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Losike-Sedimo, N. University of Botswana, Botswana. Bringing Teaching To Life: Using Multimedia To Engage And Empower Students

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ABSTRACT

The perspective taken in this paper is that technology is a powerful tool for aiding in university instruction but not as an end in itself. Therefore, institutions can use it to empower and engage students for intellectual, emotional, social and economic development. The paper presents the results of a study on the impact of simulations and virtual reality on university students' achievement and their attitude. These are then discussed in the context of specific media characteristics. The researcher used a mixed method design and examined hypotheses for effect as well as analysed qualitative data for stated assumptions. The underlying theory for the study is that simulations and virtual reality may bring teaching to life by creating an imaginary life experiential learning. Characteristically, these types of media do not only have graphics, sound, video, text, and special effects that enhance the overall appeal of teaching, they also allow students to vicariously experience real life situations. Students can experience past events, current trends, and future possibilities and also interact with each other. Through interactive participation by the students, multimedia software permitted logical thinking, problem solving, hypothesis testing, inference and many activities of higher order thinking. Computer simulations presented potential to create complex and challenging student activities. Conversely, virtual reality has the potential to transport the minds of students into a given set of experiences. Students felt that they were actually in the experience they were watching on the screen. Virtual reality experience resulted in learning that connects the student with their emotions, cognitive skills, and physical sensations. Such experience promoted memory of content learned. This study sought to investigate the impact of multimedia on developing and achieving research and assessment skills and attitude of developmental psychology students at the University of Botswana. Building on theory, a virtual psychology lab was created to train students to identify human development problems and learn strategies for problem solving. Students were later examined for improved learning, acquisition of skills, knowledge and attitude. The results show that there are numerous benefits for engaging multimedia in teaching. The paper concludes that there is a need for changing teaching methods to empower students by embracing technology.

INTRODUCTION

Lecturing dominates teaching at institutions of higher learning. Trends in Southern African Universities are currently questioning its effect as concerns facilitating learning. On the other hand, it is not uncommon in most developing countries to have large classes ranging from 200 to 500 students. The traditional lecture method remains as a viable method. The lecturer engaging this method essentially aims at explaining or transmitting concepts in a chunk of disciplinary content to large numbers of students, the assumption being that students need the selected content in order to perform higher order tasks expected of graduates. This is an executive model of teaching, basically implying that simply knowing or understanding the content will enable the graduates to perform well in their new jobs. This perspective has been criticized by the outcomes based education (OBE) (Eggen and Kochack 2001). The outcomes based education argues that students have to be taught applications and capabilities. It suggests that disciplinary content be used to build necessary competencies within the institutions in ways that compatible with the work world. This point of view is supported by the constructivist point of view of teaching. Where the learners create and construct their own meaning of the subject content as they interact with their own environment.

In this study students were taught how to identify developmental problems and to solve them. That necessitated a shift from the traditional lecture. The students were taught using multimedia on-line and off line to; a) identify a problem, b) generate diverse solutions to it, c) test those solutions against each other, d) make conclusions, and e) make recommendations based on the conclusions. Learning objectives would be achieved if all the five learning outcomes were completed. Second to outcomes, there was the aspect of student motivation to learn and do assigned tasks. Lecturing by its very nature is tedious to the instructor and boring to the students. (Day, 2003). This study investigated the impact of multimedia teaching on student empowerment. Achievement, attitude, and motivation were used to describe students' cognitive, emotional and social empowerment.

Statement of the Problem

The problem addressed by this study was to determine the impact of simulations and virtual reality based teaching method on university students' achievement and attitude. The study also aimed at investigating motivation levels when multimedia is used to teach in a university class.

Research Questions

Three research questions were formulated and investigated in the study: The three research questions were as the follows:

- 1) Will media based instructions have any effect on achievement and attitude?
- 2) What is the effect of multimedia based teaching on achievement and attitude?
- 3) Will multimedia based teaching motivate the students? Or,

Are the students motivated to learn from multimedia based teaching methods?

Purpose and Scope of the Study

The purpose of this study was to investigate the possible influence of multimedia based teaching on students' achievement, attitude and motivation.

Significance of the Study

It is important to understand what learners' experience when learning from different methods and media in order to improve their learning. As suggested by previous researchers, careful analysis of task, learning requirements, and environments can reveal scenarios in which well-designed lessons can facilitate the learning process (Dillon & Gabbard, 1998). The concept of student achievement and attitude as components of quality assurance is becoming an important component of experiential learning (Kearsley, 1999; Windelborn, 2002). The study will reveal quality of multimedia based instruction and its ability to engage and empower students

THEORETICAL FRAME WORK

Instruction design theories

First it should be realized and acknowledged that instruction is an intervention that is aimed at solving specific problems expressed by lesson objectives. These objectives are based on philosophical and psychological theories. The objectives also serve to guide design, production, implementation and evaluation of instruction. Lafrancois (2000) described teaching as an ongoing process of solving problems relating to communication, instruction, motivation classroom management, and evaluation. Smith & Ragan (1999) pointed out that instruction design draws from many theories. But the major contributors have been the general systems theory, communication theory, learning theories and theories of instruction. In this review, three theories of instruction, systems theory, information processing and conditions of learning were reviewed to conceptualize a comprehensive teaching method. The information processing theory purports that learning is a process of receiving information through the senses and forwarding it to the brain for processing and finally storing or discarding it (Catalano, 1999; Atkinson & Shiffrin, 1968). The general systems theory of instruction design asserts that different parts that work together combine to make the instruction process (Shannon, 1948). Gagne's Theory on Conditions of learning claims that instruction consists of nine events all based on cognitive theories of learning. The theory further explains teaching as follows:

Conditions of learning and the instruction process

Gagne` was a professor in the Department of Education Research at Florida State. His theory stipulates that there are several different types or levels of learning. The significance of these classifications is that each different type requires different types of instruction. Gagne identifies five major categories of learning: verbal information, intellectual skills, cognitive strategies, motor skills and attitudes. Different internal and external conditions are necessary for each type of learning. For example, for cognitive strategies to be learned, there must be a chance to practice developing new solutions to problems; to learn attitudes, the learner must be exposed to a credible role model or persuasive arguments. Gagne suggests that learning tasks for intellectual skills can be organized in a hierarchy according to complexity, stimulus recognition, response generation, procedure following, use of terminology, discriminations, concept formation, rule application, and problem solving. The primary significance of the hierarchy is to identify prerequisites that should be completed to facilitate learning at each level. Prerequisites are identified by doing a task analysis of a learning/training task. Learning hierarchies provide a basis for the sequencing of instruction. In addition, the theory outlines nine instructional events and corresponding cognitive processes: 1) gaining attention (reception) 2) informing learners of the objective (expectancy) 3) stimulating recall of prior learning (retrieval) 4) presenting the stimulus (selective perception) 5) providing learning guidance (semantic encoding) 6) eliciting performance (responding) 7) providing feedback (reinforcement) 8) assessing performance (retrieval) 9) enhancing retention and transfer/generalization). These events should satisfy or provide the necessary conditions for learning and serve as the basis for designing instruction and selecting appropriate media (Gagne, Briggs & Wager, 1992).Gagne`s theory together with the above chosen theories of instruction, emphasize perception of the real world in a meaningful and useful way. The use of multimedia brings the useful and meaningful way of perceiving. While Gagne's theoretical framework covers all aspects of learning, the focus of the theory is on intellectual skills. The theory has been applied to the design of instruction in all domains.

E-LEARNING AS A WAY OF EXPERIENCING THE WORLD

In studies conducted at the University of Botswana on E- learning, it has been shown that natural teaching environments can be improved by proper use of E- learning, (Losike-Sedimo, 2004;) The psychological foundations of teaching, specifically the theories of situated learning (Lave& Wenger,1991) and social cognition (Bandura, 1986) take the view that for learning to occur, methods of instruction must take into consideration the physical and social environment in which the learning is going to take place. The methods should require that the learners manipulate the environment, negotiate and resolve emerging dilemmas while dealing with highly situated and concrete problems (Streibel, 1995). Every academic subject faces the challenge of helping students to go beyond life experiences, to use it and reflect on it, and thereby change their perspective on it and therefore change the way they experience the world. All knowledge is located in our experience of the world (Laurillard 1993). Outcome based education (OBE) also call for real world meaningful experience. E – Learning helps to create such experiences.

MOTIVATION AND E-LEARNING

Studies from mediated communication have portrayed virtual reality as a great motivator, for example, students could be watching a video about their school choir performance and be immersed in the virtual environment (which is the projected or communicated message) to the extent of feeling like participants in that environment at that moment. Virtual reality causes the viewers to be immersed in the screen to the effect of behaving as though they are part of the mediated communication (Rosenberg, 1994). Interest and motivation are desired learner characteristics for instruction. The implementer of instruction wants the student to choose to attend and to choose to make the effort and apply themselves fully. For example, in a Web environment, intrinsic motivation is a must. The learners must have the interest and inclination to turn the computer on and pay attention to the message stimuli. They have to deal with content in a given physical environment that has its own distractions and, above all, there must be an outcome at the end of the lesson. In addition to intrinsic motivation, there has to be coding, decoding, interpretations, rehearsals, and chunking of information to come up with concepts, output, and

observed behaviors. These are but a few examples of the cognitive processes involved in motivation that have been linked to the use of multimedia (Losike-Sedimo,2004;Mathews, 2003). The multimedia presents a false reality that becomes the motivating force. In multimedia research, structured interactions between learners that are focused on achieving meaningful shared learning tasks have been observed to promote academic achievement and motivation (Angelo 1998; Salomon, Perkins, & Gloderson, 1991). Angelo proposed that motivation to learn is alterable. It can be positively or negatively affected by the environment, and multimedia environment has positive effects on learner motivation.

TEACHING AS MEDIATING LEARNING

Students bring to the classroom a world of experience. The classroom bring brings to them the world of academic knowledge and analysis of such knowledge. Teaching becomes the bridge between the two (Vygotsky, 1962) research in education and instructional technology suggests that teaching that is based on the existing experience o learners enhance learning. Multimedia presentations in teaching create the necessary experience. While academics are concerned with what is known in their subjects, how their subject is learned is also important. Teaching must not simply impart decontextualised knowledge, but must emulate the success of everyday learning, by contextualizing, situating knowledge in real-world activity. Teaching must create artificial environments which creates mediation between the lived experiences of the world and the learning of the academic world (Laurillard 1993). Integration of instruction technology has shown successful results in creating such mediation (Hugo, 2003)

LEARNING SUCCESS IN VIRTUAL AND PHYSICAL ENVIRONMENTS IN AFRICA

Since 2000, UNESCO has supported a number of initiatives that have explored the potential of Virtual Reality (VR) as a learning tool in Africa, to date in Ethiopia, South Africa and Uganda many projects have proved VR as an effective tool for teaching in Africa. These projects included 1) An overview of the general practices and approaches to the use of multimedia and interactive 3D tools as learning aids, and 2) an evaluation programme in South Africa and Uganda covering a number of schools and community telecentres. The authors prepared the overview of general use of VR. The VR initiatives in Africa have resulted in the development of a VR model addressing the needs of basic hygiene in rural African communities. The main aim of the project was to use interactive visual simulations as a means of demonstrating basic hygiene to rural communities and to focus primarily on sanitation, water and the prevention of associated diseases. A second goal of the same project was to pilot and test the use of VR as a computerized interactive training method in African telecentres. The use of VR is spreading in Africa and with much success. In Botswana it is used by the centres for continuing education (CCE) for distance learning (Seleke, Mgaya and Sechaba, 2006).

INSTRUCTOR-LED TEACHING VERSUS TECHNOLOGY-BASED TEACHING

From its origins nearly 40 years ago, e-learning has built up a significant base of research in terms of the medium's instructional effectiveness in education, training and skills development. Throughout the history of computer-based education and training (CBT) – or technology-based education and training (TBT), or e-learning there have been numerous studies comparing various computer and non-computer-based modes of instruction, and judging the relative costs and benefits of these instructional systems. Comparative research has some value if educators recognize that the differences in effectiveness and efficiency are due primarily to the way in which the CBT is designed, and not to the mere fact that the training is done on a computer or on-line. But it is natural to assume that what is true in general of CBT probably will be true specifically in a particular application or setting. The general trend in the reviews quantify the differences between CBT and conventional classrooms as follows: CBT typically results in about 30% greater learning in up to 40% less time than conventional classroom-bound methods Foshay (1994), observed that effects are typically stronger for adult and young adult populations than for children. This observation departed from previous research and its implications suggest more research in the context higher education. Bangert-Drowns, Kulik and Kulik meta-analysis on adult populations

found; 1) Performance of CBT learners on examinations is an average of about 26% to 37% higher than that of traditional classroom teaching, 2) and that CBT learners need 6% to 37% less instruction time. 3) He also recorded that long-term retention is an average of 15% to 60% higher for CBT learners. 4) Attitudes towards CBT were described as ranging from no preference to a 33% preference to CBT (Bangert-Drowns, Kulik and Kulik, 1985).

On the other hand, Foshay (1994) points out that computer-assisted instruction (CAI) in the adult basic and secondary education setting continued to attract the attention of researchers attempting to examine its effects compared to traditional methods that do not include CAI. He noted that most of the reviewed studies utilized control (non-CAI) and experimental (CAI) groups, and many examined differences in literacy, numeracy, and other areas of achievement for statistical significance. A few investigations examined attitudes towards computers as well as achievement gains. Of the twelve studies meeting Foshay's criteria for review in his research, six indicated no statistically significant differences in achievement, two had mixed results, one had significance favorable to CAI, and one had significance favorable to traditional methods, and two failed to report statistical significance. Nonetheless, his summary data supported the following general observations:

1) There were higher effects at college / university levels contrary to past reviews which found that elementary levels seemed to profit most from the use of computer applications, the highest effects were found in college and adult populations. 2) The results indicated that computer applications (primarily simulations) yielded higher effects in science than in any other area, followed by mathematics, and then language and cognitive skills last. 3) Equal effects for males and females, lower and higher achievers were observed, whilst males tended to achieve slightly more than girls with computer applications, and lower ability learners did better than higher-achieving ones on applications too. These differences were found to be not statistically significant, indicating that there was no substantial difference between these groups. 4) Insignificant impact on attitude was recorded. The researcher found little evidence to support the widely held belief that good attitudes toward computers result in better attitudes toward school or the workplace and higher achievement. An exception to this trend was observed in the use of word processing, learners' consistently portrayed positive attitude toward writing.

INSTRUCTION AND STUDENT EMPOWERMENT

The instructional process commonly called teaching, involves implementing strategies designed to lead the learner to the attainment of goals. As stated earlier, the precise nature of teaching is guided by the teacher's view of the learner as a participant in the creation of his or her knowledge, or as an acquirer of information. Besides the teachers basic beliefs about learners, the role of the teacher is to empower the learner. Three models that empower learners have been identified as executive model, therapist model and the liberationist model. Each of these models either uses direct instruction or constructivist approaches to empower the learner emotionally, cognitively, socially, economically, politically and otherwise.

METHODOLOGY

Research design

A survey design was used. The researcher used a mixed method approach and examined hypothesis for effect as well as analysed qualitative data for stated assumptions.

Population and Sample Selection

From a population of 500 third year students, 134 were selected randomly to participate in the study. The population ethnic composition was 55% minority tribes, 45% majority tribes. Seventy percent of the females were of the ages between 19 and 25. Most males (78%) were between the ages of 26 and 40 years. All the students were residing either in the university dormitories or in rented homes around the university in urban areas.

Participants

The participants in the study were 134 freshmen from the University of Botswana in Gaborone. These students were enrolled in an educational psychology course

Procedure

The researcher was granted permission to use human subjects in the study. The researcher agreed to the conditions accompanying the permission and signed the agreement. Participants were informed about the study and that they were free to terminate their participation at anytime against the understanding that participation is voluntary, participants signed a consent form. After consenting participants were pre-tested and then taught using multimedia based teaching method.

Research Questions

Three research questions were formulated as follows

- 1) Will multimedia based instructions have any effect on achievement and attitude?
- 2) What is the effect of multimedia based teaching on achievement and attitude?
- 3) Will multimedia based teaching motivate the students?

Instrumentation

The following instruments were used;

Motivation questionnaire and interview guide, achievement tests and attitude survey.

Data Collection

Pre-test and post-test scores were generated for both achievement and attitude. Relevant instruments were administered to acquire scores before teaching and after teaching .Interviews, questionnaire, and observation were also used for data collection.

Data Analysis

Collected data was analysed using SPSS to calculate means and their differences

RESULTS

Results By Research Questions

Question 1

Will media based instructions have any effect on achievement and attitude?

Means from achievement and attitude scores were calculated using SPSS. Table 1 presents means and standard deviations of Pre-tests and Post-tests scores for achievement and attitude.

Descriptive Statistics

Table 1

Pre-test and Post test Mean and Standard Deviation of the Achievement and Attitude scores

Achievement

Pretest			Posttest		
N	M	SD	N	M	SD
134	63.49	5.85	134	81.45	7.59

Attitude

N	M	SD	N	M	SD
134	66.89	8.08	134	79.00	9.04

Question 2

2) What is the effect of multimedia based teaching on achievement and attitude?

The achievement scores and attitude scores of the students' for computer – simulated lessons in developmental psychology course were compared to achievement and attitude scores when

conventional laboratory work on developmental assessment was conducted. With an alpha level of .05 a two tailed t test indicated that the difference between the two means from each method were statistically significant. (M = 81 .45, SD =7.59 for simulated and (M =63.49, SD =5.85) for conventional lessons $t(132) = + 1.96, P < .05$. The results for attitude means also showed that the difference in means were significant statistically.

Question3

3) Will multimedia based teaching motivate the students?

Interview and questionnaire results:

The methodology used for this question was to survey, interview, and observe a sample of students working on a particular task given by the researcher. The students were asked questions about how they approached the learning tasks, what they thought about it, how they felt about it, why they did what they did the way they did it. Content analysis of observation and interview notes, questionnaire data produced categories of similar responses which enabled the researcher to sort prototypes into different themes and to find common patterns of internal relationships between characteristics of each category. The result was the emergence of characteristics of the learning process in the given context. The interview and questionnaire results revealed patterns of learning such as higher order processing techniques, extrinsic motivation, and majority found the method used for teaching highly motivating. Students preferred simulations and related their use to their success and the type of outcome for each lesson. Multimedia used clarified concepts and speeded their time on task. It helped them to relate the world of school with the world of work.

Observation results:

The observation by the researcher revealed the same patterns of the students' learning processes described above. The results also revealed that the students would stop working on assigned tasks until they have produced an outcome

DISCUSSION

The results of this study conform to theories of instruction and previous research on multimedia teaching discussed in the conceptual framework. The trend observed in the literature review portrayed multimedia as an effective tool for higher achievement, motivation and attitude change. Research has revealed that interactive participation by the students, multimedia software permits logical thinking, problem solving, hypothesis testing, inference and many activities of higher order thinking (Day, 2003). Computer simulations have been shown to have the potential to create complex and challenging student activities. Similarly, virtual reality has the potential to transport the minds of students into a given set of experiences (Losike –Sedimo 2003; Seleka, Mgaya, Molemisi, Sechaba, 2006). Students can feel that they are actually experiencing what they were watching on the screen. Such experience has been reported to have a potential to promote memory of content learned (Kim and Biocca, 1998). This study sought to investigate the impact of multimedia based teaching on achievement and attitude of developmental psychology students at the University of Botswana. The results show that there are numerous benefits for engaging multimedia in teaching. The students' logical thinking, problem solving, hypothesis testing and many mental activities revealed a new and higher level of mental functioning. This was in line with what (Day, 2003) observed on memory and retrieval. He detailed how multimedia improves cognitive functioning. According to the results of this study multimedia also motivates students emotionally, and socially.

CONCLUSION

It can be concluded that higher institutions of learning can empower their students by using multimedia based teaching. Research in education psychology show how methods of teaching like lecture, and others that emphasize on rote learning can dis-empower students. Day (2003) illustrates this by looking at memory and different methods or approaches to teaching. He stated that "Research shows that names, facts, figures, and textbook information seem to frustrate the learner the most. Much semantic learning proves to be irretrievable for a variety of reasons, e.g.:

the original learning was out of context, trivial, too complex, lacked relevance, or lacked sufficient sensory stimulation. Teachers requiring large amounts of recall from texts are, at best, developing self-discipline in the learners. At worst, they are creating discouraged learners who feel unnecessarily incompetent". He also pointed out that semantic memory requires strong intrinsic motivation, and its retrieval requires effective activation via such prompts as visualization, mnemonics, music, and discussion. Multimedia provides prompts, visuals, mnemonics, organizers, contexts and meaningful experience to the learner, As such it empower the whole information processing and memory activities

RECOMMENDATIONS

The Need for Fundamental Change

There is need for fundamental change in higher education teaching. There should be more movement toward embracing technology in order to empower students. Using tools like multimedia. Teaching methods can be aligned with the realities of the work world. Hence empowering the students be work-ready. The emergence and dominance of behaviourism in the mid 20th Century served to reinforce the reward and punishment emphasis that had grown to characterize most higher education teaching. However, the recent emergence of neuroscience, exciting interdisciplinary approach to non-invasive brain research, educational psychology research, is providing an ever growing wealth of major insights which are challenging many conventional educational beliefs. Most of these have been entrenched in the new models of teaching. During the 1990s, it has become apparent that multimedia teaching can be used to empower cognitive abilities of students. And that it can enhance the quality of teaching. The results of this study make it clear that significant changes are needed both in the ways that universities teach, and the ways university students learn. A great deal of action research for teaching remains to be done. Majority of studies reviewed report the effectiveness of multimedia. This suggests a paradigm shift. It is therefore recommended that educators consider more teaching research on student empowerment and multimedia

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