Virtual Reality and Learning in An African University Environment: Trends and Contextual Issues

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ABSTRACT

Incorporating Virtual Reality aesthetics and semantics can contribute towards transforming the education landscape in both the developed and developing world. This can be realized by VR’s capacity to enable the design of more vibrant and dynamic/interactive multimedia applications that are user centric. VR has a positive impact on e-Learning, which is an emerging education model in Africa. This paper uproots the different initiatives, experiences, and challenges that have been met by various endeavors to employ VR as a tool for education, especially in African universities. Using exploratory approaches, two universities in South Africa and Botswana are reviewed as case studies in order to ascertain the status of VR use in higher education in Africa. The paper finds that the potential of VR education is evident in Africa but needs to be unearthed.

Keywords: Africa, Asynchronous Communication, e-Learning, Virtual Reality (VR), VR Model Design, VR Modeling Language

INTRODUCTION

The adoption and use of information and communication technologies (ICTs) in education mainstreams has changed the teaching and learning experience to an extent where the learner and the teacher do not necessarily have to be in one place. The information age demands transformational initiatives and the pursuit of technological transformation in higher education which has become widespread in Africa - thanks to the extensive and appropriate pervasiveness of global networks such as the Internet. This has called for the educational transformation with more student-centered learning environments where learner-teacher interaction is facilitated by means of appropriate application of ICTs. This transformation has happened in stages starting from traditional to distance and then e-learning education models. Of late, e-learning has transformed into virtual learning environments (VLEs) which promises a more interactive platform with the learners. VR education can be facilitated both on-campus and off-campus (distance education model). Brown et al. (2006) has stressed that the current practice in Higher Education is to move away from didactic content delivery, the transfer of discrete, abstract, de-contextualized concepts, towards constructionist, student-centered models with increasing emphasis on the skills that support independent and self-motivated learning. With this kind of approach, the student...
should be given the liberty to control the way he/she interacts with the course content. VR education aims to achieve just that.

VR or sometimes ‘interactive visual simulation’ can be defined as ‘a computer-generated synthetic environment in which the user is able to both view and manipulate the contents of that environment’ (Kizito, 2003). This allows intuitive, real-time interaction, supported by an intelligent, realistic 3D environment. Of late, virtual reality principles have been incorporated into the education phenomenon in African universities where virtual libraries, virtual delivery of lectures, etc, have been instituted. However, the whole concept of virtual reality as outlined in the above definition has not been pursued and VR is only looked at on a lighter note: learning in interactive dynamic web environments where the user has the right to interact with the web content using his/her preferences. Within the pretext of ICTs, VR has rapidly emerged as a very promising technology that will in future match the innovation technologies such as multimedia/hypermedia (Winterbottom et al., 2006).

In an educational environment, in its entirety, it is known that VR allows the learner to both view and manipulate virtual objects in a manner similar to that of a real environment and in a way that he/she likes. It does this in a way that heightens multi-sensory, multi-perceptual and multidimensional capabilities, thereby enhancing comprehension. VR also helps the learner contextualize the learning material. Out of this contextualization, VR becomes a very powerful visualization tool, especially in the educational sector. This applies equally well to the African context where text and language often pose a barrier to learning. It is to be noted that the levels of learner participation within the virtual environments and the extent to which these experiences will improve learning, are the key aspects which will determine whether VR has real benefits for education or not (Kizito, 2003).

There are different variations in the user levels immersion with VR (Fällman, 2001): a) Un-immersive, non real interaction - using desktop VR computer, the least expensive form, b) semi- immersive -using work benches and reach-in displays, and c) fully immersive using head mounted display units isolated from the real world. Fully immersive VR is the most beneficial but also the most costly and time consuming to develop.

Preece (1994) outlined one of the advantages of VLEs and virtual realities as typically offering a sense of direct physical presence, sensory cues in three dimensions, and a natural form of interaction (for example via natural gestures). In the contemporary world, new interaction styles have emerged: “speech input/ output, computer vision based input (e.g., gestures), audio interfaces (e.g., non-speech audio), tactile and force feedback, biophysical signals (e.g., retina scanner)” (Rauterberg, 2003). These bring the new generation of interfaces that are non-command-based, with interactions like eye tracking interfaces, artificial realities, play-along music accompaniment, and agents. These sets of attributes to VR are important as asynchronous mode of communication is employed. Asynchronous communication is where the sender sends pieces of information to the reception of the receiver without having necessarily having to wait for acknowledgement that the information has reached the final destination safely. The teacher sends out course content and scenarios and the learner should utilize this content to teach him/herself without the presence of the teacher. This being the case, it is desirable that a properly outlined virtual environment is defined so that the learner appreciates the course as if the course teacher was present. Examples of institutions that are known worldwide for having employed the distance education model are the University of South Africa (UNISA), East Carolina University, and Open University of the United Kingdom (OUUK).

The past decade has seen a lot of people exchange diverse views in relation to the use of Virtual Reality for the purposes of enhancing learning and cognition. VR has rapidly emerged as a very promising technology that will probably match the innovation of technologies such as multimedia/hypermedia. However, to experience the full value of VR as a multi-faceted technology...
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