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A Culturally Sensitive Approach to Promoting Initial Literacy Development in Africa:

Ongoing and Planned Research and Development at the University of Zambia's

Centre for Promotion of Literacy in Sub-Saharan Africa (CAPOLSA)

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Abstract

A four-year research and development programme at CAPOLSA (the Centre for Promotion of Literacy in sub-Saharan Africa) was inspired by widespread dissatisfaction with poor literacy outcomes of mass basic schooling in Zambia, and sought to test the generalisability of a scientifically grounded, computer-mediated instructional resource developed in Finland, for effective intervention in an African society where different linguistic and educational conditions obtain. Specific challenges and opportunities posed by the local sociocultural context included the prevalence of multilingualism, the relatively transparent orthographies of local languages, and poor infrastructure of the public school system. Software was translated and field-tested under ecologically realistic conditions. Complementary influences on initial literacy learning were systematically explored of children's home literacy environments, teachers' attitudes and practices, biological and social constraints on learning among children with special needs, curriculum development and teacher training. Complementary instructional resource development focused on creation of child-friendly reading materials in seven indigenous languages, translation of stories across those languages, harmonisation of their orthographies, and exploring the potential of multiple media for dissemination of literacy materials. Effective application of scientific and technological innovations to educational policy and practice called for systematic coordination of insights from multiple disciplines to situate developmental science within sociocultural context.

A Culturally Sensitive Approach to Promoting Initial Literacy Development in Africa:

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Applied Developmental Science: Convergence of Two Complementary Perspectives

Cultivation of literacy in children is recognized as an important activity across a broad

spectrum of nations in the contemporary world, despite the wide variety of economic,

ecological and cultural conditions that characterize their societies. Becoming literate is a core

defining goal on the agenda of basic education, access to which is increasingly regarded as a

universal human right (UNESCO, 1990, 2000). Moreover, a single model of institutionalized

public basic schooling (IPBS) has been adopted by most national governments as the

principal mode of delivering relevant instruction for the achievement of basic literacy,

through an age-graded curriculum (Serpell & Hatano, 1997). The languages and scripts used

for this purpose vary across societies, as does the level of funding allocated to early grades of

the public education sector. But virtually all nations publish a curriculum, train teachers to

implement it, and conduct formal assessment of literacy learning outcomes for purposes of

certification. What then is the case for applied developmental scientific research in this field?

Like other widely endorsed social goals such as economic development and

democracy, literacy tends be a very loosely defined concept. Scientific research can help to

remedy this weakness through systematic analysis and synthesis. Analysis can help to dispel

myths and prejudices by sharpening distinctions and replacing global categories with more

elaborately nuanced accounts of the various processes involved. In order to contribute

usefully to practical activity the complementary insights of multiple disciplinary perspectives

must be integrated in the design of professional practices and institutional arrangements. A

key resource for such coordination and synthesis is the statement of explicit theory. Theory is

often misconstrued as an esoteric preoccupation of ivory tower academics. However, a

powerful rationale for applied developmental science is that "there is nothing so practical as a good theory" (Lewin, 1960, cited in McGuire, 1973). Another theme of applied developmental science has been the articulation of rigorous principles for selection among alternative practices, based on empirical evidence of their effectiveness, rather than relying on historical tradition or on intuitively advocated innovation. Some educational planners and policymakers have welcomed this approach with a commitment to giving priority attention to "evidence-based practices."

The research and development programme described in this chapter has been informed by a convergence of two complementary perspectives, one originating from Western culture and technological developments based in the Northern hemisphere, the other grounded in a sociopolitical agenda widespread in the Southern hemisphere, especially in countries formerly oppressed by exogenous colonial domination. From the science and technology culture of the North, this research was informed by the desire to test and extend universalistic theories and principles of professional practice for the optimization of initial literacy acquisition. From the national development perspective of a Third World post-colonial state, the research was motivated by the political challenge of poor literacy outcomes of mass basic schooling in Zambia.

The goal of attaining and disseminating universal truths is widely recognized in the scientific tradition launched in Western Europe in the period of the Enlightenment (Berlin, 1956). A philosophical commitment to systematic methods of inquiry is credited with many of the conspicuous advances in human control over the environment in the domains of engineering and medicine, such as the use of satellites and vaccines. Many cognitive and developmental scientists derive inspiration from those achievements in their programmatic search for optimal methods of supporting children's literacy development. One such programme originates from a longitudinal study of dyslexia by Lyytinen and his colleagues

(2007) in Finland, that gave rise to a computer-based instructional phonics game

(GraphoGame[TM]) (Lyytinen et al., 2009), whose educational effectiveness has since been

empirically confirmed for large samples of school-going children in Finland (Saine et al.,

2010) and in England (Kyle et al., 2013). From this perspective, the research and

development programme described in this chapter, was an attempt to test the generalizability

of a scientifically grounded, technologically sophisticated, instructional resource as an

effective educational intervention in an African society where different linguistic and

educational conditions obtain from those in which its effectiveness had been established in

Western Europe.

A complementary source of motivation for the programme was growing

dissatisfaction in Zambian society with the very limited success rate of government efforts to

achieve the ultimate goal of the Education for All movement, namely "improving all aspects

of the quality of education and ensuring excellence of all so that recognized and measurable

learning outcomes are achieved by all, especially in literacy, numeracy and essential life

skills" (UNESCO 2000). In this chapter we describe some of the preliminary research

findings, and reflect on their implications for educational policy, technology development

and dissemination. We also briefly describe some of the efforts by CAPOLSA (the Centre for

Promotion of Literacy in Sub-Saharan Africa established in 2011 at the University of

Zambia) to mobilize action to implement the practical implications of our research. We

conclude with an analysis of the technical challenge of delineating the intersections between

cognitive and developmental science and sociocultural constraints on effective educational

planning.

The Political Challenge of Poor Literacy Outcomes of Mass Basic Schooling in Zambia

At Independence in 1964, Zambian society inherited from 50 years of British colonial

rule and a longer period of European cultural influence through various Christian missions, a

system of public schooling with many administrative, curricular and instructional

characteristics derived from the Western educational paradigm (Coombe, 1967; Snelson,

1974). Individual progress within this system was constrained by a highly selective

"narrowing staircase" designed to extract from the rural masses a talented elite into an urban,

industrialized, modern sector of the economy, where the benefits of literacy are more evident

than in the subsistence agricultural economies that prevail in the rural areas (Serpell 1993).

When the national economy entered a deep recession in the 1980s and '90s, the

resource base of this system shrank so dramatically that the widespread post-independence

optimism was significantly undermined, relative to formal education as a passport to

individual prosperity and societal progress. Considerable progress was made between 1999

and 2005 in expanding the enrolment of children between the ages of 7 and 15 in schools,

raising the gross enrollment rate from 85 to 119 per cent, and the corresponding net

enrollment rate from 71 to 96 per cent (World Bank, 2007). However, this was achieved at a

cost of huge increases in class size in many schools, combined with grossly inadequate

supplies of teaching materials and teacher salaries. Literacy outcomes at the end of primary

schooling fell far below acceptable levels (Hungi et al., 2010).

The principal medium of instruction in upper primary classes in Zambia has always

been English, which is also the sole medium of secondary and tertiary education in the

country. Educational policy in Zambia has been burdened, like that of many post-colonial

states, by the need to confront the complex mixture of benefits and troubles that have accrued

to so-called developing societies from the exponential growth of English as the global

'language of power' over the course of the twentieth century (Erling & Seargeant, 2013).

Shortly after independence in 1964, the Government introduced the English Medium Scheme

(McAdam, 1978), under which children received initial literacy instruction from Grade1 in

the medium of English, a language claimed as a mother tongue by less than one per cent of

adults in the 1969 national population census (CSO, 1973). Several problems were identified

with this policy during a national Educational Reforms debate (Alexander, 1982; Serpell,

1978), giving rise to a formal proposal to reintroduce seven of the indigenous languages as

the medium of instruction in the Early Grades (1-4) (MoE, 1976).

However, the English Medium Scheme remained in place for another twenty years,

until the Government published a landmark new policy document, stating that "all pupils will

be given an opportunity to learn initial basic skills of reading and writing in a local language"

(MoE, 1996, 40). In order to implement this policy, a new curriculum was developed, based

on an adaptation of the Molteno Project (http://www.molteno.co.za/), under the title New

Breakthrough to Literacy (NBTL). Pilot testing in several different rural zones showed that

first-grade children who received initial literacy instruction in the locally predominant

language made better progress than those immersed in English from the start (Tambulukani et

al., 2001; Linehan 2004). In light of these findings, a new generation of teachers were trained

in the new curriculum (Kanyika, 2004; Sampa 2005).

Over the following decade (2003-2013), however, a growing crisis of public

confidence has emerged. While some initial gains in reading skills have been reported in the

Zambian languages, the overall literacy profile of Zambian children in Grades 5 and 6 of

government primary schools has remained very poor (MoE, 2012).

African Multilingualism

Communicative competence (Gumperz & Hymes, 1964) in most African cities

involves knowing how to deploy several different languages or dialects in accordance with

local social norms. Zambia's profile as a multilingual nation is often misrepresented as

having 73 indigenous languages. Analysis of the core vocabulary among various sub-sets of

the 80 Bantu language varieties claimed as a mother tongue by respondents to the 1969

national census of population, generated 14 clusters (Kashoki & Mann, 1978). Varieties

within each cluster are popularly perceived as dialects of a single language, such that only ten

different languages are at all widely recognized. Seven of these have been adopted since the

colonial era for basic education in a given region, and two particular varieties are widely used

as *lingua francas*: Town Nyanja and Town Bemba (Kashoki, 1972, Spitulnik, 1998).

Furthermore, even the distinct language varieties share many commonalities and porous

borders.

In Zambia, individual multilingualism is the norm especially in urban areas (Kashoki

& Mann 1978; Underwood, Serlemitsos, & Macwang'I, 2007). In addition to acquiring

literacy, children growing up in such a society are expected to acquire competence in several

speech varieties, and their progress in doing so is monitored by family, peer-group and school

in different ways. This has implications for both assessment and instruction in urban school

settings (Serpell, 2014a). A child whose competence is assessed formally with the use of a

standardized or teacher-made test may appear much less competent than s/he would appear if

observed in informal communication with his/her peers (Labov, 1969). In urban Zambian

settings, code-switching and mixing are very common in everyday discourse (Moody, 1997,

Serpell, 1980). Indeed, for some members of such multilingual speech communities,

multilingual talk may represent "one code in its own right" (Meeuwis and Blommaert, 1998)

such that "the insistence on two distinct languages as the frame of reference for this form of

speech is not helpful in terms of interpreting it" (Bailey, 2006, 265).

A coherent system of educational policy, curriculum development and teacher

training for effective initial literacy instruction in Zambia's urban schools requires a

multilevel, multidisciplinary theoretical framework to coordinate the phenomena of societal

diversity and individual versatility (cf. Kramsch, 2012). For instance, while power and

prestige in the public sphere are invested in the use of English, everyday discourse on private

matters, especially concerning the lives of families and children, is mainly conducted in one of the indigenous languages (Underwood et al., 2007).

Another challenging issue is the design of orthography: the particular system of spelling adopted as standard for a given language. The learning challenge posed by the irregularity of English spelling has long been recognized, but attempts at reform have been vigorously resisted. As a result, the most widely written and most widely taught language in the world remains paradoxically one of the most difficult for beginners to learn to read and write, because its orthography is "opaque", requiring a knowledge of many different rules and exceptions (Aro & Wimmer 20013). The Bantu languages of southern Africa, by contrast, are highly "transparent", with each letter of the alphabet typically corresponding to one single phonemic category of sound in the spoken language. However, the particular codification of each transparent orthography was generally influenced by the spelling system of a missionary's particular European home language, giving rise to anomalous variations in the standard for a given African language across the borders between nation states defined in the colonial period (Legere, 1996). The Centre for Advanced Studies of African Society (CASAS), has sponsored technical analysis of the design features of alternative orthographies, in search of consensus-building for orthographic reform and harmonization among the orthographies of Bantu languages across the South-Central African region (Banda et al., 2008).

The Reading Support for Zambian Children (RESUZ) Project: The Core Study

The initial focus of the research programme described in this chapter was defined around the field-testing of Graphogame, an ICT-mediated intervention designed to promote initial literacy learning in the indigenous Zambian languages in the early grades of public primary schools.

Theoretical Rationale

Why might computer-assisted learning hold the key to preventing such widespread failure? The reasons and logic behind the development of the game are described by Lyytinen and his colleagues (2009) as originally motivated by search for an effective method of intervention early enough in the life of children at risk for dyslexia to prevent the developmental of full-scale disability.

As with many contemporary computer games, one major theme in the development of the GraphoGame has been creation of an environment in which repetitive practice is made attractive to the learner by engaging his or her playful motivation. If the necessary learning can be prompted by the computer program while a child is playing, the time and efforts of teachers can be directed elsewhere. Thus computer-assisted learning environments have become an intensive field of development in educational technology. In addition to motivating children to practice, GraphoGame focuses the child's attention on what has been identified as a bottleneck in the progress of initial literacy learning. Detailed analysis of the performance profiles of Finnish children enrolled in the Jyvaskyla Longitudinal Study of dyslexia (Lyytinen et al., 2005) led them "to choose phonemic differentiation as the first and most important target for preventive training that a child at-risk for dyslexia needs" (Lyytinen et al., 2009, 671).

The Finnish prototype of the GraphoGame^{TM}, known as *Ekapeli*, was designed specifically to train "the child to differentiate the relevant phonemic space represented in the language" (op.cit., p.671). The instructional method is simple and repetitive: "the player listens to one spoken item per event which requires his/her response. The player then connects the item heard to its written counterpart by choosing from several alternatives presented usually as falling balls to increase the game-likeness." (op. cit., p.671). "Because it is intended for children for whom reading acquisition is a real challenge, the most important goal was at first to make it sufficiently enjoyable to keep children interested in playing for

long enough to attain the learning goal. The most natural reward for playing is the experience of success." (op. cit., p. 671) Success on each trial is signaled by a combination of visual and auditory stimulation, which seems adequate to maintain children's engagement across many trials. The sequence of learning tasks "follows the known phonics approach by systematically introducing first the spoken phonemes, then syllables and words." (op. cit., p. 671).

After refining the game, it was posted on the internet (see http://www.lukimat.fi). "When the opportunity to try the game free of charge was advertised, it soon become very popular in Finland" (op. cit., p. 671). The authors "have recommended to kindergartens where all children in Finland have their pre-school year just before school, that the game should be used during the last two months (April–May) and preferably with massed practice. This means short 5–15 minute periods several times per day for as long as children require to learn the letter-sound connections and, if possible, also the basic alphabetic principle in terms of how letter-sounds can be connected to assemble words." (op. cit., p. 672). To date, more than 200,000 children in Finland have tried the game.

Systematic research has since shown the game to be an effective resource for the support of initial literacy acquisition in Finnish (Saine et al., 2009) and, with adaptation, in English (Kyle et al., 2013). Comparison of the rates of initial literacy acquisition across large, national school-based samples in various Western societies has shown that the spelling system (orthography) of English is exceptionally difficult for young children to master, because of its superficial irregularity (Aro & Wimmer, 2003). Since the Bantu languages designated as media for initial literacy instruction in Zambia's public schools all have a highly transparent, regular orthography, one might expect Zambian schoolchildren to master basic literacy with relative ease. However, a multinational comparison of systematically collected national statistics revealed an exceptionally low rate of attainment of literacy in Zambia (Hungi et al., 2010).

Hence, Lyytinen and his team decided to explore the potential of GraphoGame as an educational resource in Zambia, and undertook a pilot study of a small sample of Lusaka school children using a ciNyanja version of the GraphoGame mounted on desktop computers. Ojanen, Richardson and Lyytinen (2009) reported that the greatest difficulties manifested by these children in mastering the letter-sound correspondence rules of ciNyanja were encountered with those letters which correspond to sounds in ciNyanja that are incompatible with the sounds cued by the English letter names used in instructing English. They inferred from this that Lusaka teachers may be misapplying instructional methods based on teaching English to teaching initial literacy in ciNyanja. Acknowledging that computers are unaffordable in most educational settings in Zambia, Lyytinen developed a version of the game for mounting on cellphones, an ICT device that had become affordable by most families by 2008, and invited the University of Zambia to set up a field study to explore the applicability and usefulness of GraphoGame as a way of preventing reading failure among first-grade learners in Zambian schools.

Field Testing Methodology

The RESUZ study began with an intervention project in the capital city of Lusaka, introducing a CiNyanja version of the GraphoGame^{TM}, mounted on hand-held cell-phones with headphones, to first grade children. The learners were assembled at their schools in groups of six to play the game individually under the supervision of a trained student research assistant. On each day of exposure, a child was given six short play sessions with the game, lasting 7-9 minutes and separated by rest intervals of 1-10 minutes. There were two phases of exposure, one in Term 2 for an average of 18 play sessions spread over 3 days, the second in Term 3 for 30 sessions spread over 5 days. The cumulative total amount of direct interaction with the game averaged about 90 minutes, only about half of the targeted duration. We drew a random sample of 42 (about half) of the city's government schools, which are primarily

patronized by low-income families, and recruited children randomly within each first –grade

class. Classes were assigned randomly to various intervention conditions. In one condition,

only the participant children were exposed to the game, in another only their class teacher

was exposed, and in yet another both the children and their teacher were exposed

concurrently, while a control group of children were enrolled in classes where no exposure to

GraphoGame™ was offered. We developed four individually administered tests, based on

locally validated prototypes (Fink et al., 2012; Ojanen et al., 2008; Stemler et al., 2009) to

assess the cognitive skills of children in term 2 before the intervention and again at the end of

Term 3.

Impact of GraphoGame in Context

A total of 585 children (about half of them girls) participated in this core study (Jere-

Folotiya et al., 2014). Statistical analysis of the results revealed that exposure to

GraphoGame™ in any of these ways generated a significant improvement in performance

gains on the most relevant of our cognitive measures, a Dictation test that required the child

over several trials to select among four printed items the one that matched the aural stimulus

of a letter-sound, syllable or word. The scores on this test by children in the conditions that

exposed only the child or only the teacher to the game were approximately equal and superior

to those of children in the control condition, while the condition in which both child and

teacher were exposed was the best. Children in all conditions showed gains from Term 2 to

Term 3 on this test and on our tests of orthographic awareness and arithmetic. But only the

dictation test showed greater gains among the children who experienced the GraphoGame™

intervention.

Thus a reliable and selectively beneficial impact of the game was found in this

representative sample of low-income, urban Zambian children, using one of the major

languages of instruction. It should be noted, however, that the proportion of variance in initial

literacy learning accounted for by exposure to the game was quite small (partial η^2 = .04), indicating that other factors contribute greatly to how well Zambian school going children learn to decode the transparent writing system of CiNyanja. Five complementary sub-studies were undertaken with a focus on the same cohort of children, some of which have provided indications of what those other factors may be: variations in children's home literacy environment, in the quality of teaching they receive, and in biological factors influencing their cognitive abilities. Before leaving the topic of GraphoGame[TM] , a number of constraints should be acknowledged that are likely to have reduced the magnitude of its impact: limited duration of interaction with the game, frequent absenteeism, environmental noise at the schools, and culturally unfamiliar game format. Improving the input from each of these factors in future trials may be expected to enhance the impact of exposure to GG on initial literacy learning and thus to confirm the generalizability of its effectiveness as an educational intervention beyond the Western world.

The Home Literacy Environment of First Grade Learners from Lower Income, Urban Zambian Homes

Many studies in the Western world have shown that home environmental factors account for a large part of the variance in children's educational progress (Wigfield & Asher, 1984). The influence of socioeconomic status on children's educational achievement has been confirmed among minority ethnic groups in Western countries and in a few studies in Africa (Kanyongo, Certo & Launcelot, 2006; Leseman & de Jong, 1998; Ngorosho, 2009; Silvia, Verhoeven & van Leeuwe, 2008; van Steensel, 2006; Willenberg, 2004). But "social address" variables such as material wealth and parental educational attainment are less theoretically informative than more "proximal" variables that mediate the influence of social class on a child's learning opportunities (Bronfenbrenner & Crouter, 1983). A longitudinal study by Serpell, Baker & Sonnenschein (2005) in the American city of Baltimore, with public school

children of varying ethnicity and social class, probed beneath the social addresses to figure out what really makes a difference in homes that promote literacy successfully. Aspects of a family's "intimate culture" that accounted for a significant proportion of variance in children's literacy development included the child's engagement in various literacy-related activities at home, the parents' orientation towards the significance of literacy for early child development, and various routines of family life (Serpell et al., 2002). Another longitudinal study was conducted by Senechal and Lefevre (2002) with a sample of middle and upper SES English-speaking families in the Canadian city of Ottawa. These authors found that parental storybook reading and literacy teaching were two distinct domains in the home. Book reading had a direct association with children's language skills and not literacy skills, while parents' direct teaching of literacy was related to children's phonemic awareness.

Chansa-Kabali **(**2014**)** set out to explore with a mixture of methods the influence on early childhood literacy development of the kind of reading activities that take place in low-income Zambian homes. Her study focused on the families of 72 children enrolled in the RESUZ Project core study, at nine of the schools. She conducted a questionnaire survey of their home literacy environments, and in-depth interviews with the parents of six low and six high achievers on the core study tests.

Results showed that many of these lower income families in the city of Lusaka understood the importance of reading in their children's educational process. Parents who reported a strong practical emphasis on literacy oriented activities in their families had children whose independently measured literacy development was more advanced than parents who did not. The parents who reported a stronger positive attitude towards reading organized their children's literacy environment with more opportunities for literacy learning, by providing children's reading materials, paying for extra tuition classes and encouraging other family members to be engaged in the process of teaching the target child.

The principal language of communication at home is another strong theoretical candidate for influencing children's literacy learning in Lusaka government schools. According to national census statistics, only 51% of Lusaka residents in 2000 reported that one of the varieties of Nyanja was their predominant language of communication, while 8% reported their predominant language as English, and 22% one of the other major indigenous Bantu languages (Bemba, Tonga or Lozi) (CSO, 2003). In the core study, an index of familiarity with ciNyanja was developed based on questions addressed to each child about his/her home language background. Scores on this index were positively and significantly correlated with the learners' performance on our baseline tests of emergent literacy skills, letter-sound decoding, ciNyanja vocabulary and arithmetic, confirming the expectation that children with less exposure at home to the language used as medium of instruction would perform less well on cognitive measures administered in that language than children with greater home exposure. However, the magnitude of the correlations was quite low (ranging from .12 to .16), showing that even children with lower home exposure to Nyanja were able to demonstrate some competence in that language (Jere-Folotiya et al., 2014).

Further light was thrown on this by Chansa-Kabali's sub-study. Parents reported separately the language that the child spoke before starting schooling and in the last Term of Grade 1. Test results showed that those children who spoke ciNyanja before schooling significantly outperformed those who spoke another local language. However, when analysis focused on the language that the child spoke at the end of Grade 1, the groups did not differ in literacy outcomes. Thus it appears that children who did not speak ciNyanja at home before entering school learned enough of it in the contexts of play and school to be able to cope with it as a medium of instruction. Further investigation of this dynamic pattern is needed to establish whether, as has been found in the USA, home language that matches the

medium of school instruction in Grade 1 gives children a significant start up advantage that persists into later years (Whitehurst & Storch, 2001).

Beliefs, Attitudes, Knowledge and Practices of First Grade Urban Zambian Teachers

Responsible for Initial Literacy Instruction

Causes of low reading levels among Zambian third graders were identified by Ojanen, Kujala, Richardson, and Lyytinen (2013) as poor teaching methods, lack of teaching and learning aids, overcrowded classrooms and inadequate teacher training curriculum. A number of researchers on educational quality have noted that individual characteristics of teachers are more important than the institutional setting of the school (e.g. RAND, 2012).

Jere-Folotiya (2014) explored several aspects beliefs and practices of first grade teachers using mixed methods. The study was conducted within the RESUZ core study sample, with a view to identifying aspects of the current curriculum, New Breakthrough to Literacy (NBTL) that are perceived by serving teachers as difficult or problematic. The study also sought to determine the beliefs of teachers on several theoretically significant dimensions, which included teaching approaches, motivation and their personal theories of teaching. Research on teacher characteristics elsewhere has highlighted the significance of a teacher's philosophy of teaching, including her hierarchy of goals, the degree of importance she attaches to individual differences among her pupils (Akkari et al., 1998), and whether it prioritizes a pupil-centered over a teacher-centered orientation in the delivery of instruction (Schweisfurth, 2011). The study further sought to ascertain whether GraphoGame would interact with the identified teacher beliefs and practices to influence literacy acquisition of learners.

During the economic recession of the 1980s and '90s, the morale of the teaching profession in Zambia declined dramatically, especially in the primary sector. Salaries were never adequately adjusted in this period to keep pace with inflation, the personnel

establishment was not increased adequately to keep pace with increases in enrolment, and the

housing stock was not expanded to keep pace with the growing number of teachers

employed. Furthermore, the HIV and AIDS pandemic took a heavy toll on the health of the

nation's teaching force, leading to high levels of absenteeism and many deaths (Beyani,

2013). To maintain a posture of professional dedication to duty under the resulting

circumstances became exceedingly difficult. Given this scenario, another dimension selected

for analysis was teachers' motivation (cf. van den Berg, 2002; Thoonen et al., 2011),

including its emphasis on intrinsic relative to extrinsic rewards (Ryan & Deci, 2000) and the

degree to which it reflects an internal or external locus of control.

      Jere-Folotiya's (2014) sample comprised 63 first grade urban teachers, ranging in age

from 25 to 54 and 288 of the learners in their government school classes (age range 6-9

years). The study began by posing a wide-ranging set of open-ended questions and inviting

teachers to participate in Focus Group discussions about the challenges experienced with

NBTL. Thematic analysis revealed the following complaints: inadequate time within which

to complete the literacy lesson (one hour); incomplete NBTL teaching kits; inadequate pupil

books; advanced vocabulary for first grade learners in some books; the use of a rural dialect

(ciCewa) rather than Town Nyanja in the curriculum; and too may learners in the classroom

thereby making it difficult to effectively implement the curriculum. Based on these

exploratory probes, Jere-Folotiya went on to design a more focused questionnaire that

generated scores on several theoretically driven dimensions.

      Responses by a sample of 63 Grade 1 teachers in Government schools, whose pupils

participated in the core study, showed that all the teachers supported the NBTL curriculum's

emphasis on imparting basic literacy skills in the local languages. When asked more

specifically about the NBTL, 92% endorsed the belief that children learn to read faster in a

local language than when they are taught in English. Ninety seven percent (97%) believed

that the use of letter-sound correspondence in the NBTL is effective in helping children learn how to read. But 83% believed that the rural standard dialect of ciNyanja used in the NBTL programme is very difficult for urban learners, who use the town ciNyanja as their language of play. Most of these teachers (68 %) did not believe that it is difficult for children to learn to read in ciNyanja if it is not their mother tongue. However, they were quite evenly divided on whether teaching in ciNyanja is difficult for teachers for whom it is not the mother tongue.

With regard to their personal teaching philosophies, the teachers believed that not every child can learn (94%), and that learners should be treated as individuals with unique characteristics (98%). Regarding the concept of learner-centered education, the teachers appeared ambivalent. On the one hand they reported that pupils' opinions matter in the classroom (97%) and that learners are more important than teachers in the learning process (56%). One the other hand, they believed that teachers are the only providers of information in the classroom (95%) and that the teacher alone should be in control of the learning process (91%). This ambivalence may be attributed to the practical difficulties of managing very large classes, with limited teaching and learning material and no teaching assistants to support the teachers.

The teachers appeared more intrinsically than extrinsically motivated. They reported deriving satisfaction from imparting knowledge and observing their learners excel (100%). They also reported feeling responsible for the education of every learner they taught (87%). However, they also reported that their salaries were inadequate in relation to the amount of work they are expected to do as first grade teacher (78%). This was not surprising given the high learner- teacher ratio (often over 70:1) and the poor conditions of service that teachers have to contend with. In 2013, after the RESUZ study was conducted, the Government of Zambia made significant improvements in the provision of teacher salaries, allowances for

accommodation and transport. However, more needs to be done to improve the working environment in which the teacher operates.

Several researchers have concluded that beliefs are far more influential than knowledge in determining how individuals organize and define tasks and problems (Nespor, 1987; Kagan, 1992; Pajares, 1992). Therefore teachers' beliefs about what is relevant may have a significant influence on what knowledge is gained by the learners in their care. However, analysis of the Lusaka teachers' self-reports of their beliefs and practices revealed no significant impact of these on literacy acquisition of the learners.

Jere-Folotiya conducted moderation analyses to examine how the intervention with GraphoGame interacted with teacher variables, and found that GraphoGame exposure interacted with (a) the number of learners in the classroom, and (b) years of teacher experience teaching literacy in the local language. The beneficial impact of Graphogame intervention was greater for teachers with larger numbers of learners in the classroom, and for teachers with fewer years of teaching experience. This finding may be a result of changes in the literacy curriculum over the preceding two decades. Before 2000, teachers were trained to teach initial literacy in English. Therefore teachers in this study who had taught for more than ten years had received their basic training in English immersion, followed at a later stage by in-service re-training to implement the new local-language-medium curriculum. Teachers with less teaching experience were trained to teach literacy in the local languages from the onset of their training. It is possible that for the longer serving teachers, their initial training to teach literacy in English may have interfered with their later understanding of how literacy should be taught in the local languages.

Identification and Intervention of Developmental Dyslexia among Zambian First Graders

Some children have difficulty learning to read due to specific causes such as dyslexia, despite having sufficient general cognitive readiness and a supportive home environment. An intervention sub-study by Jonathan Munachaka (Department of Educational Psychology, Sociology and Special Education, UNZA) has attempted to assist first graders who were identified as dyslexic or at risk for dyslexia, to learn to read using a dynamic assessment application of the GraphoGame.

Munachaka identified the lowest-scoring ten per cent of children in the main RESUZ study cohort as manifesting severe difficulties in learning to read. The performance of these 56 children was assessed as possibly indicative of being at risk for dyslexia, based on their weak decoding skills on the paper & pencil tests of spelling and orthographic knowledge as well as their performance on Graphogame. These children received intensive training on the letter-sound correspondence rules of ciNyanja, through individually tailored administration of the Graphogame. The goal was to test the limits of the training regimen when it is strengthened by dynamic assessment, which focuses the training in real time to areas needing further practice. The assessment reveals core bottlenecks such as difficulties in perceiving specific differences between speech sounds the learner needs to connect fluently to corresponding graphemes. On the basis of such information, it guides training to give the learner practice with differences that have not yet been mastered, using letters as a medium for differentiation of the learners' phonemic space to help him or her to learn all letter-sound correspondences. Six of the participating children were still receiving intensive support for learning to read in Grade 3 as they had not profited from the intervention and were thus identified as dyslexic or at serious risk for dyslexia.

The interventions with GraphoGame for these special needs children were administered via home visits, a procedure that gave rise to many logistical challenges. Some parents experienced difficulties with operating the phones and headphones in readiness for

their children to play. Many parents were skeptical of the researchers, in spite of their

introduction by the Ministry of Education. Some thought the researchers were Satanists bent

on bringing evil into their homes. Others refused to allow their child to participate on

religious grounds. Some requested material assistance with food, money or school uniforms

for their children, or asked to be allowed to keep the cellphones after the interventions.

Because their residences were scattered across many locations, reaching them for individual,

home-based intervention was very time-consuming. Some parents never assisted or

encouraged their children to play the game in the absence of the researcher and the Research

Assistants. There were many distractions in some of the home settings. As a result, the

original sample was significantly reduced, and for those who remained there were wide

variations in actual playing time. Nevertheless, preliminary findings indicate that the mobile

version of GraphoGame mounted on a hand-held cellphone is usable in Zambia, under

favorable conditions, to identify resistance to treatment as a criterion for the diagnosis of

dyslexia and to train children slowly but reliably to overcome their bottlenecks in learning to

read.

Instructional Programme Development and Teacher Training for Initial Literacy
Instruction in Zambian Schools

Despite the difficult working conditions described above, the occupation of teaching

in a government school continued to attract many high-school graduates as one of the few

formal sector employment opportunities, and the curriculum of teacher education colleges has

been revised several times. The teacher education curriculum for the Zambia Primary Course

designed in 1971 to implement the English Medium Scheme adopted a behaviorist approach

for promoting the teaching of English, subjecting trainee teachers to extended, repetitive

practice with a view to automatizing their instructional routines. A critical review concluded

that teachers' creativity had been stifled by Handbooks that prescribed exactly what was to be

taught. In order to correct this, a new curriculum (ZBEC) was introduced in 1992, which

stressed that language was a means of communication, rather than a system of grammatical

structures and rules. It gave teachers freedom and flexibility to organize their work, replacing

Handbooks with teacher's guides (MOE 1992). Although ZBEC emphasized the systematic

teaching of spellings and introduced a phonic approach to reading, it continued to prescribe

the teaching of basic reading and skills in English in the first grade. Under this approach, the

Look and Say method remained the principal method of introducing new reading items,

despite its inadequacies.

A further revision of the nation's basic school teacher education curriculum was

formally completed in 1998 as the Zambia Teacher Education Course (ZATEC) (MOE

2008).The curriculum was delivered through a two-year programme that included attachment

to a school for teaching practice. Its main feature was introduction of a literacy component

called the Primary Reading Programme (PRP) to teach initial literacy skills to first graders in

a familiar local language (MOE 2001). The PRP prescribed a combination of the Look and

Say method and the phonic approach, and the grouping of pupils in learning sets based on

their level of literacy skills achieved (MOE: 1998).

Despite rolling out of the PRP to all public schools in the country in 2000, learners

continued to experience difficulties in learning to read at grade level, as evident in National

Assessment Reports (MOE 2008 and 2012) on literacy levels among grade five pupils whose

performance levels still fell below acceptable levels. The approach to understanding this

unsatisfactory outcome adopted by Christopher Kyakukaisha Yalukanda (Zambia National

Union of Teachers/Ministry of Education) has been informed by the empirical findings of

Ojanen et al., (2009). One dimension of Yalukanda's ongoing research has been the search

for an understanding of which cognitive impediments may be responsible for teachers

deploying inappropriate instructional methods such as teaching English letter names while introducing learners to ciNyanja letter-sound correspondence rules.

Most, if not all of the teachers of Grade 1 classes in Lusaka are multilingual. By virtue of living in the city of Lusaka, most of them have fluent oral competence in Town Nyanja, and their formal education has imparted to them fluent reading and writing competence in English. Depending on their family background, early education and migration history, they have varying degrees of competence in reading and writing ciNyanja, as well as one or more other Bantu languages. A challenge for research is to establish which elements of their repertoire of linguistic and literacy skills are either faulty or being misapplied in their pedagogical practices. One possibility is that these teachers lack an adequate cognitive representation of the phonology of ciNyanja, the language in which they are required to teach their pupils initial literacy. Another is that they lack adequate metacognitive awareness of the differences between the phonology of English (the language in which they are themselves most literate) and the phonology of ciNyanja. Yet a third possibility is that they find it difficult to keep separate the letter-sound correspondence rules that they have mastered to become highly literate in English and the letter-sound correspondence rules of ciNyanja that they are expected to teach their pupils as the basis for the children's initial literacy.

According to Lyytinen and et al., (2009), the training of teachers to impart initial literacy in the transparent orthographies of the Zambian Languages can benefit from the methods used in teaching children how to read in Finland. As described by Aro (2006) and Share (2008, p. 597), once Finnish children have stored the sound each letter represents they are able to sound out any new words they come across by means of assembly. Teaching reading using phonics is very important in first grade, because it involves experimentation with letter-sound relations. In a transparent orthography, knowledge of grapheme-phoneme correspondences and mastery of phonemic assembly can be effective and sufficient tools for

decoding any kind of word (Holopainen et al., 2001). Bos et al. (2001) explain that teachers need to know how to use effective teaching methods and instructional programmes that promote phonemic awareness, phonic skills, and application of phonics to reading text. The GraphoGame may therefore be a valuable tool to help learners and teachers master letter-sound rules in an enjoyable and efficient way through repeated practice. Thus Yalukanda's work includes the use of Graphogame not only for assessing the emerging literacy skills of young initial literacy learners and as an instructional tool for supporting their learning, but also as an assessment instrument for diagnosing teachers' phonological awareness, and as an instructional tool for enhancing teachers' pedagogical skills.

Curriculum and Instructional Strategy for the Transition from Learning to Read in Local Languages to Learning to Read and Write in English

Long-standing debates around the world on how best to design educational curricula well-suited to the needs of bilingual children have revolved around two pivotal issues (i) whether the goal is to foster additive or subtractive bilingualism, and (ii) whether the use of a familiar language to introduce literacy is conceived as a transitional process, aimed at facilitating the learner's mastery of a different, official language as the ultimate educational goal, or as the beginning of a parallel process of imparting literacy competence in two languages, in which case the first to be taught must also be maintained (Cummins, 2001). Several different curriculum models have been described for the introduction of English in primary school education for children in a society where English is seldom spoken to young children at home. Zambia's current curriculum follows a transitional model that aims at a single target language at the end of the school, English which is the official/foreign language. This is an "early exit" model where learners begin to read and write in a familiar local language in the first year in grade one and then gradually move to learning to read and write in English. Until the latest curriculum revision was introduced in 2013, although children

were given an opportunity to learn to read and write in a local language, the medium of instruction was English from grade 2 onwards and the teachers' guides and learners' books were all written in English except those intended for teaching reading in local languages.

Francis Sampa, one of the Project Leaders of the RESUZ Project, has been involved in the Zambian government's curriculum development for initial literacy learning since the 1990s and during the life of the Project he has assumed a leading position in the USAID-sponsored Read-to-Succeed Programme (RTS) that is supporting the government's efforts to achieve better national literacy learning outcomes. Data collected by Sampa and by RTS in 2012 has enabled the CAPOLSA research team to track the progress in Grades 2 and 3 of the cohort of Lusaka schoolchildren children recruited for the RESUZ project in 2011. Longitudinal follow-up of this cohort is expected to throw light on the degree to which exposure to GraphoGame during initial literacy learning in ciNyanja impacts on learners' subsequent learning to read in English.

The early exit curriculum model followed by Zambia may be an important causal factor behind the poor levels of reading skills achieved by learners in Grades 5 and 6. In the additive education model, the learner's first language (L1) is never removed as a medium of instruction. The target is a high level of proficiency in that language plus a high level of proficiency in the official/foreign language. Research in Nigeria (Bamgbose (1984), the USA (Thomas & Collier, 2002) and South Africa (Heugh, 2000) has shown that students who receive L1 education up to the end of primary school perform better than students in monolingual, subtractive, or transitional systems. Students perform better in their first language, in the official/foreign language, and in other content subjects. In addition, they show a higher level of social tolerance across linguistic groups. The additive model envisages a transfer of cognitive processes from the L1 to the official/foreign language, but this cannot

occur if the first language is removed as a medium of instruction, because essential scaffolding has been removed from the education process.

Reflecting on this international evidence and the poor outcomes of Zambia's ten-year experience, the Ministry acknowledged the need for further reform (MoE, 2012) and embarked on a further revision of the primary curriculum extending the use of local languages as medium of instruction from grade 1 to 4. Following successful piloting in 2013, the programme is being phased in gradually beginning with grade 1 in 2014. In an effort to ensure proper coordination of various education stakeholders and guide their efforts in improving literacy, the Ministry also launched a National Literacy Framework (Ministry of Education, 2013[i] that focuses on teaching five key skills of reading: phonemic awareness, phonics, fluency, vocabulary, and comprehension.

Complementary Instructional Resource Development at CAPOLSA (Centre for Promotion of Literacy in Sub-Saharan Africa, University of Zambia)

Zambia's linguistic diversity is an important part of the nation's cultural heritage. According to Mtenje (2009:63), the "linguistic and cultural diversity of most African countries has for a long time been perceived as a problem rather than an asset for language planning". CAPOLSA, however, acknowledges the cultural strength of Zambia's indigenous linguistic heritage, and seeks to promote wider public appreciation of the utility of indigenous languages for promoting initial literacy acquisition. The following projects have been undertaken by the Centre to date to advance that agenda.

Creation of child-Friendly Reading Materials in the Indigenous Languages of Zambia Approved as Languages of Instruction for Early Grade Learners in Public Schools

The aim of this project is to create, collate and disseminate child-friendly reading materials for young children enrolled in the early grades of primary schools to exercise and extend their new literacy skills in the Zambian languages. The project began with the Kalulu

Story Writing Competition which was an initiative of GraphoRead in 2011

(*http://grapholearning.info/*). The competition attracted over 700 stories and poems.

CAPOLSA assembled a panel of local language experts to review and adjudicate the

submissions. On that jury's recommendation, 14 authors were awarded prizes, and their

prize-winning stories and poems were adopted for publication by CAPOLSA. In order to

prepare them for a readership of young minds, the texts were subjected to a number of

editorial refinements in consultation with various expert referees, notably abbreviation and

grammatical and orthographic corrections. A local publisher was then contracted to produce

collections of the edited/translated stories in each of four languages widely used for initial

literacy instruction *(details of which are listed on the CAPOLSA page of the University of

Zambia website[ii]).* The publisher engaged local artists to design attractive illustrations for the

booklets.

The early grade readers are currently undergoing evaluation across some Zambian

schools. This is because the spelling system adopted for the readers departed slightly from the

orthography approved by the Ministry of Education (MoE, 1977)[iii]. The approach adopted for

this evaluation was determined in consultation between curriculum experts at the Ministry of

Education and CAPOLSA. The evaluation which started in 2014 is being conducted in

collaboration with Teacher Education Colleges. The groups whose evaluation is being sought

are teachers and parents of children enrolled in grades 1 to 4 of government schools and the

children themselves. Participants have all been given adequate time to familiarize themselves

with the readers. The questionnaires and interview guides include a mix of open-ended and

multiple-choice questions. Views from the respondents will help all interested parties learn

whether the simplified and harmonized spelling system adopted for the readers is helpful for

young developing minds. It is hoped that the outcomes of the evaluation will further steer

discussions among policy makers regarding the direction to take in making the orthography simpler and more harmonious across the Bantu languages of Zambia.

Several scholars have shown the benefits of stories to young minds. Carroll et al., (2011) and Beck & Mckeown (2007) indicate that children exposed to stories develop an expanded vocabulary which lays a foundation for comprehending larger units of speech, abstract reasoning and synthesizing text and thus increasing their intellectual capacity. CAPOLSA has endeavored to further increase the production of stories by conducting Writers' Training Workshops in indigenous languages of Zambia approved as languages of initial literacy instruction in schools. During the 3-day workshops, a number of texts were developed and handwritten in small booklets, handmade by participants. Language and literature experts from UNZA, Government's Curriculum Development Centre (CDC) and other renowned authors of books in local languages have led the workshops. Four training workshops have taken place since 2013, one each in the medium of iciBemba, ciNyanja, siLozi and chiTonga. Future workshops are envisaged in the other Zambian languages. The aims of the workshops were to:

   i.   enhance upcoming writers' narrative composition skills for developing stories that are comprehensible to young children and engaging of their imagination;

   ii. expose writers to research-based information regarding language and its dynamics;

   iii. familiarize writers with the simplified orthography adopted for publishing child-friendly reading materials for early grade readers, and with its rationale;

   iv. provide writers with skills to help them work effectively in their communities;

   v.   help to reawaken the practice of writing in local languages.

Harmonization of Orthographies of the Seven Languages Used for Initial Instruction in Schools

As we noted earlier in this chapter, the Bantu languages of Zambia share a number of common features, but their current standard orthographies differ. CAPOLSA aims at developing guidelines for the harmonization of orthographies across these languages, with a view to reducing the difficulty of initial literacy acquisition posed by the prevailing inconsistencies. Drawing on the guiding principles outlined by the CASAS harmonization project (Banda et al., 2008), CAPOLSA's goals are:

i. to iron out disagreements existing among linguists of the region as regards the spelling system; to harmonize and put in place a common orthography that consists of similar rules applicable to all languages approved by the Ministry of Education as official languages of education in order to facilitate the acquisition of literacy among early learners; to bring harmony between sound pronunciation and the graphic representation of the consonants and syllables within and across languages so that one spelling consistently represents each given sound; to generate transparent texts (with special symbols and diacritics avoided as much as possible) that children from different regions of Zambia should be able to read without difficulty.

To attain these goals, CAPOLSA convened an Orthography Harmonisation Workshop prior to the publication of any reading materials, in view of the shortcomings of current orthographies relative to the aforementioned principles. Leading participants were indigenous language experts from the University of the Western Cape, the Centre for Advanced Studies of African Society, South Africa, the University of Zambia, and Zambian Government's Curriculum Development Centre (CDC).

The workshop made several recommendations that were followed in compiling the first set of books published by CAPOLSA in 2013, to ensure that their texts are child friendly, not only in content, but also in their use of a simplified and transparent spelling system that matches the prevailing language situation in Zambia. The next, ongoing phase of

CAPOLSA's work in this area is to evaluate the first set of readers. Preliminary indications suggest that there is widespread support for the simplified and harmonized spelling system. But, as was to be expected, that support falls short of unanimity. Adults who learned to spell a given language one way generally perceive new ways of spelling that language as strange, or incorrect. If teachers and/or parents perceive the reformed spellings as inauthentic, they are likely to be less than fully supportive of the learning agenda for children in their care, and that will be a disadvantage for the children's acquisition of literacy. For that reason, CAPOLSA has sought to strike a judicious balance between an orthography that adheres to the principles outlined above and responsiveness to opinions voiced by literate "native-speakers" of each of the languages in question, especially writers and teachers. We anticipate that the process of orthographic reform will be a gradual one, and that some changes that carry important advantages from the perspective of simplicity, transparency or harmonization will command greater acceptability in the future, as successive generations come to appreciate those criteria.

Creative Writing Devised at CAPOLSA in Indigenous Languages

 (a) Translation of stories across the indigenous languages,

  The Early Grade readers published by CAPOLSA include stories and poems that were originally composed in ciNyanja, chiTonga, iciBemba and siLozi by prize-winners in the Kalulu story writing competition, and later translated across the three languages. CAPOLSA encourages the art of translating from one Zambian language to other. Most of the translators we have engaged initially expressed some uncertainty as to their competence in one or the other of the languages in question. We therefore encouraged them to work in pairs, where one member of the pair was very fluent in each of the two languages. These pairs have consistently reported that this mode of translating proved to be much easier than translating between English and their dominant local language, an activity with which they were all very

familiar. The same approach of translating from one Zambian language to another has been

followed with the prize-winning stories that were originally written in the kiKaonde, Lunda

and Luvale languages that originate from the North Western Province of Zambia. These

readers are scheduled for publication in the course of 2015.

(b) Controlled writing with emphasis on core Bantu vocabulary

The high degree of mutual intelligibility among the various indigenous Zambian languages

raises the possibility of composing stories that use a shared vocabulary. A controlled writing

workshop was convened that identified the shared vowels, consonants, syllables and words

across chiTonga, ciNyanja and iciBemba. The workshop went on to generate a number of

child-friendly short stories, each of which shared over 70% of its vocabulary across these

three distinct Zambian languages. The hope is that exposure to such texts during the early

grades will support the promotion of children's cognitive development in Zambia's

multilingual society and reduce their perception of linguistic diversity as problematic.

Building on the output of the controlled writing workshop, it has been proposed to develop a

Bantu version of the graphogame, comprising vowels, consonants, syllables, words and short

sentences shared across the aforementioned indigenous languages, as well as short interesting

stories for first graders.

Exploring the Potential of Multiple Media for Dissemination of Literacy Materials

In addition to print, CAPOLSA has embarked on the distribution of early grade

reading materials via digital, electronic media. In 2013, some were mounted on tablet

computers that were pilot tested as a classroom resource in government schools of Lusaka

(Walubita et al., 2015). A select group of Grade 1 teachers developed several alternative

ways of deploying a small number of tablets in such a way that most of the children in their

overcrowded classrooms were able to gain sufficient exposure to the graphogame to make a

significant contribution to their early literacy learning. Results suggested that this may be an

effective and increasingly affordable way of going to scale with distribution of appropriate

reading materials to the nation's large number of initial literacy learners, who are widely

scattered across the country.

CAPOLSA has also ventured into the development of entertaining methods of

promoting phonemic awareness in young minds. The Centre commissioned productions by a

local popular music group of vowel songs namely AEIOU & Nyama (vowels represented by

animal sounds) and an alphabet song coined as A-Be-Ci. Some of these are accessible on the

internet under the index name of CAPOLSA on Youtube. These are designed to appeal to

young minds in the early grades and pre-school settings. Rather than singing the ABC

English version of the alphabet, we propose to encourage teachers to use the local language

version that reflects the correct letter-sound correspondence rules that children must master to

become literate in any of the Bantu languages. Other projects under development include

mounting competitions among schools in performance mastery of the CAPOLSA spelling

system, in playing Graphogame routines and in singing the A-Be-Ci and AEIOU vowel

songs. Beyond the actual competitors, we envisage that many children will gain a boost to

their literacy acquisition by watching the competitions on television, another electronic

resource that is rapidly growing in accessibility around the nation.

Conclusion

The research described in this chapter lies at the interface between a scientific

paradigm informing experimental and developmental studies of cognition and instruction, a

humanistic tradition informing studies of culture, language and social change, and a systemic

approach to social and educational planning.

Several strands of the research we have presented illustrate the benefits of mixed

methods. The well-known strategic benefits of the quantitative paradigm in terms of precision

and reliability come at a cost that can be mitigated by qualitative methods that serve to "make

the familiar strange and make the strange familiar" (Spiro, 1990, 47). Many psychologists in

countries outside the West have noted that qualitative methods have the particular attraction

of allowing egalitarian cross-cultural communication among investigators with uneven

degrees of familiarity with the constructs and formats of Western psychology (Serpell &

Akkari, 2001). As Yoshikawa et al., (2008, 346-7) have explained, mixing qualitative and

quantitative research in developmental science is especially helpful, among other goals, for

"integrating the study of beliefs, goals, and practices in socialization and development...

examining reciprocal relationships between contextual and individual-level factors... and

exploring causal associations and their mechanisms".

The research we have presented is multi-disciplinary, drawing not only on

psychology's traditional allies of biology, linguistics and sociology, but also on political

science, history, and literary studies. These disciplines, less familiar to many psychological

researchers, in our view have much to offer in answering the sometimes overlooked, yet

fundamental question "Literacy for what?" For instance, they can readily engage with a

concern frequently expressed in Zambia's popular press concerning the quality of Zambia's

"reading culture". Collaboration with experts on literature on the design of writers'

workshops, with graphic artists for illustration of the Early Grade readers, and with musicians

on the design of songs to promote phonological awareness has prompted CAPOLSA to

include aesthetic dimensions among its quality assurance criteria.

The agenda of applied developmental science rests on the premise that scientific

theory should in principle be helpful in deciding what kind of contextual modification is most

appropriate for achieving desired developmental outcomes such as literacy. However, in

practice, educational programs in the real world tend to deviate in a number of ways from the

precise implications of any one theoretical model. Understanding why this is so calls for

more than experimental control. Rather than conceiving context as a pattern of external

stimulation, developmental researchers have increasingly recognized that humans, like other

species are inextricably embedded in ecological systems (Bronfenbrenner, 1979; Sameroff,

1983). Reviewing the mix of successes and setbacks reported by four large-scale programmes

of early childhood intervention in India, Netherlands, Turkey, and USA, Serpell (1999, 54)

posited three alternative explanations for why intervention programmes tend to deviate from

the precise implications of any one theoretical model:

"Incomplete or eclectic assimilation of theory into practice;

  Organizational adaptability as a pragmatic requirement of going to scale;

  Multiple goals as a reflection of systemic interdependency".

The technical desire to test and extend universalistic theories and principles that

motivates one perspective of our team's North-South collaboration tends to favor the first of

those explanations, whereas the more practical motivation that informs the other,

complementary perspective tends to favor the second. In order for a social intervention

program to "go to scale" from a pilot project to a general cultural practice sustained by public

policy, it is seldom effective to push for implementation of an idealized blueprint.

Widespread appropriation of a programmatic concept is more likely to come about through a

gradual "learning process approach." This calls for "organizations with a well-developed

capacity for responsive and anticipatory adaptation—organizations that (a) embrace error; (b)

plan with the people; and (c) link knowledge building with action." (Korten, 1980, 498).

The need for such adaptations highlights the importance of a complementary,

qualitatively different set of goals from those of a universalistic cognitive science. "The

nested organization of systems of social activity (families and schools, within neighborhoods

and districts, within nations and their public policies) and the relativity of symbolic meanings

to particular cultural frameworks of interpretation (narratives; curricula; and ideologies of

work and play, gender roles, intergenerational relations, etc.) demand that the impact of an

enterprise as complex as an early education program be appraised quite differently in each particular sociocultural setting" (Serpell, 1999, 59).

Sensitivity to culture in applied developmental research demands attention to three complementary ways of interpreting the role of culture. Culture structures the context of human development in a fashion that resembles a womb; through language and other semiotic means culture informs human cognition; and over the course of history culture constitutes a forum for the debate of alternative approaches to the improvement of the human condition (Serpell, 2000).

Thus in the Zambian context, the efficacy of GraphoGame should be appraised in terms of a broad constellation of factors that include

(a) optimizing the stimulation provided by the game in response to the child's evolving cognitive needs for achievement of a given curricular goal (a design task for the computer programmer, informed by psychological assessment of the child and linguistic analysis of the target language and script);

(b) orientation and training of teachers to incorporate the game appropriately within their pedagogical practices, and adaptation of teacher education curricula to that end;

(c) mutually informative consultations with the national government and other large-scale providers of early education regarding optimal strategies for integrating the game within the nation's emerging educational policy and curricula;

(d) mutually informative consultations with linguists, creative writers and other cultural experts regarding optimal orthographies for local languages and, if necessary, their adaptation for early literacy learners;

(e) mutually informative consultations with ICT developers, mass media providers, educational publishers and other agents of macrosocietal change regarding optimal ways of disseminating GG and other literacy learning resources.

While underlining the importance of mutually respectful interaction between researchers, professional practitioners and policymakers, we also acknowledge that applied developmental scientists have a duty to advocate innovative policy initiatives that avoid pitfalls identified by research, such as those of rigid orthodoxy, cultural homogenization, and the socially extractive definition of educational success. For applied research to fully earn its name, it should generate understanding that is not only relevant to action in the real world but also effective as a stimulus and guide to such action. Hence our inclusion in this chapter of a section on the interventions undertaken by CAPOLSA to realize the implications of research.

Such interventions depend for their success on cooperation with and strengthening existing institutions engaged in literacy promotion (Serpell, 2014b)[iv]. Thus CAPOLSA has established an Advisory Board on which a wide range of literacy promotion stakeholder organizations are represented. More concretely, CAPOLSA interacts with several key Zambian institutions and has combined project activities on its own agenda with capacity building of other institutions, for instance by contracting language experts to undertake translation and editing of its publications in Zambian languages. In the future, CAPOLSA hopes to collaborate with two existing centers in Zambia for professional, neuropsychological assessment of special educational needs, one at UNZA's School of Education, the other at the Zambia Institute of Special Education (ZAMISE). A mix of adapted Western instruments and locally developed methods are currently used at these centers, designed to help understand subtle deficiencies in the Central Nervous System that interfere with learning. CAPOLSA's activities have the potential to contribute to the systematic identification of learners with special educational needs and the programmatic delivery of appropriate assistance to them through refined assessment methods and innovative instructional resources such as GraphoGame.

The conception of Applied Developmental Science envisaged by these various types and levels of activity thus embraces observation and analysis of the world as it is and systematic action on many different fronts to advance towards a better world.

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