

SAFEE-Learning Model for Hierarchical Design

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Abstract: This paper describes a layer model, temporally named as SAFEE-Learning Model, for designing e-Learning environment based on frameworks and models of instructional design applied in a hierarchical fashion. There have been a number of theories and models in the field of instructional design and technology that can applied to make e-Learning a better quality. However, little is known as to how to select appropriate models for improving various aspects of e-Learning. This paper is a progress report of proposing a cohesive model for selecting right model for right purpose of e-Learning environmental design.

INTRODUCTION

It has been a universal concern as to how to improve the quality of e-Learning. From an instructional design point of view, many models have been proposed to make instructional quality of e-Learning better in various aspects: How to make the material easy to navigate, how to make the material easy to comprehend, how to make the material more attractive, and so forth. Merrill (2002) advocates the quality of e-Learning to be the 3rd power of e-Learning: effective, efficient, and engaging. For that end, Merrill has proposed the first principle of instructional design, to take into consideration of the five design elements: Real world Task centered, Activation of learners' knowledge and experiences, Demonstration of the contents using examples, Application of the target skills, and Integration of the learned skills into the real world problem-solving situations.

No universally accepted guideline for assuring quality of e-Learning has been agreed upon, although many have been suggested worldwide. The first of the kind is known as *Quality on the Line*, proposed by the Institute for Higher Education Policy, in which, a total of 24 benchmarks in Institutional Support, Course Development, Teaching/Learning, Course Structure, Student Support, Faculty Support, and Evaluation and Assessment were identified. According to Wang (2006), the most widely followed guidelines are provided by The Council for Higher Education Accreditation (CHEA, 2002), Council for Regional Accrediting Commissions (C-RAC, 2000), and The American Federation of Teachers (2000). Another widely known Sloan-C's framework (Moore, 2002; 2005) consists of five interrelated aspects: Learning Effectiveness, Cost Effectiveness and Institutional Commitment, Access, Faculty Satisfaction, and Student Satisfaction, which are known as the Five Pillars.

Quality issues have been rather separately discussed, partly because of the multi-facet nature of e-Learning (Kidney, et.al., 2007). From the standpoint of learning environment, such aspects as adequacy of information amount and fluency of communications may be issues. From technical point of view, comfortability in use, efficiency of information maintenance, language and platform, and/or functionality of the information repository may be watched. In addition, material design's perspective would concern the effectiveness of multimedia utilization, intellectual property handling, or cost effectiveness of production. Then, it is totally different to see from the perspectives of the learner, instructor, instructional designer, web creator, information technologist, or manager.

In order to utilize what have been accomplished in the field of instructional design, for the sake of improving the quality of e-Learning, a framework is necessary to know what are available from the literature of instructional design that can be used to serve for various aspects of e-Learning quality improvement. Therefore, it is the intention of this paper to propose the SAFEE-Learning Model as a hierarchical framework to show the levels of e-Learning quality and what are available to serve for each of the levels.

SAFEE-LEARNING MODEL

SAFEE-Learning Model is a temporal name for a layered model for e-Learning design, which was first proposed by Suzuki (2006; Suzuki & Keller, 2007). The temporal name of SAFEE-Learning Model was given at International Symposium on Excellence in Teaching and Learning, held at Wenzao Ursuline College of Languages, Kaohsiung, Taiwan, in April 2008. This layered model is proposed as a frame of reference for clarifying the purposes of various instructional design (ID) techniques and models and to illustrate how they can be meaningfully organized in terms of purpose and impact. This organizational structure has several benefits: it clarifies the relationships among the various design activities in e-Learning development, it can provide guidance to e-Learning designers, and it can help managers of e-Learning development who must coordinate a team of designers.

In this model there are five layers. Layer 1, Friendly e-Learning, which can be considered to be the baseline level, is actually at the midpoint of the five levels. There are two layers below it, which are Stable and Accurate e-Learning, two above, Effective and Engaging e-Learning, thus named as “SAFEE-Learning Model,” or Stable-Accurate-Friendly-Effective-E(ngaging) Learning Model. The organization is guided by the concepts of Herzburg’s (1968) “motivation – hygiene” theory of motivation. He postulates that certain activities, called hygiene factors, help avoid discontent or annoyance and keep people happy, while other kinds of factors, called motivators, contribute to meaningful work experiences and stimulate people to achieve. This theoretical foundation is reflected in the following layer descriptions, layers forming a kind of hierarchical structure among them.

Layer 1: Friendly e-Learning

Newcomers into the field of ID especially those with an information technology or media production background, often think of it as equivalent to navigation and display design to accomplish high usability, or user-friendliness. Formative evaluation and rapid prototyping are examples of ID techniques to attain high usability. Good usability features help avoid learner annoyance (a hygiene factor) and has limited effects on learning and motivation; thus, it is located in the model as the center layer. Usability is extremely important in regard to learner motivation. However, the aims of ID are not only concerned with usability, but also with other issues although all are interconnected. By putting the usability issue as Layer 1, the model tries to separate other design techniques according to whether they fall more into the hygiene levels, which are positioned below this level, or the motivation levels that lie above it (Figure 1).

Figure 1: SAFEE-Learning Model

Quality of e-Learning	Achievement Index	Major ID Techniques
Level 3: Engaging Willing to Learn (engagement)	Continuing motivation, engagement, Did I do this many without noticing? Link to future self, Self-selected, self-responsible, individual taste and persistency, Brand, Pride	Motivation Design (ARCS Model) Principles of Andragogy
Level 2: Effective Easy to Learn (Effectiveness)	Learning environment matching nature of the task, learning support elements matching learner needs, interaction effects of collaborative members, self-regulated learning, responsive environment	Learning facilitation Design (9 Events of Instruction) Structuring & Sequencing First Principles of ID
Level 1: Friendly Easy to Use (Information Design)	Operability, Usability, Navigation and Layout, faster and more accurate access to needed information, No disorientation problem	Technical writing, Prototyping, Formative evaluation
Level 0: Accurate No Deception (SME)	Content accuracy, Validity of Learning Scope, Validity of interpretation, Indication of equivocality, Freshness of Information, Rational and reliable, Intellectual Property Handling	Needs Analysis Task Analysis Content Analysis
Level -1: Stable No Pain (Hygiene)	Access environment, Adequate network speed, Substitute alternatives for different IT environment, Stability of service, Feeling of security	Learning Environment Analysis Media Selection

Layer 0: Accurate e-Learning

One layer below Layer 1 is Layer 0 which includes analysis and concerns of the potential for deception in e-Learning programs. If the content is not accurate, valid, or reliable, then attaining effective usability of such content has no meaning. Being thus placed one layer below Layer 1 illustrates the prerequisite importance this issue over information design (Layer 1). ID techniques used during the analysis phase, such as needs analysis, contents and task analysis, deal with this issue. Needs analysis is an ID technique to specify the reason why any e-Learning must be provided for a certain potential group of users. Needs may come from job-related knowledge/skill deficiencies, changes in environment, such as a release of a new version of software, or prospective future trends in a proactive mode of training. Often times the analysis of needs will call upon specification of changes in job-related behaviors as a result of training. In order to connect training result to performance change in application settings, Kirkpatrick's (1998) 4 level evaluation scheme (Reaction, Learning, Behaviour, and Result) is the most well-known ID model.

Content and task analysis refers to the process of specifying how many components are there between learner's current status and goal status, and how each of the components is related to each other. Starting from Gagne's (1968) classical hierarchical analysis, many techniques have been proposed as to how to conduct content and task analysis (e.g., Reigeluth & Stein, 1983). Having conducted content and task analysis, the designer of e-Learning can be sure as to what should be covered in the course, and which of the components can be covered prior to/only after the others. Each component should have a clear statement of learning objective, which is accompanied with a set of test items. Defining clear objectives and writing corresponding test items has been one of the traditional techniques of ID.

Subject Matter Experts (SMEs), who provide expertise in the area of target contents, would play a major role in determining the components. SMEs can provide for content accuracy, validity of learning scope, validity of interpretation, indication of equivocality, freshness of information, rational and reliable contents, as well as intellectual property handling of material, in assisting the instructional designer in charge of e-Learning design and development.

Layer -1: Stable e-Learning

An even more elemental layer (Layer -1) concerns the issue of avoiding irritation by having proper learning environment via adequate bandwidth, audio quality, and stability of the service. Such issues should be met to avoid learner's "pain," in regard to the "hygiene" elements of design (Herzburg, 1968). The presence of such technological problems would distract any audience from learning, but would not, in and of themselves, produce Learning which is why this layer has a negative number. Activities at this level include Learning environment analysis, media selection techniques, and technology support (Keller & Suzuki, 1988).

Learning environment analysis represents techniques to assess existing environment for learning in terms of media attributes of contents and available supports for learning. Media selection models have long been investigated in the field of ID, to attain not only attractiveness of environment, but also effectiveness and efficiency. Although "simple media, active students" is the conclusion derived from media studies (Schramm, 1977), many have argued various effects of media on learning. It has been widely accepted that different media can provide different learning environment serving for more/less effectiveness in producing learning. It has also been widely known that different media cost more/less in preparing and implementing learning environment. Thus, making proper combination in selecting and utilizing media is critical in composing learning environment.

Layer 2: Effective e-Learning

The layer just above Layer 1 concerns the effectiveness of the e-Learning (Layer 2). Most of the work in ID fields is concerned with how to make learning effective. In other words, the goal is to ensure that the instructional interventions match both learner characteristics and task requirements in a given environment. Various ID models such as the ones in Reigeluth's (1983, 1999) "Green Books" are the examples in this layer. Since effective e-Learning will facilitate the learners attaining objectives, by definition, ID models typically relate such factors as learner's characteristics, nature of the learning task, and learning environment to instructional strategies, in search of the best fit among elements in the learning environment. Gagne's (2004) learning outcome and conditions for effective learning is one of the classical models in this direction. Further

advancement has been made to reflect the paradigm shift in the fields of constructivist psychology and learning sciences, which was well represented in Reigeluth's (1999) second volume "Green Book II." Many ID models and theories have been proposed, and much more would be proposed in the future, stemming from design efforts in various setting for various circumstances. Efforts in integrating those models, such as Merrill's (2002), would be necessary to find out what are in common across different ID models.

Layer 3: Engaging e-Learning

The top layer (Layer 3) is about the appeal of e-Learning, in the sense of keeping learners motivated and engaged in learning, wanting to be involved in the learning activities, even when they are not required, or being happy about belonging to the organization. Appeal of instruction has been considered to be one of the three main goals of ID: effectiveness, efficiency, and appeal (Reigeluth & Merrill, 1978). Activities at this level include systematic motivational design (e.g., Keller & Suzuki, 1988) based on a model of learner motivation and the concepts of adult learning (Knowles, 1984).

The ARCS model of motivational design has been one of the major ID models that geared directly toward the attainment of appeal of instruction. It has been widely used in various sectors of e-Learning practices world-wide. The ARCS stands for four major factors associated with learner motivation: Attention, Relevance, Confidence, and Satisfaction. Numerous motivational strategies have been suggested and validated in various learning settings, each of which is classified into one of the four categories. The model also has a set of procedures to deploy the motivational design, from learner analysis, selection of motivational objectives, to test and revise the e-Learning environment.

ANALYSIS OF AN ONLINE GRADUATE PROGRAM

To illustrate how SAFEe-Learning Model can be used, an online master program at Kumamoto University was analyzed. Instructional Systems Program started in April 2006 as a fully online masters program for training e-Learning specialists in business and industry and higher education (Suzuki, 2007). It offers 30 courses, two credits each, fully online for those who are working full time to seek advanced and organized education at graduate level, majority of whom do not live near campus. In order to be approved by Japanese government as an equivalent of on-campus program, 15 interactive sessions are required in each course aligning to the approved course outline.

To make the program free of technical distractions (Layer -1: Stable e-Learning), a high performance PC and broadband network connection was required for all prospective students, whether at home or at work, in order to assure enough speed to view our multimedia content. Year around availability was guaranteed except for one day campus-wide power down and monthly night time updates of the Learning Management System (LMS). It is considered to be rather stable service, when compared with distance students in a campus based university suffering from daily maintenance shutdowns between 4 - 6 am every day, for example.

Professors from various fields joined the program to offer not only instructional design courses, but information technology, management, and intellectual property (IP). Where within university expertise was unavailable, part-time lecturers were located with cooperation from National Institute for Multimedia Education and e-Learning Consortium Japan (eLC), to provide the first class contents in all the courses provided (Layer 0: Accurate e-Learning). IP policies were set by consulting with the professor who teaches IP courses in our program. All course content and assignments were aligned with the program's overall educational goals, which was announced in the form of competencies at graduation, so as to avoid unnecessary or "just nice to know" elements in student learning.

A set of course design policy was established and shared among professors and staffs so as to offer cohesive look and feel in the course materials (Layer 1: Friendly e-Learning). For example, all courses, which consist of 15 lessons, were divided into 3-5 units of learning modules, each of which has corresponding assignments under a theme within the course. So, students can structure the coursework by aiming to finish an assignment by taking several lessons with an interactive element (called a task) in each, before submitting the assignment. Navigation in each course is standardized by utilizing functions of the commercial LMS, whereas the bridge is provided among all the courses a student is simultaneously taking in a particular semester by originally creating a portal site. An easy navigation is provided in the program portal by listing all the courses' tasks and assignment, indicating deadlines and submission status (passed, or resubmission required) with direct links to

the respective course content. Online orientation was designed and implemented to familiarize the students with the above mentioned functions in the learning environment, as well as acts of speaking up online to the colleagues who takes the same courses.

To make the best use of instructional design principles, which the program emphasizes as specialization of e-Learning professionals, careful design including the course design policy and list of competencies was conducted in the design phase of the program (Layer 2: Effective e-Learning). Tasks and assignments were set to be as authentic as possible, the information as concrete and various as possible, and opportunities for feedback and multiple challenges as much as possible. Also, learning objectives and evaluation criteria are set and announced as clear as possible, and peer interactions are introduced so that the students have opportunities to learn from each other's experiences and viewpoints from different application fields. Prerequisite relationships among courses are specified and announced in advance, so that cumulative learning effects can be obtained.

To make the program attractive to the target population as well as to the current students, the program has been aligned to the requirements of eLC's e-Learning Professional Certificates. All the graduates are entitled to certified as Learning Designer by eLC upon completion of the master's program, and those who take necessary elective courses, other certificates such as Manager, Contents Creator, SCORM Engineer, Expert, and Consultant will also become eligible. Since the program is operated totally online, we don't see each other for the coursework. However, we set up occasional social events for students and faculty to see each other, at research meetings, conferences, etc. The last item of the Core Competency List states "To contribute to improvements and advancements of the GSIS program as an alumnus." Toward that end, various efforts have been made to emphasize the bond among faculty and students. Upon the first graduation in 2008, an alumni association was organized by a voluntary group of graduates.

CONCLUDING REMARKS

Based on these concepts and examples, the SAFEe-Learning Model, as temporally so named, can provide a useful frame of reference among practitioners in e-Learning, so that proper techniques are to be utilized for proper aims. Other models using layers have been widely used in ID. These include the Cone of Experiences proposed by E. Dale (1954) to categorize various forms of educational media, Maslow's (1943) hierarchy of human needs which helps identify learning readiness based on motivational states, and Tessmer & Wedman's (2000) layers-of-necessity model that helps explain a progression from limited, or rapid, prototyping prior to engaging in a more full featured development process depending on the needs of the situation. But, none of the other "layered models" has illustrated the various levels of design activities in relation to learner satisfaction (hygiene factors), learning, and motivation. It is authors' hope that the proposed model shall serve such a function.

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