

*Original Paper*

# Exploration on Smart Classroom Construction Based on Educational Ecology

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## **Abstract**

*At present, multimedia classroom construction in colleges and universities faces the problems such as no unified planning, repeated or isolated construction, no teacher/student participation, no sufficient consideration of social needs, unchanged construction environment, and no support for diversified teaching activities. According to the viewpoint of system, dynamics and balance of educational ecology, smart classroom construction in colleges and universities should be completed based on unified planning, step-by-step construction, full consideration of the needs of teachers/students/society, and diversified classroom environment. Only then, the smart ecological classrooms can meet the demands of teachers/students/society, strongly support teaching and learning activities, and train innovative and research talents for the society.*

## **Keywords**

*Educational Ecology, Smart Classroom, Smart Ecological Classroom*

## **1. Introduction**

Students' learning activities deeply rely on the learning environment, which promotes the construction of learning environment always as a focus for research and practice. In the late 1990s, a large scale of construction for education information infrastructures was carried in China (Wang, 2011). After over a decade, many schools have been fully equipped with multimedia classrooms, and the traditional “blackboard+chalk” classrooms have been transferred to “computer+projector” multimedia classrooms. However, teachers and students have raised more requirements on the learning environment in recent

years, which further highlights the disadvantages of traditional classrooms that cannot meet the requirements of teaching and learning activities in the information era. Meanwhile, the emergence and development of the technologies such as IoT, big data, cloud computing and AI also bring opportunities to the information environment in colleges and universities, especially to the information-based teaching environment. Therefore, it is urgent to reform the traditional teaching environment and construct an information-based environment that can fully support the teaching and learning activities. The introduction of educational ecology into the smart classroom construction and exploring the construction of smart ecological classrooms are aimed to solve the problems such as isolated construction, repeated construction, low use efficiency of classroom, unsatisfactory use effect, etc., and provide some instructions for current smart classroom construction, thus supporting the deep integration of IT and education.

## **2. Difficulties Faced by Traditional Multimedia Classrooms in Colleges and Universities**

As the major environment of teaching, multimedia classrooms are always focused on by the constructors of colleges and universities. Besides financial support, the corresponding system guarantee for classroom management & use, and operation & maintenance with lots of manpower and resources are also necessary. However, the use effect of the multimedia classrooms is unsatisfactory. The constructors are not satisfied with the input-output ratio, and the more severe issue is that the teachers and students think the classrooms cannot meet the teaching and learning demands. By deep analysis of the multimedia classroom construction, the following reasons are found:

### *2.1 No Unified Planning, Repeated Construction and Isolated Construction*

Due to the construction concept, investment, historical problems and many other reasons, there is always no unified planning for the multimedia classroom construction in colleges and universities, and the construction is usually completed separately. (a) Separate construction time - some classrooms are constructed when the fund is sufficient, while some are delayed when the fund is insufficient. (b) Separate construction system - there is usually no unified planning for multimedia classroom construction at different time, with a certain system used this time, while another system used next time, which caused isolation between the classrooms. (c) Separate construction site - the formerly constructed classrooms are scattered everywhere in the school, or even the different campuses, which caused inconvenient use and management. In addition, some multimedia classroom construction in some colleges and universities is led by the departments, and the departments cannot effectively communicate or coordinate with each other due to various reasons, thus causing repeated construction. All the above aspects cause the severe inconvenience during management of multimedia classrooms, and thus result in low use efficiency and poor use effect.

### *2.2 No Teacher/Student Participation, and no Sufficient Consideration of Social Needs*

Former multimedia classroom construction is mostly planned by the office of academic affairs or modern education technology center, without the participation of teachers and students who are the

actual users, or the sufficient consideration of the social needs. Usually at the beginning of the construction, the constructors prepare the proposal based on their experience and the fund amount, without considering any demand of teachers and students, or any social demand for talent training, which causes the failure of the multimedia classrooms to effectively meet the requirements of teachers and students as well as the society.

### *2.3 Unchanged Classroom Environment, and no Support to Diversified Teaching Activities*

There are usually “computer+projector” classrooms in colleges and universities, which are actually used as traditional “blackboard+chalk” classrooms during practical teaching activities, only supporting the presentation by teachers and even transferring the traditional “human teaching” into “machine teaching”. However, more attention is paid to interaction between teachers and students and students’ experience during current teaching, but the variety of the facilities in the existing multimedia classrooms is not enough, lacking interactive and experiential teaching equipment. In addition, the “seedling-type” classroom layout (Wu, 1998) brings distance between teachers and students and between students themselves, which negatively impacts the interactive and experiential teaching activities, and can neither support the discussion-based and observation-based teaching activities.

## **3. Smart Classroom Construction Based on Educational Ecology**

### *3.1 Basic Viewpoints of Educational Ecology*

The word “Ecology (Eco-)” comes from the ancient Greek word “oikos”, meaning “house” or “residence place”, which usually refers to the survival and development status of creatures under a certain natural environment, and the relationship between them as well as between them and the environment. Ecology (Note 1) is initially the science that studies all the relationships between the animals and inorganic/organic environment. Later, the basic principles of ecology were gradually applied in social science, including education (Amos, 1950). In 1932, US educator Waller proposed the “classroom ecology” concept in *The Sociology of Teaching*. In 1996, British Scholar Anhby raised the “ecology of higher education” in the research on comparison between British, Indian and African universities (Willard, 1932). The “educational ecology” concept was firstly mentioned in the book *Public Education* in 1976 by Lawrence Craven, Director of Teachers College, Columbia University (Anhby, 1966). In order to solve the problems in US education during that time, Craven stated that the schools should not be fully responsible for the education failure, and the factors outside of school need to be considered. He applied the ecological method in education research, re-examined the relationship between education institutions and between those institutions and the whole society, and raised the “educational ecology” thesis. Educational ecology intends to find the interaction and interactive influence in the educational ecology system from the perspective of ecology, explore education development rules, and thus realize the balance of educational ecology system (Tan, 2006). The viewpoint of system, dynamics and balance of educational ecology can provide some instructions to the smart classroom construction in colleges and universities (Ren & Bai, 1992).

### 3.2 Smart Ecological Classroom Construction

As a high-end pattern of multimedia and network classroom, smart classroom is the typical materialization of smart study environment, which can optimize the teaching presentation, make resources be easier obtained and promote class interaction, and has the functions of situation awareness and environment management. <sup>[9]</sup> Based on the educational ecology thesis and smart classroom construction practice, the author thinks that the smart ecological classrooms can meet the demands of teachers, students and the society only when the following aspects are considered during construction (Huang, Hu, Yang & Xiao, 2020).

#### 3.2.1 Unified Planning and Step-by-step Construction

Smart classroom construction in colleges and universities is an organic part of smart campus construction. Thus, similar with the smart campus, smart classroom construction should also be completed based on unified planning and step-by-step implementation. As per the educational ecology, the smart classroom should be systematically and wholly constructed by one department rather than several departments, and the whole construction should be considered based on the school's situation and long-term development, so as to guarantee interaction and communication between the classrooms as well as unified management. Meanwhile, smart classroom construction is a dynamic process, thus the plan should be adjusted from time to time according to the actual situation, so as to better meet the demands of the times, teachers and students.

#### 3.2.2 Full Consideration of the Demands of Teachers, Students and the Society

According to the educational ecology, any education problem can be deemed as an ecological system. Smart classrooms of colleges and universities are an ecological system performing material circulation, energy flow and information transfer with external ecological environment. All related factors should be considered during the construction, such as demands of teachers, students and the society, with the demands of the first two as the focus of the construction (Liu, 2015). In the initial stage, the demands of teachers and students should be fully investigated through questionnaire, discussion, etc., so as to enable the classrooms to be actually used by them for teaching and learning and avoid the unavailability of the so-called high-end facilities. In addition, the demands of the society also need to be considered, such as technology development status, and social requirements on school talent training.

#### 3.2.3 Diversified Classroom Environment

The colleges and universities are always firstly considered during the education reform due to the continuous change of social requirements on talents, which requires diversified teaching from the teachers. Such teaching activities require diversified classroom environment, including both diversified facilities and layouts. (1) Diversified facilities refer to interactive electronic whiteboard, intelligent transponder, recording equipment, etc. that support local or remote interactive and experiential teaching. (2) Diversified layouts refer to seedling-type layout, U-shaped discussion-type layout, round table layout, movable interactive layout, etc. Such layouts (Note 2) enable the real implementation of

heuristic teaching, interactive teaching, experiential teaching, cooperative teaching and other concepts in the teaching process through the change of classroom pattern (Note 3).

#### 4. Conclusion

Smart classroom construction in colleges and universities can be deemed as a dynamic and balanced integrity that is interdependent and interactive with the external environment. Thus, the construction should be completed based on unified planning, step-by-step construction, full consideration of the needs of teachers/students/society, and diversified classroom environment (Ren & Bai, 1992). Only then, the smart ecological classrooms can meet the demands of teachers, students and the society, strongly support teaching and learning activities, and train innovative and research talents for the society (Li, Zhao & Chen, 2016).

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#### Notes

Note 1. Ecology [EB/OL]. <http://baike.baidu.com/view/10382.htm?fr=aladdin>

Note 2. SJTU. *SJTU Smart Classroom* [EB/OL]. <https://etc.sjtu.edu.cn/classroom/index.html>, 2017.

Note 3. *Construction of Facilities in Colleges and Universities. 101 Smart Classrooms in HUST are on display!* [EB/OL]. [https://mp.weixin.qq.com/s/wpJ9BD5nEjTelwh\\_SopktQ](https://mp.weixin.qq.com/s/wpJ9BD5nEjTelwh_SopktQ), 2020.