

# INTERNATIONAL JOURNAL OF RESEARCH IN COMPUTER APPLICATION & MANAGEMENT

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**ACTIVE LEARNING THROUGH THE INTEGRATION OF 3D VIRTUAL ENVIRONMENT**

**I.MUTHUCHAMY**  
**ASSOCIATE PROFESSOR**  
**DEPARTMENT OF EDUCATIONAL TECHNOLOGY**  
**BHARATHIDASAN UNIVERSITY**  
**TIRUCHIRAPPALLI**

**K.THIYAGU**  
**ASST. PROFESSOR**  
**DR. SIVANTHI ADITANAR COLLEGE OF EDUCATION**  
**TIRUCHENDUR**

**ABSTRACT**

Information and Communication Technologies can be important in the process of adapting to the new demands, as they have the potential to make learning resources more accessible, to allow a greater degree of individualisation and to make the learning process a more active one. This article focuses on how to design and develop the active learning environment. Active learning is the learning strategy that encourages students to interact and think by working on a problem-solving activity in order to develop their knowledge and experiences. By using 3D virtual learning environment corresponding to an instructional design methodology called ADDIE, the active learning environment is created. The proposed active learning environment consists of Simulation, Problem Solving, Game, Self-Assessment, and Animation. We believe that when students study in the active learning environment, they can fully understand the content through the learning components.

**KEYWORDS**

Active learning environment, Integration, 3D virtual environment.

**INTRODUCTION**

Active learning, as one of the learning strategies attempting to improve student learning outcomes, focuses on how to make students active in learning environment and to engage students in thinking and problem solving activities. Because students generally remember only 10 percent in traditional passive learning environment, encouraging students to interact and be active in learning environment may increase their learning outcomes. Active learning focuses on the learning experiences and promotes students learning by doing (Hamada, 2007). In addition, active learning encourages students to learn through problem solving, game, and learning activity. Moreover, activities always take place under a certain circumstance with a specific environment. Student's who work or learn a specific subject in the active learning environment can improve their learning outcomes (Uden, 2007).

Therefore, this study aims to create the active learning environment. Since using multimedia benefits students to learn complex or new ideas (Su, 2007), 3D graphic and animation is used in the development of the learning environment. In addition, 3D animation is appealing and students enjoy in using it (Elliott, 2002) and it encourages students to interact with the content which makes students active in the learning environment. In this paper, the design and development of the active learning environment with the integration of 3D virtual reality is described.

**3D VIRTUAL LEARNING ENVIRONMENT**

Virtual Reality and Virtual Learning Environment have become increasingly ambiguous terms in recent years. For example, Moore (1995) states that "Virtual reality falls into three major categories: text-based, desktop and sensory-immersive virtual reality". The term Virtual Learning Environment has begun to be used to encompass any Internet or Web based learning resource with associated discussion tools. The term 3D environment has been chosen to focus on a particular type of virtual environment that makes use of a 3D model.

Specifically, the main characteristics of a 3D environment are as follows:

- The environment is modelled using 3D vector geometry, meaning that objects are represented using x, y and z coordinates describing their shape and position in 3D space.
- The user's view of the environment is rendered dynamically according to their current position in 3D space.
- The user has the ability to move freely through the environment and their view is updated as they move.
- At least some of the objects within the environment respond to user action, for example doors might open when approached and information may be displayed when an object is clicked on.

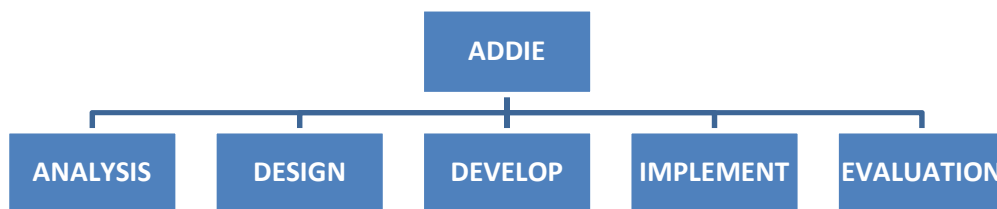
**3D ANIMATION SOFTWARE**

The main software tool that is used to create 3D animations is a package that can model, render, and animate 3D scenes. Several different packages are available to do this for all the major operating systems. Below is a short list of the most popular and capable 3D modeling, rendering, and animation packages:

- **Maya:** Used extensively to create both movies and games, Maya is especially good at modeling and animating organic-based objects.
- **3ds max:** Perhaps the most-popular modeling, rendering, and animation package for games, 3ds max includes a host of features for animating characters.
- **SoftImage XSI:** As part of the Avid line-up, SoftImage XSI includes an amazing collection of additional tools in its base package.
- **Lightwave:** Used in many television series, Light wave consists of two separate interfaces for modeling and animating.

**INSTRUCTION DESIGN OF ACTIVE LEARNING ENVIRONMENT (ALE)**

To design the active learning environment, a systematic approach that is goal-oriented, well-planned, and procedurally executed, should be applied. The instructional design methodology, called ADDIE, is used in develop the active learning environment. ADDIE is a commonly used methodology that is effective in almost every situation (Huang et al., 2005). ADDIE is an acronym derived from the 5 phases of the process which are Analysis, Design, Development, Implementation, and Evaluation. The descriptions of 5 phases are given below:



**Analysis Phase:** The analysis phase emphasizes the goal of the design. Since the active learning focuses on making students active by encouraging them to interact with the media, the designed environment should make them enjoy while they learn. Since 3D animation can make students enjoy, it is used as a tool in the active environment.

**Design Phase:** In the design phase, the active learning environment is designed to be the integrated learning environment. By using 3D animation, the active learning environment consisted of 5 components which are Simulation, Game, Assessment, Animation, and Problem Solving.

**Development Phase:** In the development phase, the content of Computer Network course is produced by using 3D technology corresponding to the components designed in the active learning environment.

**Implementation Phase:** In the implementation phase, the active learning environment is implemented as a web-based learning environment and used in the classroom. Students may take the advantage of using web-based technology which they can access the content from anywhere, at anytime.

**Evaluation Phase:** In the evaluation phase, students are asked to answer the questionnaire to evaluate if they satisfy with the learning environment.

### COMPONENTS OF ACTIVITY LEARNING ENVIRONMENT THROUGH 3D ANIMATIONS

Integration 3D animation, the active learning environment consisted of 5 components which are Simulation, Game, Assessment, Animation, and Problem Solving.



**Simulation:** The first component integrated in the active learning environment is the Simulation. Here the pupil faces scaled down approximation of real life situations. Hence, realistic practice takes place without involving any risk. By experiencing simulation, students have an opportunity to increase their thinking flexibility. Moreover, Simulation helps students easily understand something that is difficult to explain in text and reach beyond the imagination when they only read a book.

**Problem Solving:** The second component is the Problem Solving. Problem solving is always important in the learning process because it efficiently helps students develop critical thinking skill. In problem solving activity, students experience a real-life task which is important to improve their learning outcomes. 3D animation plays an important role because it makes the problem look real. As found in Hadjerrouit (1998), when students think that they are solving the real problem, they are actively involved and motivated to solve the problem.

**Game:** The third component that is integrated in the active learning environment is the Game. This Game mode may or may not be instructional, but it is recreational. Sometimes learning takes place through games. This mode is especially meant for young children. Games are good to supplement students to practical training (Mili, et al., 2008). Moreover, game can draw the student attention and may be used to encourage student interactivity. Therefore, we may use game to develop student skill.

**Animation:** The next component is the Animation. The advantage of animation is that it can better demonstrate and explain the complex concept than text (Syrjakow & Szczerbicka, 2000). In computer network course, animation may be used to demonstrate many computer network events that are difficult to explain.

**Self-Assessment:** The final component in the active learning environment is the Self-assessment. Self-assessment keeps students interactive and helps them focus on the learning content. Besides, students may evaluate their learning performance by using the self-assessment component. If they receive low score in the assessment, they do not understand the content deep enough and they need to go back and learn more.

### BENEFITS OF 3D VIRTUAL ENVIRONMENT IN AN EDUCATIONAL SETTING

Using virtual reality in schools and colleges 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/colleges 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. For example in 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 3DVLEs (also known as 3 Dimensional Virtual Learning Environments) can thus be summarized in three broad areas:

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



➤ Communication: This element 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.

Traditionally, the primary source for obtaining information would be the encyclopaedia generally available in the library. But now, we access to interactive 3D animation multimedia, the student would collect various textual materials about the particular topic from sources on a CD-ROM. With a multimedia approach, the student could also access Web sites on the Internet to get more information. The student could then add film clips on the particular topic in their natural habitat (all may be from the same CD-ROM) and blend them into a report. Then by adding titles and credits, the student now has a new and original way of communicating his/her own individual perspective.

Besides student use, teachers should find 3D animation multimedia of great use in delivering their lessons. For example, a history teacher could use a multimedia CD to create a lecture on the non-violence movement by using film clippings and audio tapes on Mahatma Gandhi or Martin Luther King, also by incorporating other audio visual information with text to make the subject come alive. All this material would be available on a videodisc. Similarly, a university professor might use a 3D animation multimedia CD to prepare or to update information or to teach so as to enliven and also add insight to his/her teaching, thereby improving the quality of the course. The uses of 3D animation multimedia need not be seen as a tool for classrooms only.

### DISADVANTAGES OF 3D VIRTUAL ENVIRONMENT

3D virtual animation multimedia requires high-end computer systems. Sound, images, animation, and especially video, constitute large amounts of data, which slow down, or may not even fit in a low-end computer. Unlike simple text files created in word processing, 3D animation multimedia packages require good quality computers. A major disadvantage of writing multimedia courseware is that it may not be accessible to a large section of its intended users if they do not have access to multimedia-capable machines. For this reason, courseware developers should think very carefully about the type of multimedia elements that need to be incorporated into applications and include only those that have significant value.

3D animation multimedia has other weaknesses too. While proponents of this new technology are very enthusiastic about its potential, they often leave the financial and technical issues unattended. Developments in 3D animation multimedia are very high and the process of developing effective multimedia takes time. Time spent on developing the 3D animation multimedia package requires money so that the true cost of an interactive programme mounts with each delay. Further, if the prerequisites for using multimedia include to computers with related software, the user must possess a minimum level of computer literacy in order to exploit the capabilities of this medium for learning. And finally, of the educator who is unfamiliar with the production and design of multimedia courseware or packages can be equally complicating.

### CONCLUSION

The future development of this active learning environment is to create the collaboration component which students can not only interact with the media but also interact with their friends. Therefore, the collaboration component will also help students improve their learning outcomes. The objective of the study is to advocate the use of 3D-VLEs and virtual objects in schools and colleges 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 and colleges. This paper has discussed the potential educational applications of 3D environments. Although the potential of 3D environments as learning resources is clear, there is still a great deal of work to be carried out before designers can be sure about where 3D environments should appropriately be used and about how best to design them.

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