

# Building a delivery platform for literacy research and literacy development

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**Abstract-Our FundaWethu software program is a Computer Aided Instruction (CAI) system designed to deliver reading lessons to Grade R-3 (foundation phase) children who are learning to read in a multilingual context. Starting from a premise that the system should be "edutainment" based, the system allows literacy researchers or teachers to construct rich multimedia reading lessons, with words, animated pictures, and pre-recorded syllables, words or sentences. The objective is to make the lesson authoring easy enough for use by non computer specialists, but expressive enough to enable a wide range of beginners reading exercises to be constructed in a number of different languages. This paper therefore outlines the process of developing FundaWethu using design based research.**

**Index Terms-computer aided instruction, multilingual, foundation phase, design based research, edutainment**

## I. INTRODUCTION

**P**ROFICIENT reading at the foundation phase is a foundation for further learning [1]. The PIRLS<sup>1</sup> 2006 assessment showed that South Africa fared worst out of forty six educational systems around the world in reading literacy [5]. This is mainly due to lack of financial and human resources.

CAI, as opposed to teacher led instruction, is interactive and can illustrate a concept through multimedia. Progress reports for individuals can be automated which makes assessment easier for educators. Computers also provide immediate

FundaWethu will be used for both instruction and assessment. The building block is a mechanism that permits the child to make multiple-choice selections. From this base we can construct lessons that instruct or assess children in a number of different ways: letter-by-letter spelling, constructing words by syllables, fill-in-the-missing-word in a sentence, and multilingual side-by-side or translation exercises. Because most foundation phase children in developing communities speak a mother language that is different from the school system, there is a need to incorporate language diversity in FundaWethu.

<sup>1</sup>edutainment is a blend of education and entertainment, pursued in multimedia software

<sup>2</sup>Progress in International Reading Literacy Study which is an international reading assessment conducted at the fourth grade.

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Some research has shown this to be an effective way of getting children to read the second language with ease [8].

FundaWethu will initially deliver in English and isiXhosa, but with a design that allows lesson authoring for any other indigenous South African language.

## II. RELATED WORK

G. Ayorkor Mills-Tettey et al [3] outline experiments that were done with Project LISTEN's Reading Tutor in Ghana and Zambia. The reading tutor uses automated speech recognition to provide a guided reading experience for the user. From the outset, because of the multilingual goals, we decided not to attempt to recognize or synthesize speech. Instead, we have provided the ability to use pre-recorded sound clips of spoken words, phrases and sentences. This offers us a very flexible mechanism with excellent quality, and makes it easy for the lesson designer to add new words, sentences, or sounds. The Project LISTEN experiments showed improvement in the reading abilities of the children which further supports the crucial role that technology can play in literacy development.

Locally, Macmillan Talking Stories (MTS) which was developed by Kathy McCabe [4] presents stories in English, isiXhosa and Afrikaans. Unlike MTS, FundaWethu will offer the flexibility of allowing educators to design and update the tutor content to suit the learners they are working with. This aspect of flexibility is scarcely available in reading tutors therefore it hampers localization of content.

## III. RESEARCH STRATEGY

### A. Design Based Research

Design-based research methodology is an iterative approach. Researchers and practitioners collaborate in a real-world setting [7]. The approach has been found to be flexible and particularly suitable for both research and design of technology-enhanced learning environments (TELEs) because it integrates the design and research processes [7]. According to Cobb et al [2] and Shavelson et al [6], design-based research has 7 characteristics:

1) *Iterative*: it involves design-analysis-redesign cycles that move toward both learning and artifact/system improvement.

2) *Process focused*: it seeks to trace both an individual's and group's learning and the impact of instructional artifacts on that reasoning and learning.

3) *Interventionist*: it tests theory and instructional artifacts by designing and modifying real-world settings.

4) *Collaborative*: depends on the knowledge and co-work of practitioners

5) *Multileveled*: links classroom practices to events or structures in the school, district and community.

6) *Utility oriented*: focuses on improving the effectiveness of instructional tools to support learning.

7) *Theory driven*: it tests and advances theory through the design-analysis-redesign of instructional activities and artifacts.

The above characteristics are an embodiment of how we seek to carry out this project and deliver a useful and effective artifact for both learners and education researchers.

In the proposed work, the design-based research paradigm is going to be evident at two distinct levels:

First, the construction of the software artifact itself will be iterative, process focused, and utility oriented. We plan to build a rapid prototype, work with the lesson designers, see how we can improve it, and iterate our platform over a number of software delivery cycles.

Second, we expect the lesson construction and experiments with the children will also follow an iterative, process-focused model. As lessons are developed and delivered, the literacy researchers will be getting feedback that will reflectively allow them to enhance their lessons or ask different research questions of interest. But in order to do this, they in turn will be feeding back new requirements into the platform design process.

#### IV. OUTCOMES

FundaWethu is made up of 3 modules namely; delivery engine, lesson authoring and data gathering.

##### A. Delivery Engine

To date we have a prototype implementation of this module that allows one to spell multi-letter or multi-syllable words in either English or isiXhosa from a range of possible alternatives. The alternatives are displayed on multiple casino-like fruit machine wheels. When a word is randomly selected from the lesson, it triggers the display of a (possibly animated) picture, and it can also say the word.

##### B. Lesson Authoring

We have elected to use a file system rather than a database for the content (sound files and graphics) and lesson repository. Lessons are coded in simple text files, to promote easy access for non-programmers. For our first English lesson, we have used 3 wheels for spelling words like "dog" and "pig". The permitted words are explicitly listed in the lesson. The first isiXhosa lesson is syllable-based. Also using 3 wheels, we can build words like "u-ma-ma" or "i-kha-ya", with appropriate graphics and sounds. Images are also stored in language-specific folders, but we treated the English directory as a "base repository", and provided a simple translation/redirection dictionary from other languages, so that the isiXhosa "ikati" will fetch the image "Cat" from the base repository. But we also provide an override capability for the local language, so that "ikhaya" for example, can select language-appropriate images (perhaps a traditional isiXhosa home).

##### C. Data Gathering

We also plan to incorporate a data gathering module for assessment of learners and research purposes for the education specialists.

#### V. CONCLUSIONS

In this paper, we have proposed a localized literacy delivery platform. Although our implementation is in its infancy, case studies [3] indicate that tools like these can aid in the literacy development of foundation phase learners. Our next design-based research steps will be to have our literacy research collaborators in the Education department attempt to construct some lessons, and to provide iterative feedback to refine our prototype. Thereafter we will move onto a phase where children begin to use our lessons.

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Bwini Mudimba completed her BSc (Hons) at Rhodes University. She is currently reading towards an MSc degree at the same institution. Her research interests are in the area of technology use in education.