

# Higher Education E-Learning Courseware: Pedagogical-Based Design and Development

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## Abstract

*In response to the e-learning challenge, it is important to design and develop efficient and effective e-learning courseware with pedagogical based in an e learning setting. Presently, eLearning has been integrated into not only an online education, but also in blended and web-facilitated courses which contain less degree of online instructions and activities. The common elements for e-learning system are: 1) Learning Management system for administration purpose; 2) courseware for instructional content or as substitutes to lecture in traditional classroom; 3) interactive learning activity through online communication and interaction and; 4) evaluation to testing and grading learners. (Monsakul, 2008; Bonk & Graham, 2006; Monsakul, 2006; SLOAN, 2005; Waterhouse, 2005).*

*The designing and development of the effective e-learning courseware for higher education consist of two major phases. First, the designing phase involves three main theory of e-learning, including behaviorism, cognitivism, and constructivism. It also involves pedagogical work of Chickering and Gamson's seven principles for good practice in higher education and Gagne's nine events of instructional design which will be discussed in this paper (Monsakul, 2007; Davidson-Shivers & Rasmussen, 2006; Waterhouse, 2005).*

*Second, in the development phase, a courseware is considered as an e-lecture, or virtual lecture, which is alternative to traditional lectures in eLearning context. It can be classified as, first, a text-based*

*format, and second, a multimedia presentation format containing structured and manageable information. This type of courseware can be further developed by various courseware development tools. The existing courseware development tools that gain popularity in higher education can be grouped into three types, first, an advanced tool producing multimedia courseware, such as Macromedia Flash program. Second is a basic tool that even subject matter expert can develop courseware of their own. Such tools are, for example, Macromedia Breeze program, MS Producer program, and Adobe Captivate program. Third is a streaming technological tool that usually comes with hardware, such as AcuLearn program and ECHO360 program.*

*The purpose of this paper is to, first, present the model of courseware design based on the learning theories and pedagogy affected. Second, it will present courseware development process and will review existing courseware development tools and their effectiveness and constraint to give higher educational institution an overview of each tool along with important issues for future development of e-learning courseware for the institution. The paper will be based on the review of literature, and personal experiences of the author as an instructional design, a lecturer of educational technology program, who has experiences in the addressed courseware development tools. Information on the theoretical based of e-learning and pedagogical works are presented to assist an effective design of e-learning courseware in higher education teaching and learning.*

### Designing and development of the effective e-learning courseware

In higher education context, there consists of two major phases. First, the designing phase involves three main theory of e-learning, including behaviorism, cognitivism, and constructivism. It also involves pedagogical work of Chickering and Gamson's seven principles for good practice in higher education which will be discussed in this paper (Monsakul, 2007; Davidson-Shivers & Rasmussen, 2006; Waterhouse, 2005).

#### E-Learning: the core elements

In general, the four core elements for e-learning system consist of 1) Learning Management System (LMS), 2) courseware, 3) interactive learning activity, and 4) evaluation. Details of each are discussed as follows. First, Learning Management System for administration purpose since the system usually be used as a major tool in the e-learning class for content delivery, learning activities, reflection and assessment. Second, the courseware for instructional content or as substitutes to lecture in traditional classroom. In the designing of courseware, pedagogical based design including the three learning theories, principle for good practice, and events of instructional design should be considered. Such design and development progress will be discussed in-depth later. Third, interactive learning activity through online communication and interaction. There are various types of activities that can be assigned, such as, group meetings may be assigned to students using chatroom, e-mail, or message board as a communicating tool. The common tools and their usefulness are described. Chat activity can be assigned to students so that they will be able to communicate with instructor and/or their classmates synchronously. E-mail will be used to remain in contact between student and instructor and also among students. Message Board can be used by content expert, instructor, and/or students in posting topics and information related to the topic or to use as a communication between instructor and students and among students

themselves asynchronously. Lastly, evaluation to testing and grading learners. Evaluation maybe divided into two types--formative and summative evaluations. To demonstrate learners' learning progress (a formative evaluation) their learning journal throughout the course must be collected. By so doing at the end of every class, learners begin to have a habit of meta-cognition skill, one of higher order thinking skills, as they start to review, revise, and evaluate what they have gone through during the learning activities. They are also aware of what they already knew, what they just know, what they do not know, and what they should know. While the online learning journal is used for assessing learners' learning progress, electronic portfolio collecting all major projects is used to assess learners' learning outcome (a summary evaluation). (Monsakul, 2008; Bonk & Graham, 2006; Monsakul, 2006; SLOAN, 2005; Waterhouse, 2005).

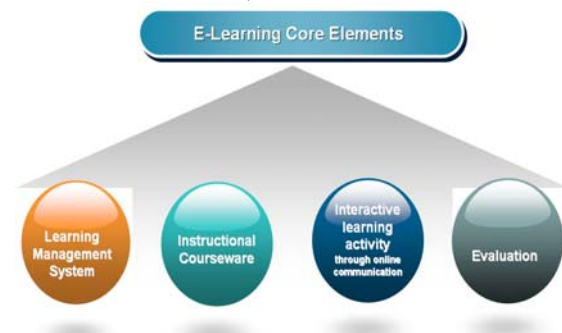


FIGURE 1: E-Learning 4 Core Elements



FIGURE 2: Implication of the E-Learning 4 Core Elements

### Design of Pedagogical-Based Courseware

When designing for pedagogical-based courseware should consider , perspective of pedagogy in e-learning context is usually corresponded to three theories of

behaviorism, cognitivism, constructivism (emphasizing on Dewey's work of social constructivism and Vygotsky's concept of scaffolding) and Chickering and Gamson's seven principles for good practice in undergraduate education, and Gagne' nine event of instructional design.

1) Behaviorism believes that learning is an action and is studied through observable measures of behaviors. In e-Learning context, behavioral learning theories will be used practice, reinforcement, and being active responders. The practices of an activities are positive reinforcers from the instructor via e-mail message and requirements for active participation within a threaded discussion. (Davidson and Shiver, 2006)

2) In contrast to the behaviorism's belief of external, directly observable indicators of human learning, cognitivism believes in the processes inside the brain that allow human beings to learn and remember. Accordingly, cognitivism hypothesizes that the brain contains certain structures that process information much like a computer. This model of the mind as computer hypothesizes that the human brain has three kinds of memory including sensory registers (part of memory that receives all information as person senses), short-term memory (the working memory where new information is held temporarily until it is either lost or place into long-term memory), and long-term memory (part of memory that has an unlimited capacity and can hold information indefinitely) (Atkinson and Shiffrin, 1968 as cited in Roblyer, 2003). Accordingly, effective courseware should be well structured in an organized format, such as , the use of advanced organizer, table of contents with heading and sub-heading.

3) Dewey's Social constructivism is considered as groundwork for many today's educational systems. Interdisciplinary curriculum and hands-on, experience-based learning activities represent Dewey's life

long learning message. In addition, Dewey supports the use of Internet to help students' communication to learn more about their society. Dewey believes that cooperative learning and use of technologies enhance students' group project and presentation. He also believes that curriculum should arise from students' interests, thus it needs to be flexible and tailored to the need of students. Curriculum topics should be integrated rather than isolated from each other. Education is growth, rather than an end in itself as it helps one to understand their culture and develop their relationship to roles in society -- rather than a preparation for work. Learning should be hands-on experience based, rather than abstract, thus meaningful learning results from students working cooperatively on tasks that are also related to their interest (Roblyer, 2003).

Supporting Dewey's social constructivist concept, Vygotsky believes that instruction is based on individual child's personal experiences and learning through collaborative and social activities. The concepts of scaffolding develop each individual's potential. Online tools, resources, and community that related to their relevant experience and related to real-life situation are used with an assumption that they can help bring students up from their level of understanding to a higher level including ability of implication, analysis, synthesis, and evaluation (Roblyer, 2003).

#### **Seven principles for good practice in undergraduate education.**

Chickering and Gamson (1987 as cited in Waterhouse, 2005), shared their perspective of the seven principles for good practice in undergraduate education that are instructional guidelines applied to online learning contexts. Each of the seven principles is described with examples as follows. First, good practice encourages contact between students and faculty, such as online announcement, online discussion, online faculty, staff, and

students' bios. Second, good practice develops reciprocity and cooperation among students, such as online project, online discussion, and online peer evaluation. Third, good practice uses active learning techniques, such as participation in course's online community. Fourth, good practice gives students prompt feedback, such as accessibility to online grade books and electronic feedback from instructor, assistant instructor, and peers. Fifth, good practice emphasizes time on task, such as online resources and online tracking of students' participation. Sixth, good practice communicates high expectations, such as online course syllabus, online course agenda, and online course norm. Seventh, good practice respects diverse talents and ways of learning, such as online assignment addressing variety of learning styles and provides students with choices, and online survey to determine students' need (Waterhouse, 2005).

#### **Gagne's events of instructional design**

Gagne created a nine-step process called the events of instruction, which correlate to and address the conditions of learning. Gagne's 9 events of instructional design provide a good starting point for designing any instruction including in eLearning mode. Gagne pointed out that these events of instruction do not always occur in this exact order; although this is the most probable order. Practically, all learners already have some events; therefore, those events are not needed to be mentioned again to learners. If one or more events are provided by learner himself, particularly when the learner is a self-learner, there is no need for teachers to mention those events again (Gagne & Briggs, 1974; Gagne, Briggs, & Wager, 1992; Gagne & Twitchell, 1991 as cited in Monsakul, 2006).

According to Gagne's aspect of learning hierarchy of intellectual skills, he stated that prerequisite skills must be attained before moving toward more complex learning.

Gagne developed a hierarchy for learning in order to assure that these skills were acquired. Since the 9 instructional events help learners to proceed from a beginning to an achievement level, all the events should be applied into each lesson as follows: 1) Gaining attention from learners 2) Informing learners the objective 3) Stimulating recall of prerequisite material 4) Presenting stimulus materials 5) Providing learning guidance 6) Eliciting the performance 7) Giving feedback about performance correctness 8) Assessing the performance and 9) Enhancing retention and transfer.

#### **Development of Pedagogical-Based Courseware**

In addition to the implication of developing the pedagogical-based courseware design, basic principles for how to design (multimedia) courseware learning environments plays vital role to the effectiveness of courseware development. Mayer et al. describe such principles, based on research evidence supported, as follows:

1) Multimedia Principle believes that people learn better from words and pictures than from words alone (Fletcher & Tobias as cited in Mayer, 2005). Therefore, effective courseware should be included at least words and pictures.

2) Split-attention principle believes that people learn better when words and pictures are physically and temporally integrated (Ayres & Sweller, as cited in Mayer, 2005). Thus, the effective courseware should integrate words and pictures at right place and right time, similar to the belief of Mayer's spatial contiguity and temporal contiguity principles.

3) Modality principle believes that people learn better from graphics and narration than graphics and printed text (Low & Sweller as cited in Mayer, 2005). Such belief can be implied that learners understand multimedia instruction better when words are presented as speech rather than on-screen text.

4) Redundancy principle believes that people learn better when the same information is not presented in more than one format (Sweller as cited in Mayer, 2005). Such belief implies that learners understand multimedia instruction best with spoken words alone. Adding on-screen text to an explanation may impede student learning.

5) Segmenting, pretraining, and modality principles believe that people learn better when multimedia message is presented in learned-paced segments rather than as a continuous unit, people learn better from multimedia message when they know the names and characteristics of the main concepts, and people learn better from a multimedia message when words are spoken rather than written (Mayer, 2005).

6) Coherence, Signaling, Spatial contiguity, temporal contiguity, and redundancy principles believe that people learn better when extraneous material is excluded rather than included, when cues are added that highlight the organization of essential material, when corresponding words and pictures are presented near rather than far from each other on the screen or page or in time. People learn better from graphics and narration than from graphics, narration, and on-screen text (Mayer, 2005).

7) Personalization, Voice, and Image principles believes that people learn better when words of a multimedia presentation are in conversational styles rather than formal style and when words are spoken in a standard-accented human voice rather than a machine voice of foreign-human voice. Though, people do not necessarily learn better when the speaker's image is on the screen (Mayer, 2005).

There are also advanced principles of multimedia learning. Some interesting example, such as, an interactivity principle focused in well designed of mixed design lesson that allows students to select answers before receiving explanations or to ask

questions during learning.; a collaboration principle emphasizing computer as a supporting tool for learning activities in online environment. As such, it would support the effective design of multimedia courseware.

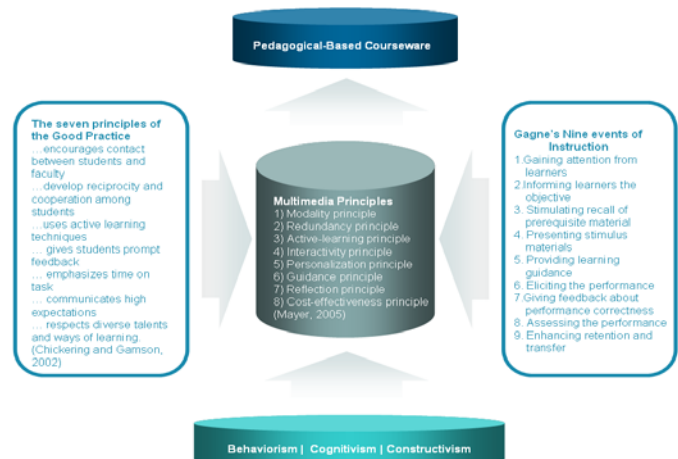


FIGURE 3: Pedagogical-based design and development procedures of higher education E-learning courseware

### E-Learning Courseware: software Review

Courseware is considered as an e-lecture, or virtual lecture, which is alternative to traditional lectures in eLearning context. It can be classified as, first, a text-based format, and second, a multimedia presentation format containing structured and manageable information. This type of courseware can be further developed by various courseware development tools. The existing courseware development tools that gains popularity in higher education can be grouped into three types, first, an advanced tool such as Macromedia Flash program. Second is a basic tool that even subject matter expert can develop courseware of their own. Such tools are, for example, Macromedia Breeze program, MS Producer program, and Adobe Captivate program. Third is a tool with streaming technology

such as AcuLearn program (presentations synchronized with PowerPoint slides), and ECHO 360 (Flash streaming server).



FIGURE 4: Courseware developed by Macromedia Flash program

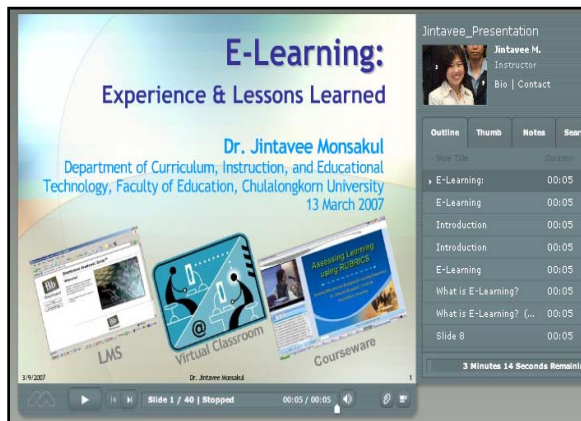


FIGURE 5: Courseware developed by Macromedia Breeze program

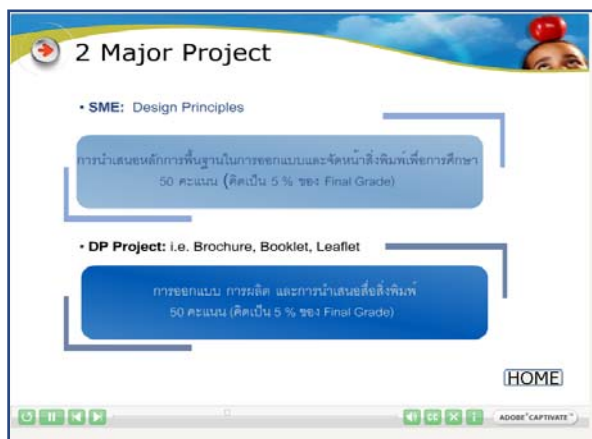


FIGURE 6: Courseware developed by Adobe Captivate program

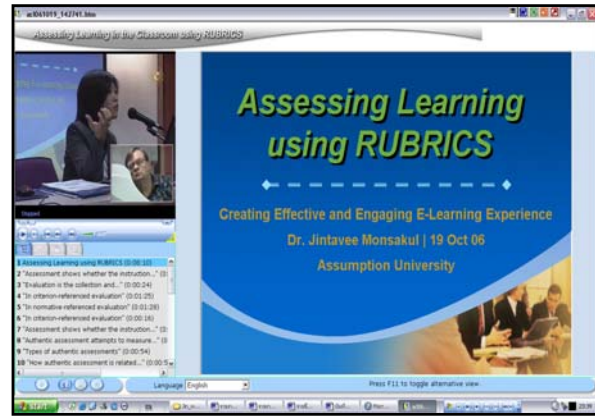


FIGURE 7: Courseware developed by AcuLearn program

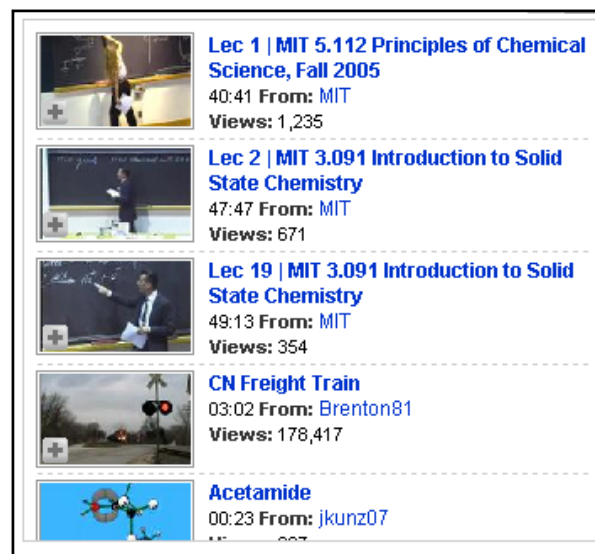


FIGURE 8: Courseware developed by Streaming technology, MIT Open Courseware (<http://ocw.mit.edu/index.html>)

### Summary

In response to the rapidly expanding demand for e-learning higher education in Thailand, Learning Management System and multimedia courseware have become vital tools in such type of learning environments. Pedagogical-based design and development procedures model of higher education E-learning courseware are proposed in this paper, so that lecturers, institutions, and courseware developer may consider and apply this model during the process of

designing and development of their effective e-learning courseware when it comes to the higher education pedagogical concerns.

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