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Integrating Virtual Worlds and Virtual Learning Environments in Schools in Developing Economies

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ABSTRACT

In recent years there has been significant growth in the use of 3D virtual worlds for e-learning and distance education. Virtual learning environment (VLE) has achieved an adequate level of development and supports teaching and learning in an educational context, offering the functionality to manage the presentation, administration and assessment of coursework. This paper's main philosophical claims are that virtuality is itself a bonafide mode of reality and that VLEs must be understood as a possible platform for effective and quality teaching, learning and training. The paper investigates the suitability of virtual learning in Higher Education Institutions in Africa. It also explains virtual reality principle, describes the interactive educational environment, highlights the challenges HEIs face in the traditional mode of delivery and discusses educational benefits of implementing virtual reality. A number of demonstrative examples showing how virtual world/virtual learning environments can be integrated will be shown and the potential opportunities that exist in this area discussed. The paper then proposes a model for integrating virtual world tools with the existing learning environments.

Keywords: *Virtual worlds, virtual learning environments, e-learning; developing economies, model*

1. INTRODUCTION

Emerging multi-user virtual environments (MUVE) or virtual worlds such as Second Life offer the potential to change the nature of education, particularly in the distance taught e-learning arena [1]. Such fully immersive 3D technologies coupled with communications approaches such as VOIP and media streaming, allow academic staff and students to engage and interact in real time, in the same virtual space regardless of their actual physical location. In addition, increasing cross-influence of technology on education and modern pedagogical approaches could be integrated to act as an academic whole in the universities for the improvement of teaching-learning processes [2][3]. By means of virtual laboratories, teachers and students can use technological means and web infrastructure to overcome classroom and laboratory limitations in equipment, personnel and space, additionally, by the guidance of correct pedagogical strategies, they can fulfill requirements of the education process not fully covered at classroom, during course time[4][5]. Through proper design considerations, the operation of a virtual laboratory can be based on open-free hardware and software resources currently being used worldwide and widely known, available without any cost.

The advent of web 2.0 tools has stimulated a drift in the way learning and teaching is offered due to its flexibility and interractiveness [6]. VLE platform models real-world education by integrating a set of equivalent virtual concepts for tests, homework, classes, classrooms, and so on, and perhaps even museums and other external academic resources [7]. Though VLE is heavily applied in distance learning, it has now often been used to supplement traditional face to face classroom activities, commonly known as Blended Learning. The VLE systems usually run on servers, to serve the course to students Multimedia and/or web pages

Virtual reality and VLE is breaking out from traditional areas of use (e.g., aviation and research through simulation) and now emerging as an increasingly important tool for education and training [6][4]. Part of the reason is that as the cost of computing power decreases it is becoming an economically viable media. However, economics alone do not fully account for the emergence of VLEs growing incorporation in education (at all levels ranging from first grade through graduate education) and training. Why is the use of virtual objects and learning becoming so important? VLEs:

a) Are applicable to students of all levels and ages.
b) Help students see complex relationships that would otherwise involve expensive equipment or dangerous experiments.
c) Allow for math, science, and technical skills to be taught in an applied, integrated manner.
d) Provide students with new methods of problem solving.
e) Provides realistic training and skills for a multitude of career areas. It is used extensively in science and industries.
f) Are cost effective and reduces risks to humans.
g) Facilitate the integration of distance and campus-based learning or of learning on different campuses.
h) Economize on the time of teaching staff, especially when they are also involved in research and administration. The extent of the

economy over traditional "talk-and-chalk" teaching is not yet clear, but for instructors without web development expertise, using a VLE absorbs less time and produces a more professional result

HEI in Africa, in particular, there has been unequal rise in number of students with the facilities for teaching, learning and training. There has also been inadequacy in funding of these institutions. This has triggered a number of these countries to adapt online education [8] [6] as an alternative learning paradigm. However, there still remains a gap. The researchers envisions that through the proposed framework HEIs in developing economies are bound to reap major economic advantages over traditional classroom setup based on commercial solutions; budget constraints due to high investments in license and proprietary hardware purchases are reduced. Long term sustainability is favored because of the growing worldwide efforts and communities continuously providing support, sharing resources and developing new materials related with the project.

2. RESEARCH DESIGN

The researchers have adopted descriptive survey approach including extensive literature survey and online interviews. Research findings on VLE adoption offer some guidance, with researchers focusing on either students' acceptance by measuring their computer efficacy levels or use-intentions or their resistance by measuring their supporting/resisting behaviors. In doing so, "acceptance" and "resistance" have, implicitly or explicitly, been conceptualized as either/or proposition, the opposite ends of a single closed dimension. The number of students interviewed was 32 and were basically categorized into six groups. Hence the researchers explored six actor groups in adopting VLEs and used six-group model as depicted in figure 1.

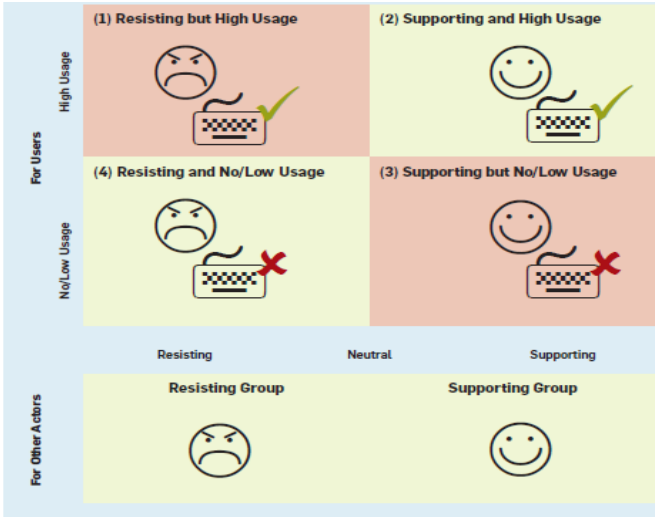

Figure 1: Six-actor groups in adopting VLEs in schools

Figure 2 gives summary of student responses in relation to VLE and adoption

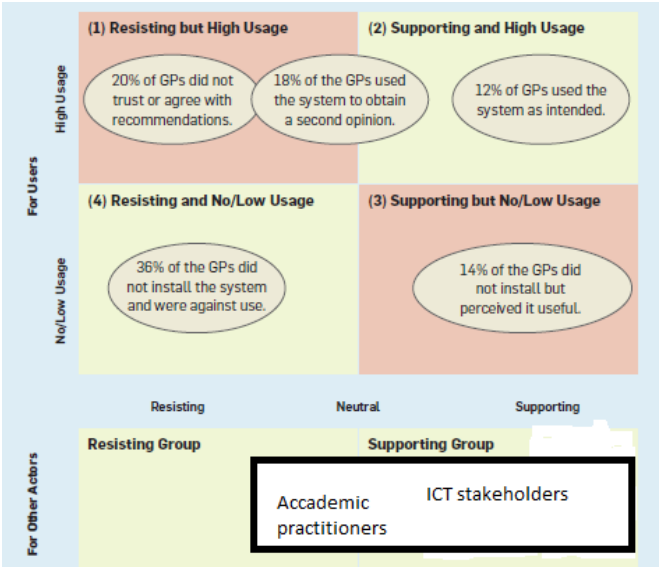

Figure 2: Responses by students on VLEs adoption

From the results in Figure 2 it's clear that its not only resistance to usage of VLEs that can affect negative adoption of VLEs in schools but also a number of factors come in to play. There are those who support but with no/low usage and hence there must be proper strategies that ought to be embraced in order to maximize the adoption of VLEs and virtual objects in schools. Figure 3 shows various strategies that can be used to promote VLE adoption.

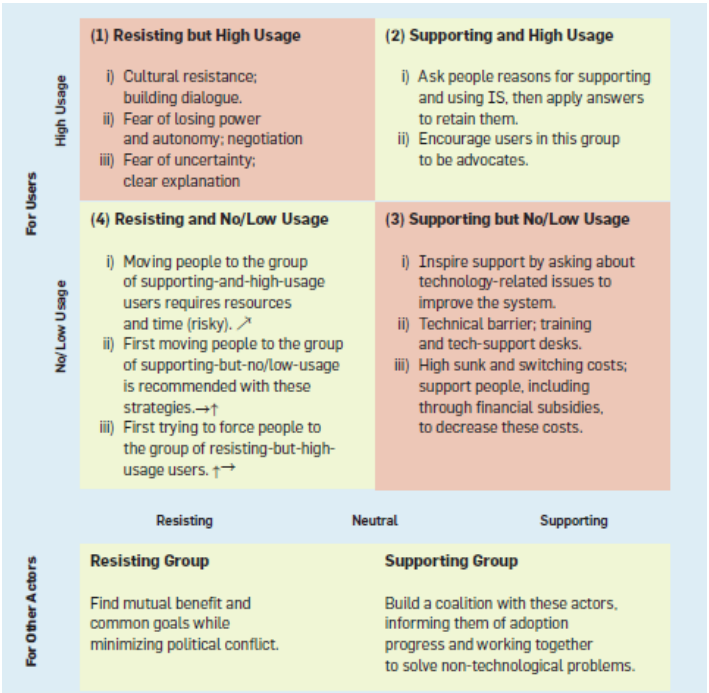

Figure 3: Strategies to promote VLEs in schools

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3. VIRTUAL WORLD AND VLEs IN EDUCATION AND TRAINING

The virtual experiments do not only aim at mediating theoretical knowledge but also at introducing into practical experimental work. Users can develop experimental designs for the different learning experiments. For example, users are shown how to use control groups or how to think about adequate test situations. After an experimental design is prepared, the experiment can be performed virtually as can be depicted from Figure 4.

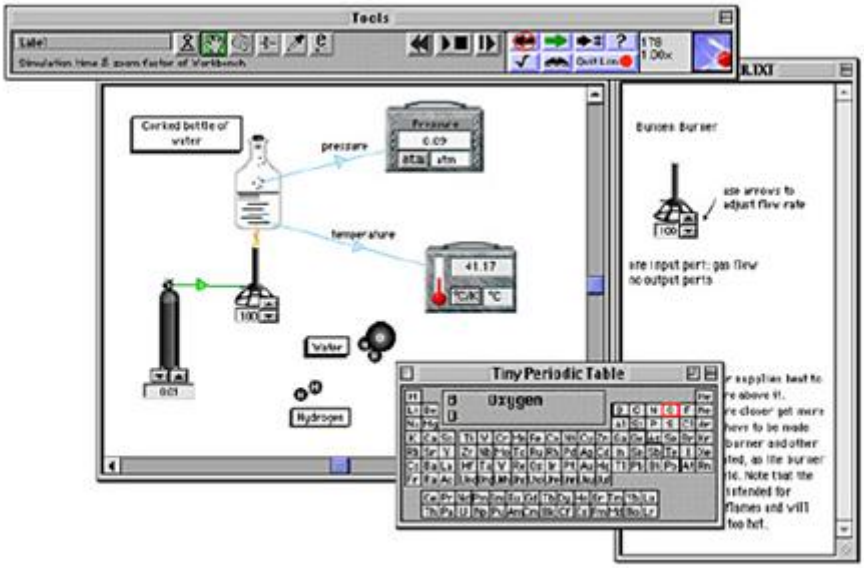

Figure 4 ActivChemistry. A virtual chemistry set construction kit grounded in chemistry theory

ActivChemistry, shown in Figure 4 is an example of an educational simulation of a chemistry lab. It is a chemistry construction kit that provides students with equipment and materials such as Bunsen burners, chemicals, and a wide variety of meters and gauges. Using these components, students perform experiments, gather and graph data, and learn about new concepts in interactive and dynamic lessons. ActivChemistry illustrates several advantages of the use of simulation as compared with real equipment. These advantages include safety (experiments can be done that would be too dangerous for most high school chemistry labs), economy (saves the cost of expensive equipment and materials), and learning efficiency (students using the program are not under the time pressures often found in standard chemistry lab periods and often complete exercises at a faster rate).

According to Peter and Westerlund [9] simulations are very useful because they help students explore new concepts and gain an understanding of the interplay between related complex phenomena. Simulations typically incorporate free-play environments that provide the learner with experience in understanding how a set of conditions interact with each other. In the context of training and education "*simulation* is typically a software package that re-creates (simulates) a complex phenomena, environment, or experience." The learner is thus presented with the opportunity for some new level of understanding. PC-based simulations are typically interactive and grounded in some objective reality [11]. Educational simulations are also usually based on some underlying computational model of the phenomena, environment, or experience and usually have some degree of unpredictability.

4. BENEFITS OF VLEs

Using virtual reality in schools greatly eases the burden for teachers. Teachers become learning facilitators as students explore and learn in virtual reality. As opposed to merely supplying answers, teachers guide students' self-discovery and assist in building ideas. Virtual reality is a giant step towards "perfect learning" - a learning environment that focuses on the student rather than placing burdens on teachers. It creates a learning environment where students explore, discover and make decisions, while teachers assist and guide. From a teacher's perspective, virtual reality creates a structured environment that focuses students on specific learning objectives, similar to good teaching. Because the students are immersed in the virtual reality learning environment with a headset, there are no distractions to learning. Students are totally focused with no unruly behavior.

Tied to the curriculum, virtual reality is an educational aid without peer. It can be integrated into schools in a number of ways. Modularly designed programs work as a standalone educational tool, as a classroom supplement or as a study aid. In an initial stage of integration, as with the science subjects, virtual reality is best used as a supplement to existing coursework,

allowing instructors to integrate the programs into learning objectives. The biology class where students are learning cell structure is supplemented by a trip to the virtual reality lab where students enter and explore a human cell.

The relevance of VLEs (also known as Virtual Learning Environments) can thus be summarized in three broad areas:

i) Accessibility- If taking an Asynchronous curriculum, student has the availability to access the course after office hours. For Synchronous and Asynchronous instruction, the student has the flexibility of being in the safety of their own home.

ii) Interactivity- There is much evidence to show that students benefit from actively engaging with their course [9]. More specifically, the advantages relate to feedback, practice and customization.

iii) Communication-This element is must be increased in a VLE. It helps the student to feel part of a learning community. Tools used are bulletin boards, being able to "play-back" a session, chatting, email, and instruction & announcements are current due to the live instructor[10]

Figure 5 depicts a conceptual framework for Effective use of Virtual objects and Virtual Learning Environments in school set up.

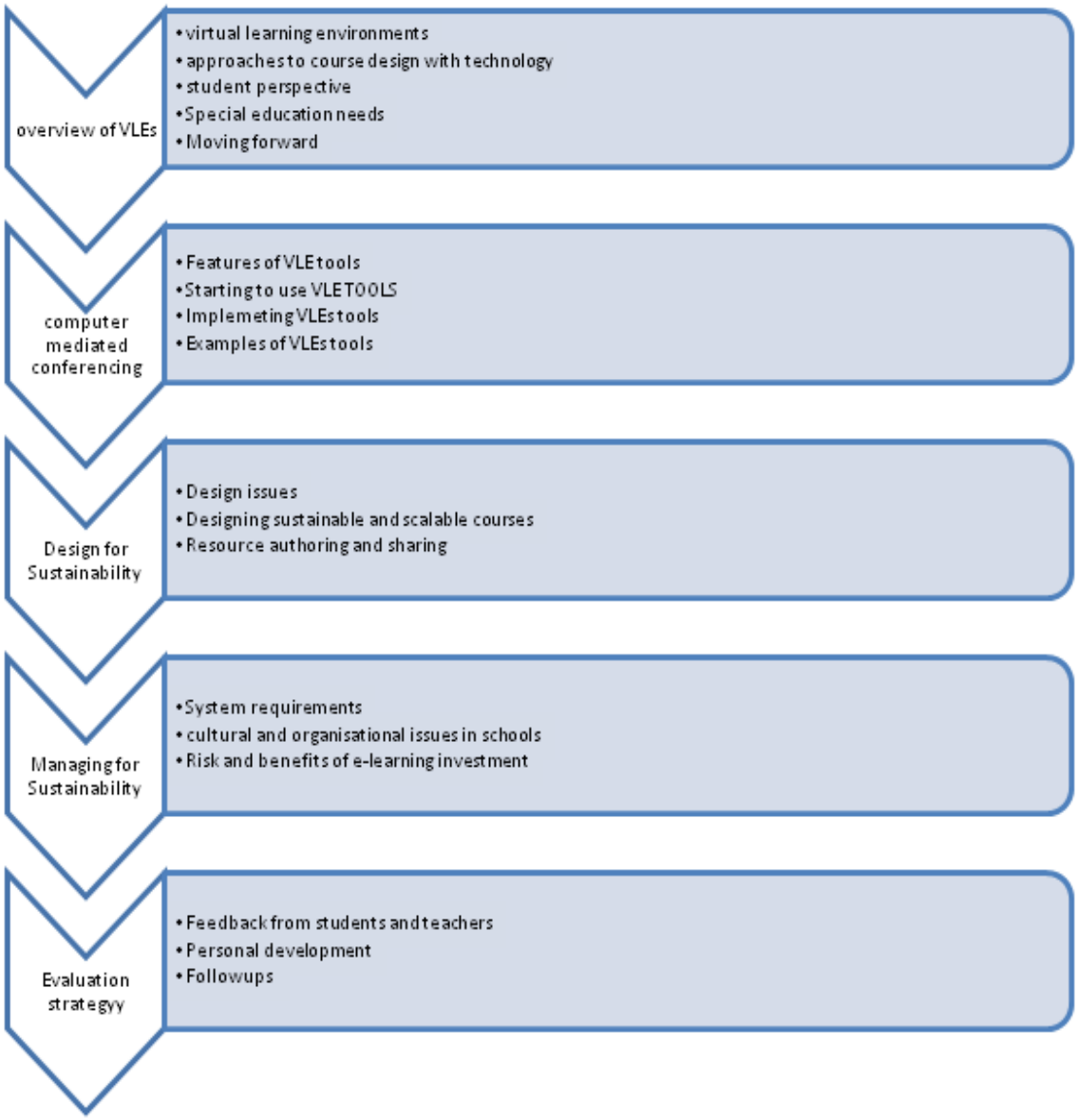

Figure 5: Framework for effective use of VLEs in Schools

5. CONCLUSION

The objective of the study is to advocate the use of VLEs and virtual objects in schools using distributed computing infrastructures in science subjects with the goal of bringing computer modeling and simulation in those subjects to new frontiers in complexity and to a new regime of time-to-solution. This will stimulate innovation and cost-effective but at the same time offer quality education. Such areas of application as in computational chemistry using VLEs cover traditional chemistry, materials science, molecular biology and environmental chemistry. Enabling and accelerating the transition of teaching and learning to Virtual learning environment will make students be more competitive, innovative and cost-effective to schools.

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