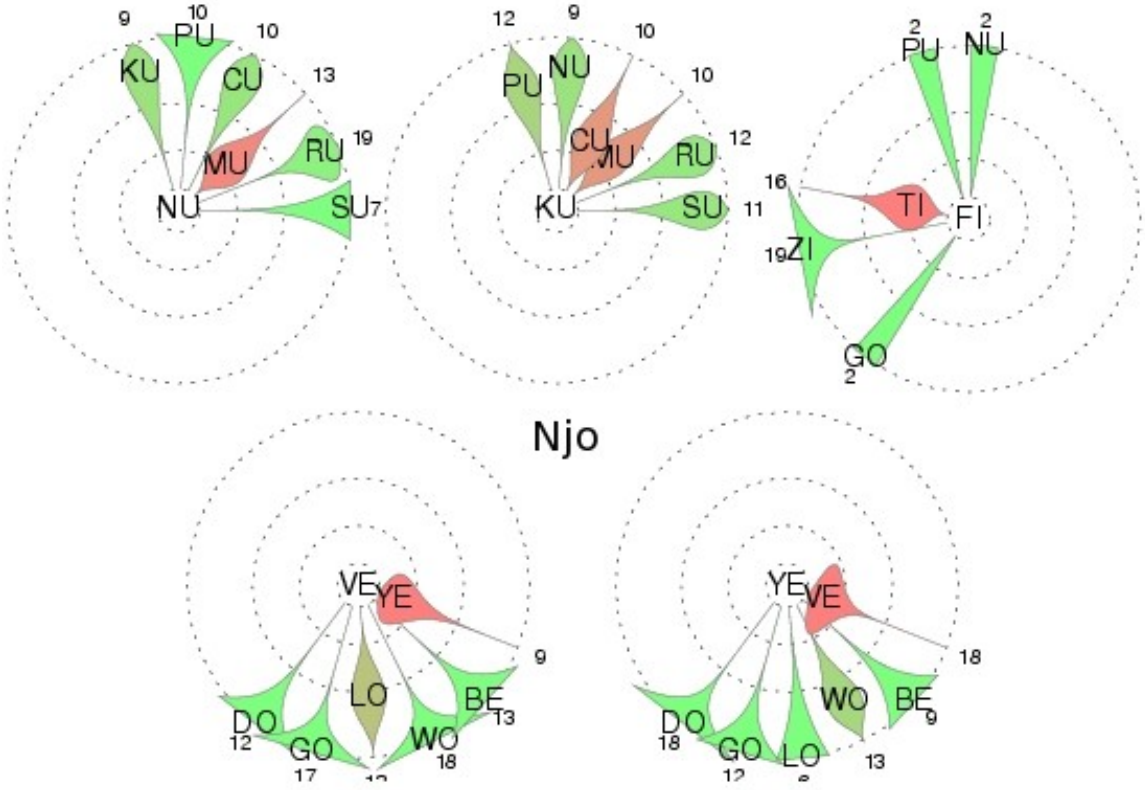

Illustration 8: Njo daisygraph targets NU, KU, FI, VE and YE

3.6 Mina 472

Mina was a 10 year old girl on Grade 3. Mina got 3 points in the screening spelling test and 20 in the screening orthography test. In the spelling pre-test Mina got 2 points and in the orthography pre-test 29 points. Mina was able to reach 10th level in the game, meaning that she played half of the game. She had done 1 hour 47 minutes playing in 17 days (1862 Trials).

Mina had some difficulties in the phoneme levels. Target A was not differentiated from distractor I even after 67 trials or from distractors S and N (less than 10 trials). Target I was not differentiated from distractor A (68 trials) and remained under 70% performance, progress went backwards. Target S was not differentiated from distractor T (20 trials) (see picture 9). Target N was not differentiated from distractor S (13 trials). Target D was not differentiated from distractor F (15 trials). Target G was not differentiated from distractors F and D (see picture 10). On the syllable levels Mina experienced some difficulties as well. For example target NU was not differentiated from PU (26 trials) or RU (25 trials). Target CU was not differentiated from NU (27 trials). Target KU was not known from distractors NU although the performance was around 80%.

In the post-tests Mina got 29 points from the spelling test and 40 points from the orthography. Even though Mina did not seem to overcome all her phoneme confusion problems in the game, the assessment results improved a great deal. Intervention was beneficial to Mina.

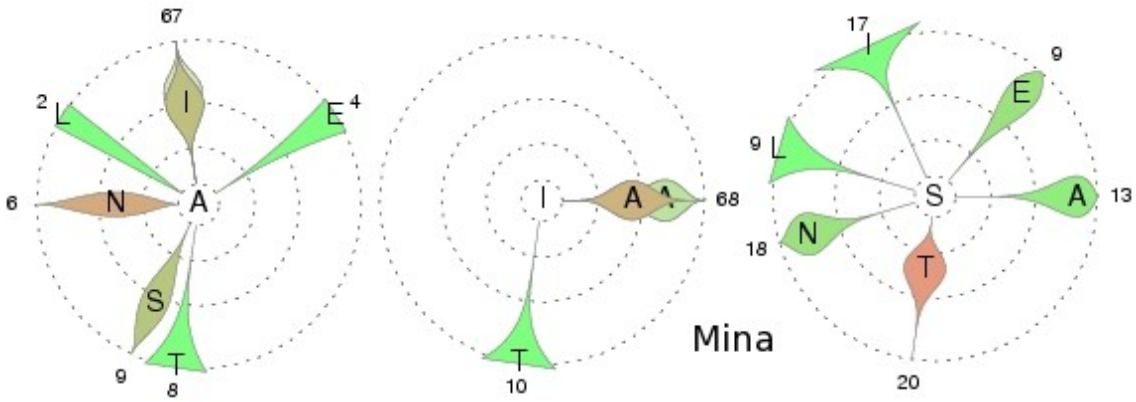

Illustration 9: Mina daisygraph targets A, I and S

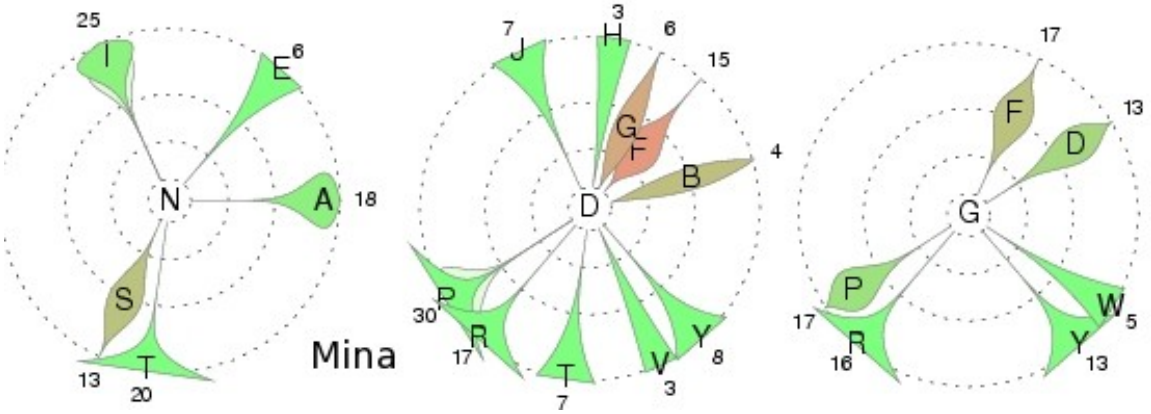

Illustration 10: Mina daisygraph targets N, D and G

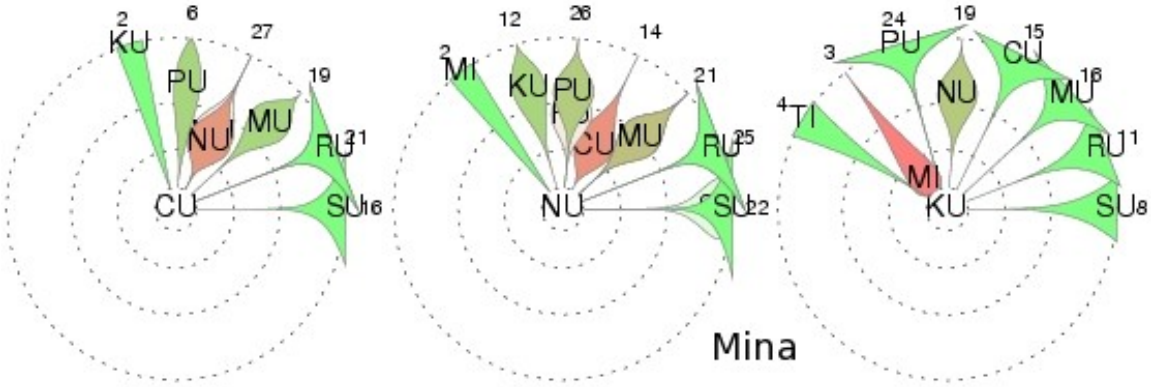

Illustration 11: Mina daisygraph targets CU, NU and KU

3.7 Ise 539

Ise was a 9 year old boy on Grade 3. Ise got 3 points in the screening spelling test and 16 points in the orthography screening test. The pre-test scores were 1 point in spelling and 25 points in the orthography test.

Ise was able to reach the 14th level in the game, meaning that he played ¾ of the whole game. He played the game for 1 hour 55 minutes (2408 trials).

The performance on the phoneme levels was quite good though he had problems with some target items. Target A did not differentiate well from distractor I (29 trials). Target I did not differentiate well from distractor A (30 trials). Target Y did not differentiate well from distractor H (14 trials) (see picture 12).

On the syllable levels there were some confusion. Target KU was not differentiated well from distractors RU (18 trials) and NU (28 trials, improved during the intervention). Target SU was not differentiated from distractor CU (10 trials) or RU (37 trials). Target BE was not differentiated from distractor VE (only 8 trials) and target YE was not differentiated from distractor BE. (See picture 13).) Target NE did not differentiate well with NGE, NDE and NYE.(See picture 14) and target NGE did not differentiate with distractors NDE and NYE.

Target NKHA was not differentiated well from KWA (50 trials). Target KWA was not differentiated from distractor KHA (54 trials) and BWA (only 8 trials) (see picture 15). Target KA did not differentiate well with KWA and KHA (picture 15
The problems Ise had might relate to sound differentiation problem, especially when sounds are very close to each other. Based on the assessment post-test scores intervention was beneficial to Ise.

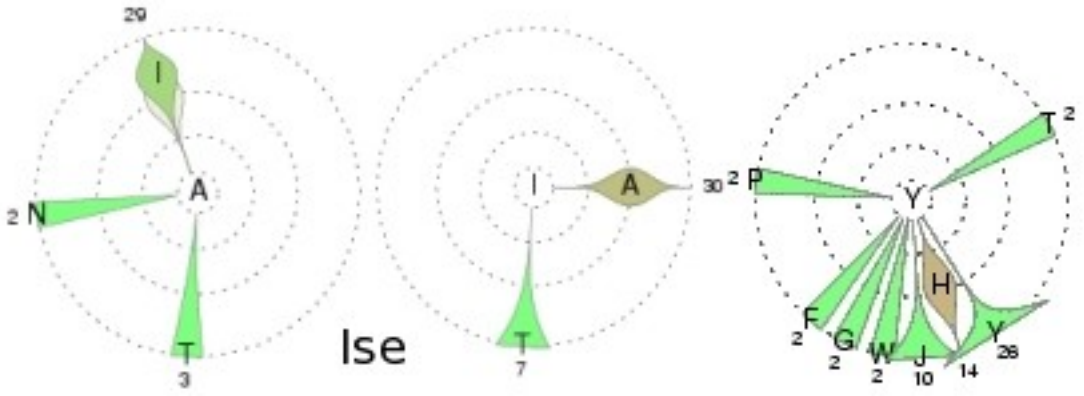

Illustration 12: Ise daisygraph targets A, I and Y

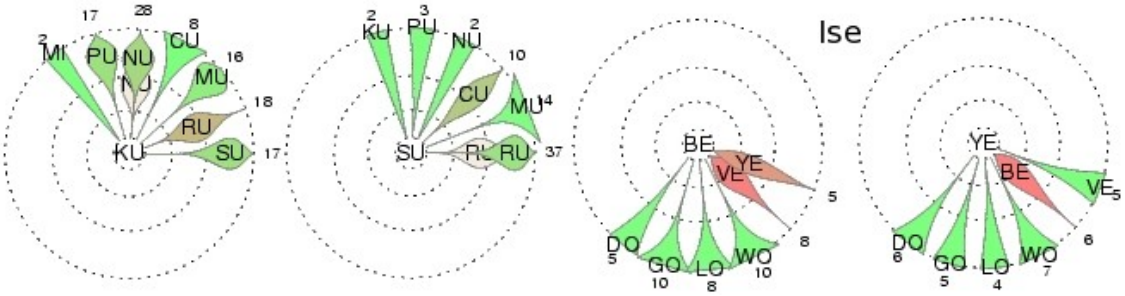

Illustration 13: Ise daisygraph targets KU, SU, BE and YE

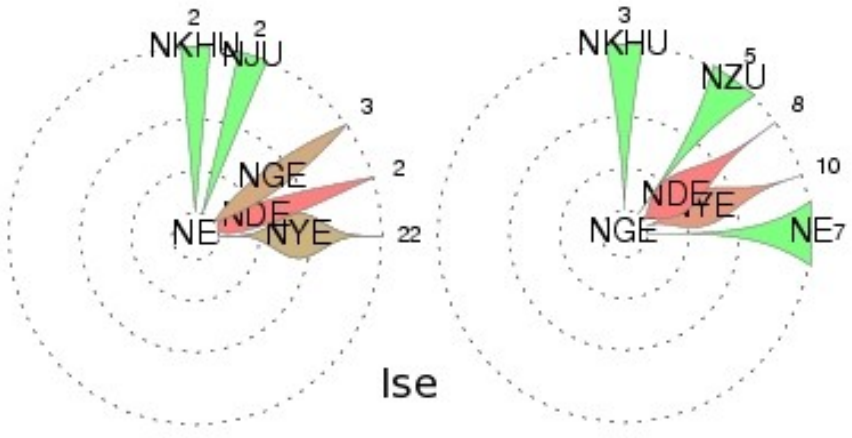

Illustration 14: Ise daisygraph targets NE and NGE

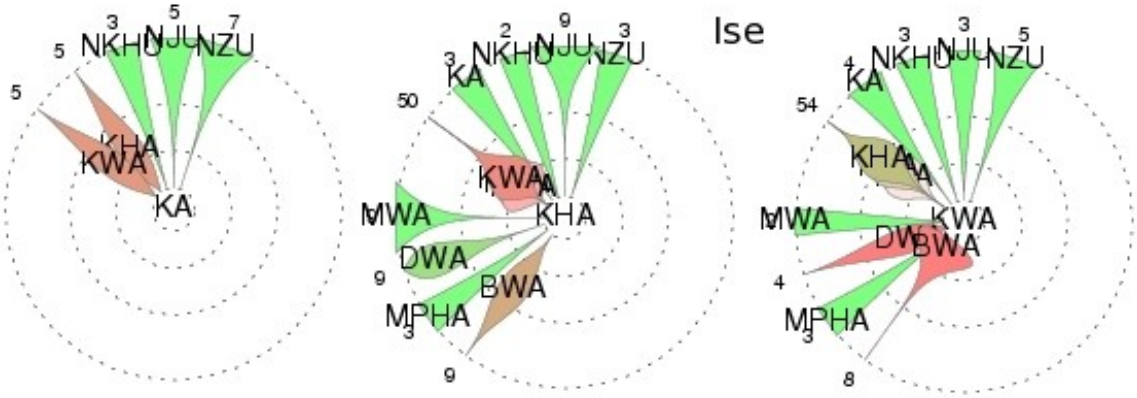

Illustration 15: Ise daisygraph targets KA, KHA and KWA

3.7 Siya 568

Siya was a 9 year old girl in grade 3. Siya got 1 point in the spelling screening test and 61 in the screening orthography test. In the pre-test she got 1 point and in the orthography pre-test 21 points. Siya was able to reach level 17 in the game with 18 playing days and playing time 1 hour 49 minutes (2306 trials).

In the phoneme levels she had difficulties of differentiating target L from all distractors presented except I (see picture 16). On the syllable levels Siya had few difficulties with targets DO, GO and WO (see picture 17) but managed to improve in the target GO distractor DO difference. Target KHA was difficult to differentiate from KA (only 8 trials). Target KWA was confused with KHA but Siya learned the difference almost perfectly. Target PHE was confused with distractor PHA (see picture 18). Target NDE was confused with distractor NYE and target NGE was confused with distractors NJU, NDE and NYE. However, target NZU was differentiated from all presented distractors perfectly (see picture 19).

Siya made improvement in the post-test, getting 8 points from the spelling test and 61 from the orthography test, suggesting that intervention was beneficial to her.

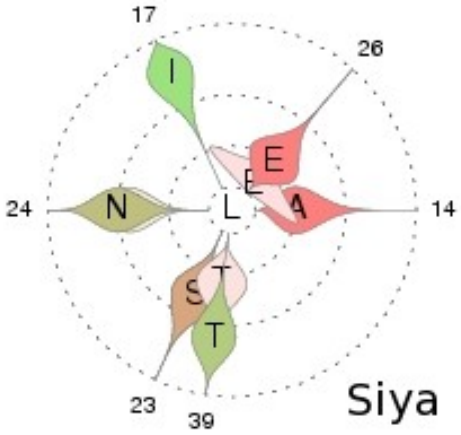

Illustration 16: Siya daisygraph target L

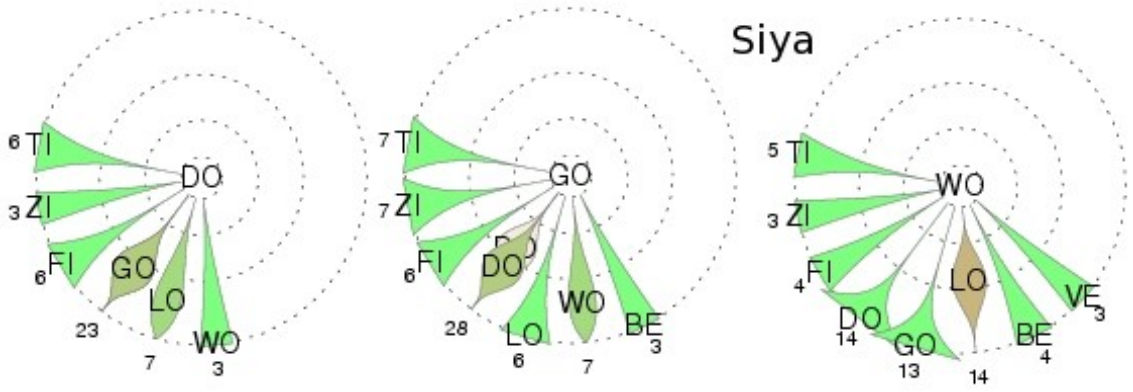

Illustration 17: Siya daisygraph targets DO, GO and WO

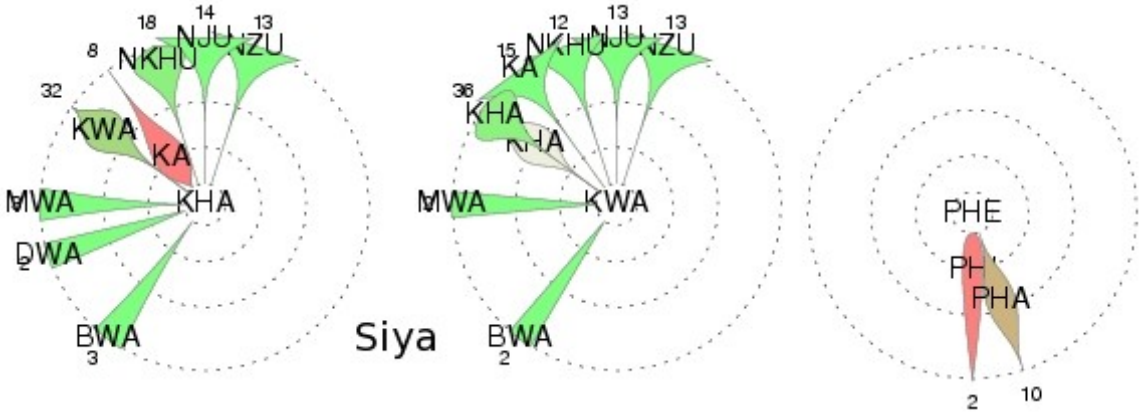

Illustration 18: Siya daisygraph targets KHA, KWA and PHE

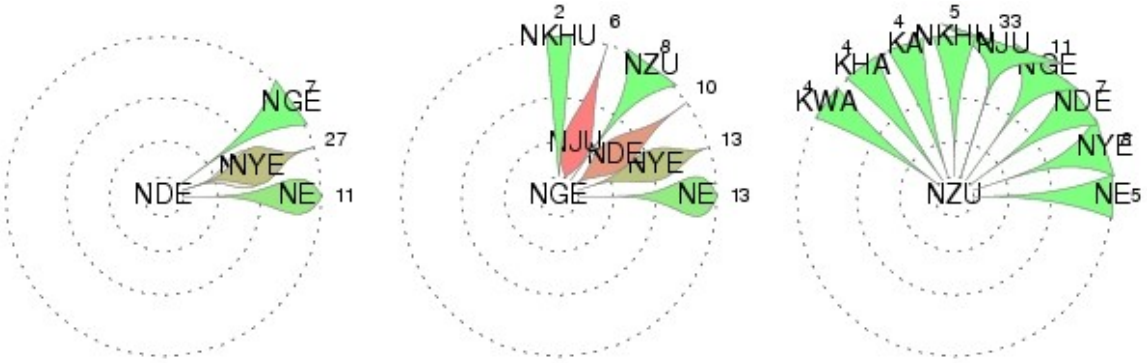

Illustration 19: Siya daisygraph targets NDE, NGE and NZU

3.8 Gayi 619

Gayi was a 12 year old grade 4 girl, she got 1 point in the screening test and 20 in orthography screening test. Pre test score in the spelling test was 14 and in orthography was 28.

Gayi was able to the reach the 24th levels of the game which meant that she played the whole game. Gayi had done 2261 trial in 18 days she of played the game. Her playing time was 1hour 28 minutes and 44 seconds.

The performance on the phoneme items was good, but on syllables Gayi failed to differentiate between target DO and distractor GO (12 trials), target KU and distractor CU (13 trials) , target GWE and distractor GE (17 trials), target DZI and distractor ZI (13 TRIALS), target KHA and distractor KA (15 trials) and target NZU and distractor NJU (32 trials). All these small errors were probably due to similarity of sounds in the syllables.

Gayi made tremendous improvement in the post test getting 18 points from the spelling test and 34 from the orthography test. It can be said that from the assessment, the intervention was beneficial to Gayi.

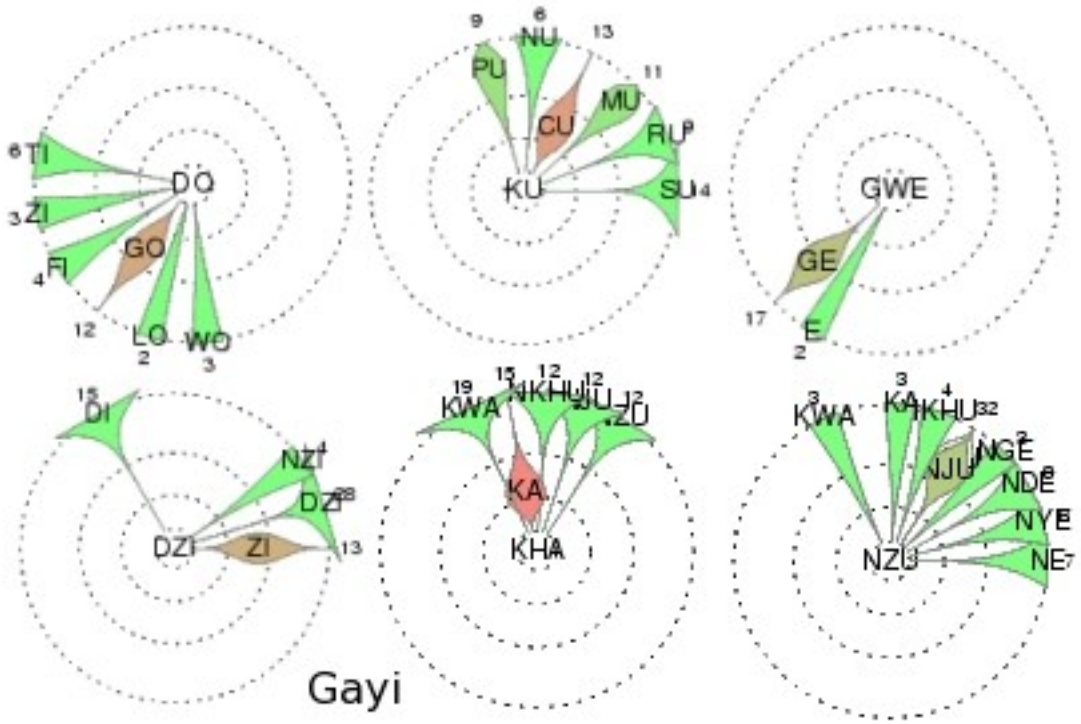

Illustration 20: Gayi daisygraph targets DO, KU, GWE, DZI, KHA and NZU

3.9 Summary of the results

Name	Screening Test %		Pre- Test %		Post –Test %		Level
	Spelling	Orthography	Spelling	Orthography	Spelling	Orthography	
Pape	3	1	18	27	45	61	25
Pepe	10	57	15	20	33	69	25
Seka	5	0	5	20	60	51	7
Njo	5	33	8	27	65	30	11
Mina	5	29	5	41	73	57	10
Ise	8	23	3	36	68	60	14
Siya	3	87	3	30	20	87	17
Gayi	3	29	35	40	45	49	24

Table 1: Summary of the assessment results (in percentages) and highest achieved game level.

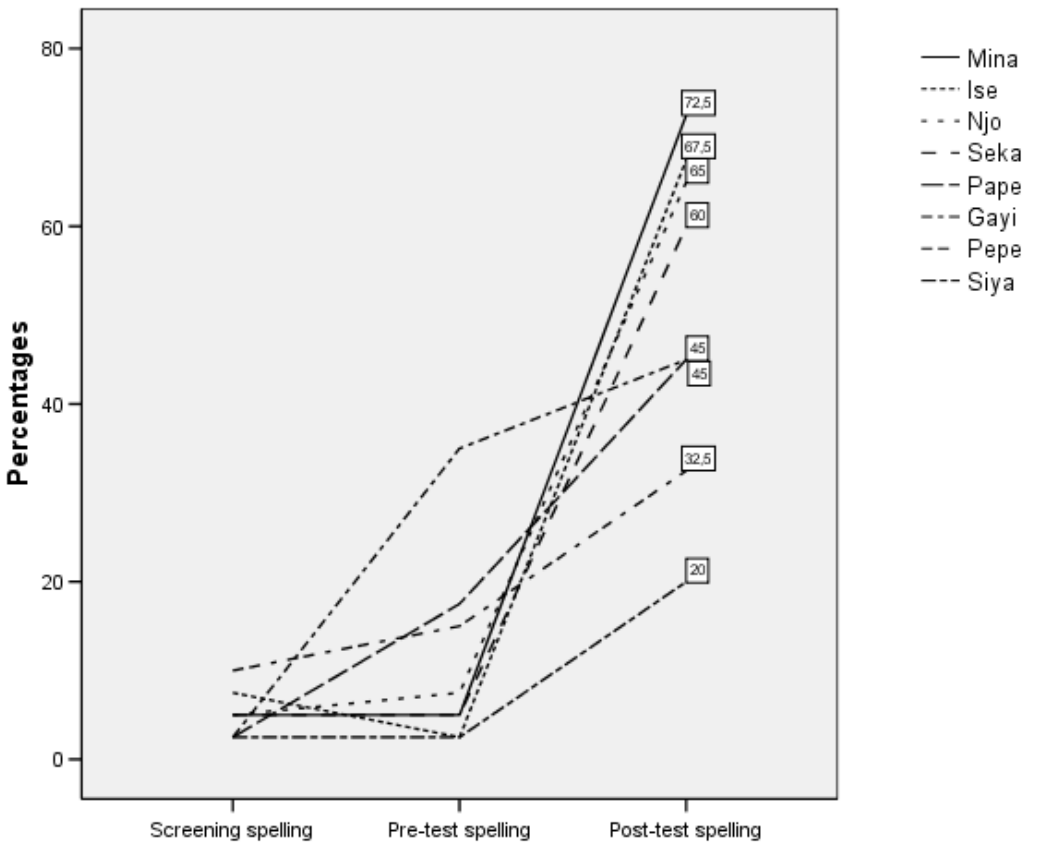

Illustration 21: Assessment results in spelling test in screening, pre-test and post-test.

Pape performed generally very well in the pre-tests and post tests although the screening test was not impressive, gaining 11 points in spelling test and 24 in the orthography test. Pape's good performance was due to her persistence to work, she was one of the pupils who played for a long time reaching the level of 25.

Pepe performed well in the screening test compared to all other children and improved in the pre- test and post- test. His performance can be attributed to the fact that from the start he liked the game and was very keen on playing it. He completed playing the game.

Seka had not improved his spelling skills in school as the spelling test scores in screening and pre-test were the same. However, he was able to make tremendous progress during

the intervention, even though he was able to play mostly only the phoneme levels of the game, improving his spelling test scores 25 points and orthography test scores 22 points between pre- and post-testing.

Njo had gained one point in spelling in the classroom teaching, yet he gained 23 points in spelling during the intervention. The orthography post-test was two points less than the pre-test score, but this might also be due to more careful answering style in the post-test.

Mina gained the best benefit of the game intervention, improving full 29 spelling points from the pre-test to the post-test. She also almost doubled her orthography points.

Ise did not perform well in the screening test or pre-test, having only 1 point in pre-test spelling and 25 points in pre-test orthography. He did show improvement at the end of the game as the post test in spelling show. 73 on spelling and 57 on the orthography posttest.

Siya did not perform well in the pre-test, having 1 point in spelling but 61 points in orthography. She showed improvement in post test at the end of the game, gaining 7 points in spelling and keeping the same score in orthography This may be attributed to the fact that she was consistent and played for the long time.

Gayi had the best starting point in this study, having 14 points in pre-test spelling (although only 28 points in orthography) and she gained 4 points in spelling and 6 points in orthography. Gayi played the game through and never missed class this might have been the reason for her good performance.

Finally even if this intervention was short (just few hours), the participants were able to improve their reading skills and many of them made more progress during this three week period than they done at school in several months.

4.0 Discussion

The purpose of the study was to demonstrate phonetic approach to literacy teaching as the literate game was based on letter-sound correspondences. Similar teaching was done in Zambia before the independence (syllable charts). This study also shows how poor literacy skills children can have even though they're in grade 3 or 4. The mean score of the grade 3 pupils in the spelling screening test was 5/40 and for grade 4 10/40 even though the children were expected to do much better than that (see appendix). It must be mentioned here therefore that the intervention seemed to be beneficial to all of the participants which means that even a short time (less than 2 hours) of systematic teaching of letter-sound correspondences is beneficial for children who have reading problems.

Improvement in the orthography test might not be so clear because it is also possible, that when children have learned something, they've actually started to read print more carefully. The orthography test was time-limited so maybe some children did not improve that much because they wanted to do the test carefully, instead of being fast and giving wrong answers.

Most of the children in the game made progress and if they started with low points in the screening test, when they started to play they gained points. In case of Gayi and Seka, these children started with low points but they increased the points as they started to play. The other reason to show that children progressed is to see the results of Siya who maintained the same spelling score while in school but rose from 3% points to 68% when playing the game, with only about 2 hours of training during one month. This was remarkable achievement. This is the same with Seka, who also increased the points when he started to playing the computer game. Except for Gayi, Pape, Pepe and Njo who started with points above 5% in the screening spelling test maintained their performance until the end of the game

Most children may not do well at the beginning of the playing because a computer is new to them. However, as Lyytinen (2007) says, computer provides a child a chance to practice at his or her own pace and gives positive learning experience as the feedback

from the computer is not as emotionally sensitive than feedback from a teacher. Lyytinen continues to say that the game is adaptive, meaning that it adjusts the difficultness of the game to meet the player's performance level. The player is not allowed to go to the further levels until the easier ones are completed.

The other very important scenario that can be observed from this study is that when a child is doing well in spelling, he will also do well in orthography. This can be seen from the results. A child must first learn the phonemes before he starts to learn how to blend these phonemes to make syllables. The importance of sound differentiation is also cardinal as it helps the child to remember connections better. That's why it is important to teach phoneme sounds and phonological awareness to children who starting to learn reading. This study also shows, that even if children have learnt basics of literacy poorly, they can still improve even on grade 3 and 4 if they get appropriate teaching.

Lastly in this discussion, the study has also shown that mother tongue learning is important in early age. Learning foreign language retards the child's progress in learning. In our Zambian context this is especially obvious as our local languages are transparent and therefore easy to learn, whereas the foreign language in our school system (English) is among the most difficult languages in the world. English is generally thought to be the most opaque alphabetic orthography with complex and context sensitive phoneme-grapheme paring, multi-letter graphemes and inconsistencies (Lyytinen, 2006a). This is why it is a great benefit if children learn the basics of literacy in Zambian languages. We still don't put stringent measures to allow the mother tongue to be taught in schools, like our neighboring countries like Kenya, Tanzania and Uganda do. Using English as language of instruction does not improve our literacy levels in the country.

Computer game, Sewero La-ma-u, Cinyanja translation of Literate game was able to assist children to learn Cinyanja basic literacy skills. The computer game does not only teach the child to learn phonemes, it also complements on the teacher's work and helps him to be true with right pronunciations. However, it should be remembered that a teacher could do just the same thing as a computer, to teach letter-sound correspondences in a logical and natural way. It is mainly only the children with real learning difficulties

who need something more efficient than classroom teaching. In Finland Literate game is only used for dyslexic pupils but still reading levels of first grade pupils are very high in Finland. It shows that classroom teaching can be also very effective for majority of pupils when it's done in the right way.

Recommendation

Children should be taught learning to read in their mother tongue. In case of Zambia, some of the seven languages which were identified and located to each province must be used. Alphabet code is the same in different Zambian languages, teaching in a language that is not the child's own might not be a problem if the teacher is able to translate the meanings of the words to the children.

In teaching literacy children should first be taught phoneme awareness before teaching syllables and whole words. Letter-sound correspondences are the basis of reading in all transparent languages. Teaching should be synthetic, starting from letter-sound correspondences, then learning how to blend sounds into syllables, then learning how to combine syllables into words.

Six hours twenty minutes allocated to teaching Zambian language in schools per week MoE (2000) is not enough to foster learning to read. It is therefore important that enough time be allocated to teaching literacy in Zambian language. This is so because all learning depends on reading. The Curriculum Development Centre should look into the issues of providing enough Zambian language reading materials in all Zambian local languages. When writing reading materials, writers should take into account the traditional and cultural life of the people and language in use.

The Ministry of Education should support programs that supplement the teaching of literacy using computers (or otherwise provide personal help in teaching letter-sound correspondences with those children who have difficulties in reading acquisition. This should also happen before the end of the first grade so that all first grade pupils would really learn the basics of literacy as the curriculum promises before starting learning literacy in English).

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Appendix 1 Screening test results

Below are the screening test results from all three public schools, grades 3 and 4. Tests were done in July 2005.

Grade		N	Min	Max	Mean	Std dev
3	Cinyanja spelling test	299	0	31	6,588629	5,929791
	Cinyanja orthography test	299	0	51	17,0903	9,086564
4	Cinyanja spelling test	395	0	37	10,44557	8,339494
	Cinyanja orthography test	392	0	56	23,3699	10,5092

Below are the screening results from school where children of this study had their intervention.

Grade		N	Min	Max	Mean	Std dev	**Cut-off**
3	Cinyanja spelling test	**103**	**0**	**20**	**5,058252**	**3,887701**	**3**
	Cinyanja orthography test	103	0	25	12,35922	6,199074	4
4	Cinyanja spelling test	**170**	**0**	**37**	**10,22353**	**7,901579**	**6**
	Cinyanja orthography test	167	0	47	23,21557	11,27751	7

Maximum for spelling test was 40 and 62 for the orthography test.

Appendix 2 Orthography test

NAME: _____
GRADE:_____

u = f > g

SCHOOL:_____

imbe uli pola enda

---

a t s e # ¤ w c d ^^

& u p h } l v Δ ∞ k

j z c б п b n u y

ma ne ad om fo co nu em zi ec

uka ema nma ava uli aco uza iai ine uwa

iwe ima nbi ola ali una ipa ika gfa cao

tola laca gmoa lira sopo buku iday kana lova imba

maso bola yase kama moto sita inde bebi cisa lera

taya tula pesa mesu bala uvbe basi toto gulu caka

koka tapa suta tula gulu bowa mesa guza kelo lero

tuma unga pita mere leka mena kita tate ceba cule

atate cenga bwala konda tenga wmana mbale menya mpeni kubya

itana caini bwera ulola lesi sanza phika bande nhosi manzi

dzitu njala ulaki jnoka mwana mbuzi kawma tunga bwino kwera

lemba tcala bwalo patca tsuka tsiku penay phala mvula dzina

ngombe dilesi buluku nuymba nsomba ampndo cikomo kuriya kuseka mtengu

tumiza tsitci pumula milono njanga nkhuku cisote mhpika tsamba zobvala

Appendix 3 Spelling test

(pre-test order, words were in mixed order for post-test)

1.	b
2.	d
3.	a
4.	i
5.	m
6.	be
7.	ni
8.	ma
9.	ta
10.	pa
11.	ona
12.	ako
13.	ima
14.	uka
15.	eka
16.	koma
17.	mseu
18.	imba
19.	taya
20.	amai
21.	bweza
22.	menya
23.	nkhuku
24.	kulera
25.	tumiza
26.	kuseka
27.	zikomo
28.	sukulu
29.	zobvala
30.	milomo
31.	cimodzi
32.	zabwino
33.	cilimba
34.	mtengo
35.	cimanga
36.	makolo
37.	nsomba
38.	sowero
39.	zakudya
40.	kungwira

SPELLING TEST
FOR GRADES ONE-FOUR

Appendix 4 Sewero La-ma-u game contents

Level 1: **A I T N**
Level 2: **A I T N S E L**
Level 3: **T L E K U Z O**
Level 4: **K Z U M P R C**
Level 5: **P R D F G Y W**
Level 6: **J H Y T D B V**

Level 7: **SU RU MU CU NU PU KU**
Level 8: **NU PU KU MI TI ZI FI**
Level 9: **TI ZI FI DO GO LO WO**
Level 10: **DO GO LO WO BE VE YE**

Level 11: **NE NYE NDE NGE NZU NJU NKHU**
Level 12: **NZU NJU NKHU KA KHA KWA GWA**
Level 13: **KHA KWA GWA BWA MWA DWA MPHA**
Level 14: **PHI PHA PHE PHO PHU MPHU**
Level 15: **PHI PHA THU THE KHO KHE NKHA**

Level 16: **ZI DZI NZI BZI CI TSI SI**
Level 17: **DI DZI BE BWE NO NGO**
Level 18: **GE GWE E MA MBA A PU PHU U**

Level 19: **U-ZA U-MA U-SA U-CI U-FA U-VE U-WA**
uza [tell/inform], uma [to dry up], usa [to rest], uci [honey], ufa [mealie meal], uve [dirty], uwa [barking]

Level 20: **U-CI U-FA U-ZA A-NA O-NA I-NE I-WE**
ana [children], ona [to see], ine [me], iwe [you]

Level 21: **DU-WA CA-LA FU-NA CI-SA TA-TE BU-KU GA-LU**
duwa [flower], cala [finger], funa [to look for], cisa [honeycomb], tate [father], buku [book] galu [dog]

Level 22: **MA-DZI DZI-NA MUD-ZI PHA-LA KHA-LA BZA-LA MA-NJA**
madzi [water] dzina [name] mudzi [village] phala [porridge] khala [to sit] bzala [plant] manja [hands]

Level 23: **GA-MI-ZA MI-SI-KA SE-WE-RA MA-KO-LO FU-PI-KA KA-VA-LO**
gamiza [think] misika [markets] sewera [play] makolo [parents] fupika [short] kavalo [horse]

Level 24: **KU-MBU-KA MA-SA-MBA CI-MA-NGA PHU-NZI-RA NYE-NYE-ZI ZI-THU-NZI**

kumbuka [to remember] masamba [leaves] cimanga [maize] phunzira [learn] nyenyezi [star] zithunzi [pictures]

Level 25: **CAKA CALA | DZIRA DZIWA | MVEKA MVERA | BWALO BWATO | MWINI MWINA | ULEMA ULEMU**