The Functions of Smart Classroom in Smart Learning Age

Ronghuai Huang[a*], Yongbin Hu[b] ,Junfeng Yang[c]& Guangde Xiao[d]
[a]*R&D Center for Knowledge Engineering, Beijing Normal University, China*
[b]*R&D Center for Knowledge Engineering, Beijing Normal University, China*
[c]*R&D Center for Knowledge Engineering, Beijing Normal University, China*
[d]*R&D Center for Knowledge Engineering, Beijing Normal University, China*
* huangrh@bnu.edu.cn

Abstract: Reconstructing classroom and creating new type of classroom for students and teachers is an inevitable trend, and integrating sensor technology, artificial intelligence, rich media technology and communication technology into classroom is an inevitable choice. We propose a SMART model of smart classroom which characterized by showing, manageable, accessible, interactive and testing. We analyze the characteristics of three typical smart classrooms: "high definition" smart classroom, "deep experience" smart classroom and "rich interactivity" Smart classroom.

Keywords: smart learning environment; smart classroom; SMART model

1. Instruction

With the development of ICT in education in China, the majority of the teachers in class transform from the original "blackboard + chalk" teaching mode to the "computer + projection" teaching mode. But the teaching reform only remain in teaching-show status, the current teaching mode has not changed (Huang, 2011). If we consider from the classroom environment perspective, we could say there are some main predicaments in the nowaday's classroom environment.

First, the serialized presentations hinder students' understanding of the content. Second, learning material is intermittent displayed, which separates the backward and forward linkages of the teaching content. Third, multimedia console is fixed In the front of the classroom, which limits the teachers' performance. Fourth, a unified and fixed seating layout, is not conducive to a variety of teaching activities. Fifth, the equipment of the net classroom can't meet the needs of the students to explore.Sixth, a certain gap exits between the electronic whiteboard teaching application and the expected deeply interactive teaching.

The classroom is a physical environment which should provide support for the implementation of the curriculum. In the information age, new kind of classroom should be effective to present teaching contents, convenient to acquire learning resources, able to promote classroom interaction, with contextual awareness and environmental management, which may be called smat classroom.

2. Concept Model of Smart Classroom

A smart classroom relates to the optimization of teaching content presentation, convenient access of learning resources, deeply interactivity of teaching and learning, contextual

awareness and detection, classroom layout and management etc.. It may be summarized as Showing, Manageable, Accessible, Real-time Interactive and Testing, which nicknams "S.M.A.R.T". The five dimensions just embody the wisdom of a smart classroom feature, which can be referred to as "SMART" concept model, as shown in figure 1.

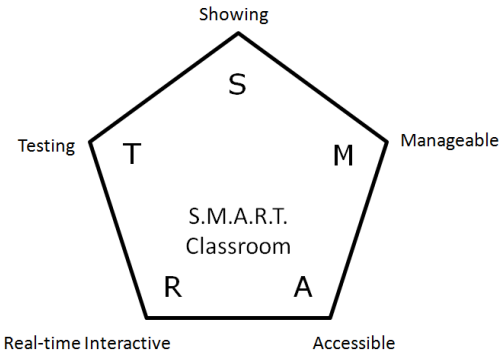

Figure 1 concept model smart classroom

2.1 Showing

Showing dimension represents teaching information presentation capabilities of the classroom, which requires not only showing the contents can be clearly visible, but also showing content suitable for learners 'cognitive characteristics, to the learning process to enhance the learners' learning materialsunderstanding and processing. The existing research shows that: multi-screen display can reduce the cognitive load and improve learners' achievement, Colvin (2007) pointed out that the multi-screen better than single-screen in the improvement of learners' achievements; Chen Changsheng (2011) developed a theory of dual channel dual teaching platform, and put forward a twin-track teaching mode. Displaying the teaching content by multiple-screen, smart classroom can effectively overcome students' thinking discontinuity problem which causes by the single screen. The Smart classroom can be equipped with light sensors to judge the intensity of the ambient light intelligently, even can automatically control the curtains opening and closing and opening and the intensity of lighting, which maintaiing the brightness of the screen is suitable.

2.2 Manageable

Manageable dimension represents diverse layouts and the convenience of management of the Smart classroom. The equipment, systems, resources of Smart classroom should be easy managed, including layout of the classroom management, equipment management, physical environment management, electrical safety management, network management etc. In terms of seating arrangement, rows are the typical environment for a teacher-centered classroom and/or individual learning. However, this layout severely limits the interaction between students, resulting in the students' passive learning (Su Hong, 2003). The layout of the Smart classroom should be flexible, diverse, supporting a variety of teaching and learning activities, give full consideration to the placement of various devices to improve the space utilization efficiency, the design of desks and chairs should consider the material, structure, color and other factors. Furthermore, the desks and chairs must be applied ergonomic principles consistent with adolescents' body scale (Sun Shanshan, 2011).

2.3 Accessible

Accessible dimension represents convenience of resources acquisition and equipment access in the Smart classroom, which involves resource selection, content distribution and access speed. Chen Shijian (2003) pointed out that the rich network of learning resources is conducive to independent learning, interactive cooperative learning, personalized learning, the implementation of educational socialization. In the selection of resources, the Smart classroom should be able to provide a wealth of teaching resources to support teaching and learning activities, computers, tablet PCs, smart phones, PDAs, wireless projectors, interactive whiteboards and other equipment can be flexible to facilitate access and supportinteract with the resource in the teaching process, the operation and re-generated. In content distribution, curriculum, lesson plans, teaching content, teaching tools should be able to facilitate distributed learning terminal. The speed of resource access and terminal accesss should not affect the teaching and learning activities.

2.4 Real-time Interactive

Real-time Interactive dimension represents the ability to support the teaching interaction and human-computer interaction of the Smart classroom, whichi involves convenient operation, smooth interaction and interactive tracking. In convenient operation, the Smart classroom should be able to support the man-machine natural interaction, interactive equipment and interface with a simple, full-featured, clear navigation, consistent with the operating habits and characteristics, touch, visual and voice interaction can improve the mouseman-machine interactive experience of the keyboard, the interaction tends to be more natural. In smooth interaction, the Smart classroom hardware should meet the interactive needs of the multi-terminal, and a large amount of data. In interactive tracking, smart classroom shoud record and store the basic data among teacher student and computer, so as to support the decision-making of teachers and students' self-assessment. The Horizon Report predicts that learning analysis technology will be popularized in 4-5 years (Johnson, 2011). The smart classroom should support teaching interaction comprehensively. Keep abreast of the topic of student interaction, students' difficulties and problems and to guide or help them would be smart classrooms’ important function. Record interactive process and timely analyze the data obtained is the main way to achieve this function.

2.5 Testing

Testing dimension represents perception of the physical environment and learning behavior in Smart classroom. The physical environment factors,including air, temperature, light, sound, color, odor etc, affect the physical and mental activities of teachers and students (Li Bingde, 1991). With he development and popularization of sensor technology, a variety of sensors can be used in Smart classroom to detect indoor noise, light, temperature, odor and other parameters timely, , automatically adjusts the blinds, lamps, air conditioning, fresh air system equipment in the light of default ideal parameters,which maintain sound, light, temperature, air regulator suitable for students' physical and mental health status in the classroom.

3. Three Typical Smart Classroom

According to ‘SMART’ model, Managable and Testing dimensions are the common requirements of the smart classroom. Managable dimension requires Smart classroom

should be achieved for all equipment, system, resource monitoring and management. Testing dimension includes two aspects. On the one hand, by monitoring the indoor air, temperature, light, sound, color, odor and other factors, Testing become reasonable. On the other hand, teachers can use classroom recording and broadcasting system records the teaching process and the use portable computing devices to record interactive process and to monitor learning outcomes, thus completing the tracking of the learning process.

The tradictional classroom, originally supports imparting knowledge, unable to meet the actual needs of the classroom teaching nowdays. The redesign of traditional classrooms, multimedia classroom and networked classrooms is urgently needed.

We propose three types of smart classroom, whici is high definition smart classroom, deep experience smart classroom and rich interactivity smart classroom.

"High definition" smart classroom is mainly used in transfer-accept teaching mode, the background of the teaching model is directly related to meaningful to accept learning theory which proposed by David Ausubel's, a well-known American educational psychologist. The theory suggests that the learning of students happens by acceptance learning, rather than discovery learning. In other words, the students master the knowledge and experience of their predecessors.by teachers' instruction and presentation. However, this acceptance learning should be meaningful rather than mechanical. "Deep experience" smart classroom is is mainly used in inquiry teaching mode. The mode is under the guidance of teachers in the teaching process, students explore co-operation to autonomy, characterized by learning teaching content knowledge, independent learning, group cooperation and exchange in-depth inquiry and, in order to achieve the requirements of a teaching model curriculum standards on cognitive goals and emotional goals.

Strong interaction smart classroom is mainly used in the collaborative learning mode. The group's collaborative learning is a group activities as the main teaching activities, mutual co-operation between the students, the interaction of teaching and learning activities which the power source .

4. Conclusion

The study of smart classroom equipment and its application model is an inevitable requirement for the development of educational information to a higher stage. This study if of great significant for the promotion of the digital school construction, elimination of the difficulties faced by the multi-media teaching, enhancing of students' innovative ability. The ultimate objective of the study is to change learning and teaching methods in the information age.

References

[1] Huang Ronghuai (2011). ICT in Education Promotes Current Educational Change: Challenges and Opportunities [J]. Chinese educational technology, (1):36-40.

[2] Colvin, J., Tobler, N., & Anderson, J.A. (2007). Productivity and multi-screen computer displays. Rocky Mountain Communication Review, 2(1), 31–53.

[3] Chen Changsheng, Liu Sannvya, Wang Hong,&Chen Zengzhao (2011). Dual track teaching modal based on dual coding theory [J]. China Education Info, (3):52-55.

[4] Su Hong (2003). Basic education curriculum reform and school cultural reconstruction [J]. Curriculum, Teaching Material and Method, (7):10-14.

[5] Sun Shanshan (2011). On school desks and chairs design [J]. Art Design, (8):134-135.

[6] Chen Shijian, &Wang Chong (2003). The meaning, function and type of e-learning resources in the internet [J]. E-education Research, (10):50-54.

[7] Johnson, L., S. Adams and K. Haywood (2011). The NMC Horizon Report: 2011 K[EB/OL].

[2012-2-20] http://wp.nmc.org/horizon2011/.
[8] Li Bingde (1991).Theory of instruction [M]. Beijing: People's Education Press:266-267.