Computer Science Honours Project Proposal

"Developing a Web Based Learning Environment to Support Previously Disadvantaged Schools in South Africa"

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1.   Problem Statement

Many previously disadvantaged schools in South Africa are faced with a shortage of qualified educators and quality teaching materials [1]. Computers and networks are being deployed in some schools, however, providing an opportunity to use Information and Communication Technologies (ICTs) to assist learners and teachers. By developing an online environment, that facilitates the sharing of educational information, it will be possible for teachers to prepare learning material and make it accessible to learners in several schools.

The low average computer literacy level [2] of these learners necessitates a web site that is easy to use and structured in such a way that learning is actively facilitated. It is salient that the resource makes both contributing to and learning from the site easy and effective. It is also crucial to be able to assess whether the material is actually benefiting learners. Essentially, the aim of this project is to research the best way to structure a web-based learning environment; develop a prototype using web application technologies; and to evaluate whether the prototype is a successful teaching aid.

2.   Intended Approach

My approach to this project can be conceptualised as consisting of four main phases:

Phase 1: Background Research

I will begin my research by performing background research in the broad field of the use of ICTs in education. This should provide me with a solid understanding of the historical and current roles of ICT in education, which will guide and inform my subsequent research.

Phase 2: Specific Research

Before undertaking any development, it is important that I have a clear idea of how to structure the content on the web site most effectively. In order to decide on an approach to the development, I plan to undertake research into current uses of ICT in education and learn about state-of-the art e-learning techniques. In addition to academic papers and books, I will discuss e-learning with people working in the field of education. This will include interviewing teachers and lecturers. In particular, I will focus on their experiences and expectations of e-learning. From this research I hope to determine how best to structure the content in an online learning environment, so that the information is useful and easily accessible.

Phase 3: Development

A significant focus of my project will be on the actual development of an online learning environment. I plan to research the suitability of web application technologies, particularly the Google Web Toolkit. It is essential, especially considering low computer literacy levels [2], that the resource is easy to use, so I will also research effective user interfaces.

Phase 4: Testing

In order to evaluate the success of the project, I will organise teachers who are willing to contribute content in a particular learning area, and a class from a few schools to test the application. I will obtain results from the use of the prototype in order to have some indication of the efficacy of the application. With this end in mind, it is crucial that the resource is developed in such a way that it is able to collect usage statistics and assess whether learners are benefiting from the resource.

First semester	*Proposed dates:*
1st term (16 Feb – 3 Apr)	
Formal written proposal	2 March
Oral presentation of proposal	3 March
Basic familiarity with GWT	13 March
Finish interviews	20 March
Submit literature review draft	3 April
2nd term (20 Apr – 26 Jun)	
Mid-term development evaluation	15 March
Literature review due	26 June
Working prototype of site	26 June
Second semester	
3rd term (27 Jul – 4 Sep)	
Prototype roll-out	27 Jul - 31 Aug
Submit draft structure of thesis	3 August
Code inspection week	11 August
Poster presentation	24 August
Submit draft thesis write-up	4 September
4th term (14 Sep – Fri 18 Dec)	
Final oral presentation	2 November
Final project hand-in	9 November

3.   Survey of Resources and Literature

3.1.Readings on the use of ICT in Education:

Isaacs, Shafika. "ICT in Education in Southern Africa".

➔ This recent (2007) paper provides a solid introduction to the current state of ICT use in education in South Africa. It quotes and discusses numerous statistics on the use of computers in South Africa. It also outlines several of the difficulties facing e-learning in South Africa.

Nam, S., Smith-Jackson,T. "Web-Based Learning Environment: A Theory-Based Design Process for Development and Evaluation" in *Journal of Information Technology Education* (Volume 6, 2007).

➔ This paper will be useful as its focus is very close to my own. Its main concerns are user interface and assessment, which I agree to be crucial considerations in the development of a web-based learning environment.

Osin, L. "Computers in Education in Developing Countries:Why and How?" in *Education and Technology Series* (Vol. 3, No. 1, 1998).

➔ This paper presents a broad discussion of the use of computers in education and takes a structured, critical approach. It also spends some time investigating causes of the failure of computer-aided teaching.

South African Department of Education. *White Paper on e-Education*, 2003.

➔ This white paper will prove useful in understanding the government's stance on e-learning. In particular, it offers the government's definition of several concepts, and outlines the Department of Education's policies and goals regarding e-learning.

Wagner, Daniel A., Bob Day, Tina James, Robert B. Kozma, Jonathan Miller and Tim Unwin. 2005. *Monitoring and Evaluation of ICT in Education Projects: A Handbook for Developing Countries*.

➜ This is essentially a handbook of strategies for approaching the implementation of e-learning. It also focuses on how to evaluate whether e-learning is being effective.

3.2. Guides to using the Google Web Toolkit:

Chaganti , P. *Google web toolkit.*

➜ An example-based introduction to most of the GWT functionality.

Hanson, R., Tacy, A. *GWT in action.*

➜ An in-depth guide to the GWT, including advanced functionality.

4.   Design Considerations and Implementation

The decision to develop an online learning environment, as opposed to a windows application has several advantages. Firstly, it allows easy access to the resource (and mobile access, as a possible extension), with no installation required. Secondly, it ensures the centrality of information, making the resource and its content easier to manage. LasAltly, it enables the easy collection of usage statistics that will be used in evaluating the efficacy of the resource. The development of an online learning environment in the form of a web application, as opposed to an ordinary website, will allow for the use of more powerful functionality and better communication with the underlying database. It will also provide a cleaner, faster user interface by avoiding browser refreshes, and allow for a more interactive learning experience. I plan to use the Google Web Toolkit (GWT) for the development of this project. The GWT is designed specifically for the development of AJAX web applications such as the one I have in mind. It allows the easy development of modular applications and allows the ability to add external modules (such as Google widgets, RSS feeds, etc.). I plan to develop my application to be as modular as possible to enable easy extension. The

GWT allows the developer to code largely in Java and compiles this Java into JavaScript, ensuring easier coding and enabling the use of powerful features. The data layer of the prototype will take the form of a SQL database, probably managed using Microsoft SQL Server. Having an underlying database will allow the site to easily collect and store usage statistics, as well as keep a record of every learner's progress with the learning material.

5.   Expected Output

By the end of my project, I plan to have produced a working prototype of an online learning environment. I hope to organise content for the environment in a particular subject area from a few contributors. The prototype will be tested in a few classes from both previously disadvantaged and established schools, to determine whether the application has the potential to be an efficient, useful learning supplement. Results from this testing will include: usage statistics from the web application; learners' marks for online tests on each lesson's content; learners' online evaluations of the lessons; and interviews with teachers that used the learning environment. My final thesis should demonstrate a solid understanding of the history and current trends in the broad field of ICT in education; investigate the best way to structure and assess online content; demonstrate insight into the efficacy of the Google Web Toolkit for web application design; explore the design and implementation of an online learning environment; and, finally, provide some discussion of the findings obtained from the use of the project prototype.

6.   Possible Extensions

Possible extensions to the core project could include:

• Ability for learners to contribute material
• Forums – for discussion of material
• Searchability

- Mobile access
- Social interaction component
- Ways of preventing plagiarism
- Creative writing section
- Learner run news or features section
- Resources that improve computer literacy
- Resources that improve general literacy and numeracy

7.   References

[1] Isaacs, Shafika. "ICT in Education in Southern Africa". Survey of ICT and Education in South Africa, 2007.

[2] South African Department of Education. *White Paper on e-Education*, 2003.