



Mechanism of Virtual Learning Environment System

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Abstract. Virtual learning environment refers to an artificial environment built with information technology to support student learning, which consists of the physical environment. The design of the virtual learning environment should be enhanced to make it self-monitoring and regulatory functions and to strengthen its anti-interference ability against external influences; Aiming at the performance problems such as the display delay and the stiff physical movement caused by the scene rendering of the existing three-dimensional virtual learning environment, the cloud computing is introduced into the construction of a three-dimensional virtual learning environment. The application and development of virtual reality technology in education have enriched the forms of teaching and learning in the existing education system.

Keywords: 3D virtual learning environment · Cloud computing
Virtual reality technology

1 Introduction

Virtual Learning Environments is a rapidly developing field of research in recent years. It refers to a computer-based standardized learning system that is mainly used to support the content delivery of online learning and promote the interaction between online teachers and students. It is an innovative model of information services, build knowledge base and provide professional users with a platform for information exchange through online learning resources. What's more, it not only play the leading role of teachers on guiding, enlightening and monitoring the teaching process, but also fully embody the initiative, enthusiasm and creativity of students as learning subjects by combining the advantages of traditional learning methods with the advantages of digital or networked learning. Virtual learning environment refers to an artificial environment built with information technology to support student learning, which consists of the physical environment, social environment and normative environment. This kind of learning method is learner-centered and provides learners with interactive real-time courses that meet individual needs and characteristics which are designed with learners' timely feedback and learning outcomes. This kind of information-based learning environment, which is supported by the network and can be used for teaching management and shared learning resources and various learning tools, is called virtual Learning Environments [1].

2 Virtual Learning Environment

Virtual Learning is an online learning method based on constructivism learning theory and network and multimedia. Constructivism of learning theory hold the view that the experience of the environment is necessary for learners to build knowledge. Learning is the process of learner's actively construct internal psychological representation, which includes not only structural knowledge, but also includes a large number of unstructured experiences. Situational, collaborative, conversational and constructivist constructions are the four major elements of constructivist learning environment.

The aim of virtual learning environment is to support or manage all aspects of the network environment of teaching and learning, including all kinds of online interactions between learners and mentors (including online learning). There are also other people define it as: the virtual learning environment is a server-side software designed to manage all aspects of learning (delivering learning materials, student tracking, appraisal, student communications, etc.). VLE is a kind of virtual learning community that supports virtual learning. It can be generally understood as a virtual environment for reproducing the real world.

3 Definition of the Concept of Virtual Learning Environment

However, the learning environment is not a natural pile, it's systematically designed by designers, including teachers, students and other technologies (including hard and soft technologies). The crystallization of technical activities materialized form artifact, Learning environment is naturally "artifact". What is learning environment? The current concept of the learning environment has not been clearly defined. However, in terms of various definitions, there are mainly two explanations for it. One is to emphasize that learning environment is a static concept. This understanding holds that the learning environment is the material environment of individual learning. Another is that the learning environment is a dynamic concept, including the material and non-material conditions and conditions as well as its teaching mode and teaching strategies. Such as learning resources, learning atmosphere, learner characteristics and so on. In fact, we think that the learning environment is a dynamic concept, including all aspects of learning. This is not only because the environment is also related to the technical learning environment and the emotional learning environment [2], but also takes the wide range covered by "artifacts" in distributed cognitive theory into account. The learning environment is considered as a concrete concept of "artifact" should have the same category as "artifact". Therefore, the elements of the learning environment are not only material conditions, but also non-material conditions such as teaching modes and tactics [3].

4 Learning Model Framework

As shown in Fig. 1, the learning model framework is divided into four parts:

1. Learners. Individual learners acquire learning resources from a three-dimensional virtual learning environment by initiating learning activities and gain knowledge through the construction of meaning. In addition to these, multiple learners can also communicate with other learners. The user interface provides technical support for learners' activities.
2. Teachers. Teachers are the providers of teaching resources and the organizers of curriculum design. They design teaching objectives and teaching content through the analysis of teaching tasks, and design a reasonable curriculum evaluation criteria based on the analysis of teaching objects. The curriculum design interface helps teachers design a three-dimensional learning environment in a visual way and interacts with teachers in real time to modify and refine the design of a three-dimensional learning environment. Learners and teachers form two major groups of users for learning.
3. Three-dimensional virtual learning environment. Three-dimensional virtual learning environment is a rich knowledge base, reflecting the teacher or curriculum ideas of textbook. Each environment is a three-dimensional space context learning environment, the relative relationship between the shape and the position of each teaching model is expressed in the form of a three-dimensional space vector to support real-time roaming and other functions. The environment provides a wealth of theoretical knowledge of learning and uses the actual teaching material design learning module unit for the object.

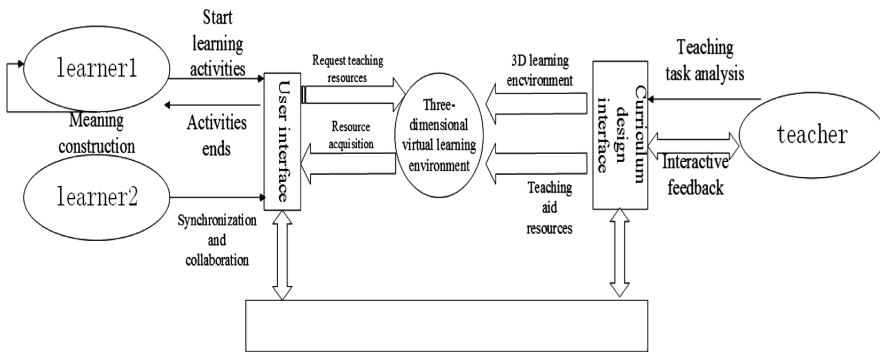


Fig. 1. Learning model framework

5 Interactive Teaching in Three-Dimensional Virtual Learning Environment

5.1 Teaching and Learning Supported by Virtual Reality Technology

Virtual Reality (VR) is a three-dimensional virtual environment gradually rises at the end of the 20th century and is computer-generated, but also a comprehensive information technology. It can leverage a variety of sensor devices to help users interact directly with the environment and “put” users into the virtual environment [4]. The application of virtual reality technology in teaching, the formation of the “virtual reality teaching environment” is an important part of the information-based teaching model in recent years. It is characterized by immersion, interest, convenience, richness, creativity and spanning time and space. In terms of teaching content presentation, teaching process, teaching and learning support and interaction, etc., it have played a positive role in promoting teaching effectiveness and teaching quality. For example, in a lifelike virtual history lesson, learners can be involved as part of a history, feeling important historical events and complex relationships with people. Teachers and designers can create unique cross-temporal teaching environment based on teaching strategies to make up for the defects that the real world situation changes less and time and space cannot be reversed(Such as reproduction of history, simulation of plant and animal growth process, show the structure of complex systems, vacuum physics experiments, etc.), greatly enhances the learning interest of learners in the learning process and provides strong support for teaching modes such as contextualization teaching, interactive teaching and cooperative learning.

5.2 Virtual Teacher Interaction in 3D Environment

Virtual Learning Environment is a tool that integrates all the features required for online learning. Virtual Learning Environment can be used as a basic tool for providing content and resources to school ID virtual learners, as well as for widely-distanced learners. The main components of a VLE include lesson planning (breaking down lessons into sections that can be assigned and evaluated), online support for teachers and learners, e-mailing (e-mail, discussion groups, chat rooms, web publishing) and Internet link to external course resources. In general, the user of the virtual learning environment has a teacher ID or learner ID. Teachers can see what learners see, but teachers have additional user rights such as creating or modifying contents of courses and tracking learner’s performance. The design of ecological virtual learning environment mainly completes two tasks: First, it designs the virtual learning environment from a macro perspective, optimizes its overall function and realizes its self-organization; Second, it specifically design the various sub-environments from the microscopic point of view to optimize their internal structure and enhance learners’ e-learning adaptability. And finally reach the goals of optimizing the virtual learning environment and improving learners’ learning efficiency and effectiveness through these two aspects of design.

Overall, the ecological virtual learning environment should have the function of self-regulation, self-improvement and self-development. To realize its self-organization,

a core monitoring and regulation mechanism needed. The establishment of this monitoring and regulation mechanism can be considered from two aspects of “technical support” and “human support”: one is intelligent technical support for the virtual learning system and another is monitoring and regulation functions of aid scholars or student team. Combined with the basic composition and function of the ecological virtual learning environment and the analysis of the interaction between its constituent factors and factors, following the basic principles of ecology, we can design an ecological virtual learning environment structure and function model. As shown in Fig. 2.

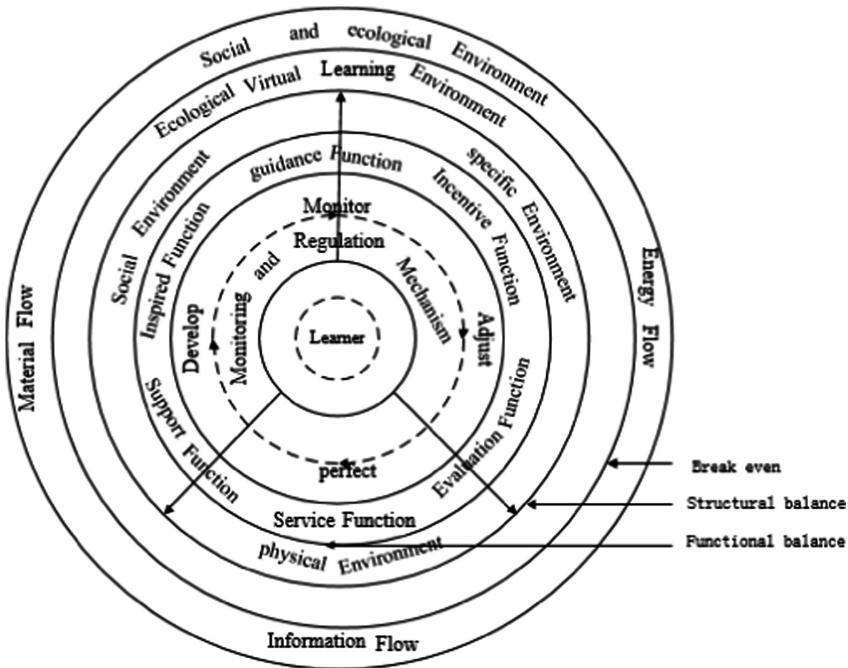


Fig. 2. Ecological virtual learning environment structure and function model

Ecological virtual learning environment is a subsystem of the social ecological environment, open to it and exchange material, energy and information with it constantly, and they keep balance between information, material and energy exchange. The physical environment, social environment and normative environment are interdependent and based on each other. The overall function of the virtual learning environment depends on the balance of the three types of environmental structures and the homogeneity of overall functions. Based on the integration of the three types of environment, the virtual learning environment should have the basic functions of supporting learning, service learning, guiding learning, enlightening learning, motivational learning, evaluation learning and should maintain the coordination of overall functions. The core mechanism of ensuring the self-organizing function is the learner-centered monitoring and regulation mechanism. Through this mechanism, the

basic functions of the virtual learning environment can be effectively supervised and regulated, and the dynamic operation of “monitoring, regulation, perfection and development” can be realized. Timely identify problems and solve them, then improve and perfect the system, and ultimately achieve the continuous development of virtual learning environment.

6 Digital Cloud Data Library and Virtual Learning Environment Integration

The digital cloud information library covers different types of information resources in various disciplines, including online bibliographic databases, full - text electronic journals database, electronic books, audio and video materials, online CD - ROMs and various library related network information. The library provides teachers and students with a variety of academic information resources to support school education, learning and research and to provide them with quality service. The integration of digital cloud data library and virtual learning environment is conducive to the full exploitation and utilization of digital resources and carry out online teaching activities through the support of digital cloud data library’s strong technical. Modern university library bear the important task of information literacy education in addition to the traditional service functions. As the center of academic information resources, university libraries can not only provide simple information retrieval services, but also should actively integrate into teachers ‘teaching and students’ learning process to provide direct information resources services for teaching and research activities in schools. Information literacy education emphasizes the ability of students to efficiently acquire, use and properly evaluate information using computers and information technology. The integration of digital cloud data library and virtual learning environment provides an integrated open learning environment for information acquisition and utilization, which provides a way to realize the development of various learning methods and improvement of information literacy.

In the integration system of the digital cloud data library and the virtual learning environment, the digital resources in the library can support users to learn independently and meet the information needs of users’ information sharing, quick access and timely updating. Realizing the integration of library digital resources and services with VLE can play an active role in promoting teachers’ teaching. Students or teachers can log in to VLE only once, and they can easily access teaching resources and digital resources of libraries to achieve integrated learning. For example, in the virtual learning environment, curriculum teachers can preset part of the reference learning resources, students can not only use the fixed learning resources in the system, but can also click on the need to get the latest digital resources in the digital cloud information library (e-textbooks, e-journals, etc.) in the process of virtual learning. The final result of the consolidation is to build a fully integrated online learning environment that seamlessly links and interoperates with digital cloud data libraries and virtual learning environments and to provide personalized, flexible services through one-stop access. System integration diagram shown in Fig. 3:

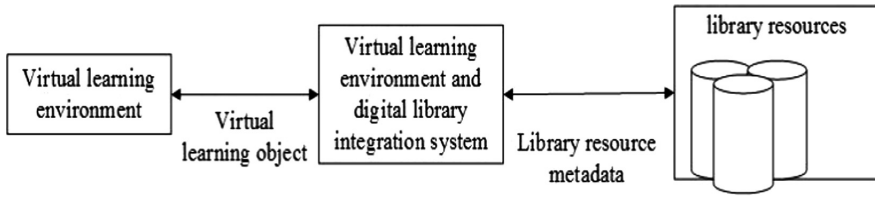


Fig. 3. System integration diagram

7 Conclusion

Virtual learning environment is an important place for the current and future students to learn. It is an effective way to design, develop and maintain the ecological development of virtual learning environment by analyzing the existing problems in the virtual learning environment from the perspective of ecology and exploring solutions to the problems based on the ideas, principles and methods of ecology. There is “ecological balance” in the ecological virtual learning environment, and also faces the “ecological crisis” triggered by human factors and external influences. If not promptly dealt with these issues it will affect the coordinated operation of the entire system and function. Therefore, on the one hand, the design of the virtual learning environment should be enhanced to make it self-monitoring and regulatory functions and to strengthen its anti-interference ability against external influences; on the other hand, the structure and function of various sub-environments should be optimized to make the internal sub-environment form a stable and unified system with the function of self-protection and defense, finally realize the ecological balance of the virtual learning environment and form a healthy virtual learning ecosystem.

References

1. Li, G. (ed.): Moodle Curriculum Design, p. 251. Shanghai Education Press, Shanghai (2007)
2. Li, Q.: On learning environment design. *Prim. Second. Educ.* **7**, 8–10 (2004)
3. Wu, F.: Web-based learning environment design. *Electrochem. Educ. Res.* (4), 33–52 (2000)
4. Li, X.: Virtual reality and its educational applications, no. 4, pp. 28–32. Science Press, Beijing (2017)