Design Principles in Graduate E-Learning Programmes and the Use of a Content Bank

John Arul Phillips
Professor
Faculty of Education, Arts & Social Science
Open University Malaysia
johnarul@oum.edu.my

Kasiran Buang
Professor
Faculty of Information Technology & Multimedia Communication
Open University Malaysia
kasiran@oum.edu.my

Abstract
The paper reports the application of the science of instruction in the design and development of graduate courses supported with a content bank at Open University Malaysia. Focus is on the principles applied to print material (content, learning outcomes, learning activities and assessment tasks) and its use in engineering face-to-face interaction, online collaboration and utilisation of resources from the digital library and a specially designed digital content bank. Emphasis is on the design of the digital content bank. The system can be considered as a purely management tool that archives all our existing printed materials in digital form in a more systematic way. More important objective is to use this system to support module writing and versioning to ensure standard and quality of our instructional and course content. As OUM moves towards providing an E-Learning option for its courses, students and tutors/facilitators will be able to access content derived from this database. Hence the more ambitious goal is to use the system to support the development and delivery of e-Learning.

Introduction
The adoption of the e-Learning is increasing not only in institutions of higher education offering distance learning but also in traditional or on-site institutions of higher learning. Especially evident are graduate programmes offered using the e-Learning alternative to reach a wider audience as well as support on-site experiences. Instructional design principles have also shifted from designing instruction for face-to-face practices to distance education and the e-Learning format. Instructional design is broadly defined as the systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction. It is the entire process of analysis of learning needs and goals and the development of a delivery system to meet those needs. It includes development of instructional materials and activities; tryout and evaluation of all instruction and learner activities (Merrill, Li and Jones, 1991)

Graduate courses at OUM are conducted over a period of one semester (14 weeks). Students taking the courses are provided with a Learning Package consisting of a course guide, an assignment guide and course content. Course content is divided into 10 chapters totalling about 220 pages. Students taking the course are mostly working adults with wide experience in their educational institutions, business, government and industry. They may have had extensive experience in their respective jobs but exposure to theory is confined to their undergraduate degrees and for some only a postgraduate diploma.
The Course Design Framework

To facilitate the design and development of the course, a course design framework was developed and closely adhered to (see Figure 1). The framework, an adaptation of the models proposed by Fink (2003), Biggs (2000), Morrison and Kemp (2001), provides a structure and foundation for the learning process while nurturing student participation, expression and reflection. Also, emphasised in the framework is interactivity, authentic problem solving activities, multiple perspectives and representations. In short, the whole teaching-learning experience is engineered or initiated by the interrelatedness of 4 components; namely learning outcomes, content, learning activities and assessment tasks. While the course design framework has been around in different formats, it provides a useful and simple enough guide for course development especially, among uninitiated academics in institutions of higher education who traditionally who are not accustomed to designing their courses in such detail.

Figure 1: The Course Design Framework Supported with a Digital Content Bank
a) The Content

The first component relates to ‘What to teach?’ and decisions had to be made in connection with the breadth and depth of content and expectations of students. Considering that graduate courses address not only Malaysian students but also an international audience, it was decided to concentrate on the basic concepts, principles and theories that apply across cultures. Examples, illustrations, case studies and analogies from different systems were been incorporated to explain ideas. The content forming the ‘meat’ of the course was identified, structured and organised according to the learning outcomes identified. The sequencing of the content followed the ‘classic tutorial’ (Horton, 2000) in which learners start with an introduction to the chapter and proceed through a series of pages towards more advanced concepts and principles. At appropriate points in the sequence of content, learners encounter various kinds of Learning Activities to reinforce accomplishment of objectives of the chapter. Though there are other options in sequencing the chapter such as the activity-centred format, knowledge-paced and exploratory tutorials, the classic tutorial was preferred because it is more familiar to learners and since the contents of the course may be new to the majority of students, it reduces the possibility of learners getting lost. Another reason being that the course is written in English and for some students who are less proficient in the language the classic tutorial format may be less intimidating.

b) The Learning Outcomes

The second component consists of statements indicating what students are expected to know, to do and attitudes inculcated at the end of each of the 10 chapters. The learning outcomes stipulate what changes students taking the course will experience inform students them what is expected of them as well as indicate what will be important in assessing the course. The Taxonomy of Significant Learning proposed by Fink (2003) was used to guide the selection of learning outcomes which identified six significant kinds of learning:

- foundational knowledge (facts, concepts, principles),
- application (problem solving and decision making in real-world situations),
- integration (making connections among ideas),
- human dimensions (learning about oneself and interacting with others),
- caring (changing one’s feelings, interests and values), and
- learning how to learn (becoming a better and self-directed learner).

An interesting feature of the taxonomy is that it combines both cognitive and affective outcomes of learning. The taxonomy is interactive which means that each kind of learning can stimulate other kinds of learning. Admittedly, it may not be possible to include all six kinds of significant learning in a chapter or lesson; the more that can be included will make students’ learning richer (Fink, 2003).

c) Learning Activities

The third component involves the design of learning activities. It is not so much a matter of getting things for students to read; it is getting together a set of things for students to do that is important (Ellington and Race, 1993). Students learn more and retain their learning longer if they acquire it in an active rather than a passive manner. Learning activities are designed to help students monitor their own progress, check their understanding, develop specific skills, apply what they have learned to real-world situations and to reflect on what they have done (Melton, 2002). According to Merrill (2002), the most effective learning activities are those that are problem-centred and involve the student in activation of prior experience,
demonstration and application of concepts to real-world settings. Based on Fink’s taxonomy, three kinds of learning activities were designed and developed for chapter throughout the course, namely; Self-Test, Activity and Discussion Questions.

i) Self-Test – this activity was introduced at strategic points in the text to enable learners to monitor their understanding of foundational knowledge and integration, i.e. the key information (facts, terms, concepts, principles) important for students to understand and remember in each chapter. The Self-Test questions were aimed at enhancing the mathemagenic behaviours (Rothkopf, 1966) of learners or processing behaviours that give birth to learning. Questions direct intent and search while reading a piece of text. Three types of adjunct questions were introduced (Pearson and Johnson, 1978). Text-explicit questions or factual recall questions tested key information students had to understand and remember and the answers are right there on the page. For example, ‘What is the hidden curriculum?’ Text-implicit questions required learners do some sort of inferencing and ‘read between the lines’. For example, ‘Why do you think the Taba model is called the grass-roots model?’ Script-based questions required learners to use their prior knowledge or schema to answer the questions. For example, ‘Give specific examples of constructivism in your classroom’. Text-implicit and script-based questions encouraged learners to make connections among ideas within the chapter and connections with their experiences in the workplace (i.e. integration).

ii) Activities for Application – these learning activities present learners with real-world situations in the area of curriculum design and development (i.e. application of concepts). Case studies were incorporated in the text in which learners analyse and evaluate (critical thinking), suggest solutions (creative thinking), solve problems and make decisions. The aim of these learning activities is to provide opportunities for students to use the conceptual tools of the discipline in authentic situations and through collaborative interaction (face-to-face and online) socially construct knowledge (Brown and Collins, 1989).

iii) Discussion Questions – this learning activity is located at the end of each chapter which aims to initiate discussion and sharing of ideas between learners in face-to-face and online sessions. Through interaction learners learn about themselves and learn about their fellow course mates. Adult learners approach learning as problem solving and are keen in sharing their experiences (Knowles, 1984). Keeping this in mind, issue oriented activities were designed for each chapter to engage learners in active debate similar to what they would encounter as curriculum professionals.

iv) Learning Journal – students are encouraged to keep a journal in which they write reflectively about their learning experiences. Since this is a new activity for many students, the following sample questions are listed to guide their efforts. What am I learning? Of what value is this? What difficulties did I have learning the content? What was I most comfortable with?

d) Assessment Tasks

The fourth component is assessment which is designed not solely to give a grade but more importantly to enhance student learning. The assessment tasks used in the course consisted of audit assessment, authentic assessment and self assessment with criteria and standards made explicit. Audit assessment is assessment which only determines whether students ‘got’ the material they studied or learned correctly. Authentic assessment incorporates exercises, questions, problems that create a real-life context for a given issue, problem or decision to be addressed (Fink, 2003). The criteria and standards used to assess student work are made explicit. For example,
what is meant by ‘acceptable’ or exceptional’ work is clearly stated. The assessment format for this course consists of a final examination (50%) and coursework (50%) which is made up of two written assignments.

**Digital Content Bank**

As accessibility to the web is enhanced with the increase of broadband penetrations, programmes using e-Learning approaches may be further extended to reach a wider audience. In anticipation of these trends, the development of Digital Content Bank System (DCBS) is proposed to support graduate eLearning programmes with the following objectives:

- To develop a DCBS of existing course materials that functions as archives as well as for other module management.
- To evaluate the effectiveness of the DCBS in facilitating module writing and versioning.
- To design and develop an E-Learning Course at the graduate level.
- Test the effectiveness of the DCBS in supporting the e-Learning Course.

**Methodology**

The project consists of TWO phases, namely the development of the Digital Content Bank System and the development of the e-Learning Course which may run concurrently.

**Phase One**

The first phase of the project would include requirement analyses, the software design, and the implementation. In this phase a prototype of DCBS will be developed using open standard and Open Source Software and tools. The application would be Web-enabled as it is the main media for e-learning implementation (Honkaranta, 2005). However, the use of propriety software especially in preparing and converting the data to various formats will be explored to see if it meets the needs of the project and its cost-effectiveness (see Figure 2).

**Data Preparation**

Between 8 to10 modules will be selected based on their content being closely related to the content of the e-Learning course developed. The DCBS shall store the module documents in several different formats to meet its goal. We are considering MS Word document saved in eXtensible Markup Language (XML). This format will facilitate updating and versioning as it is actually an alternative format provided by the new MS Word application. As XML is a text-based format it enables searching for words or phrases found not only within the chapter titles but also within the body of the document itself. Another important reason is that many of our subject matter experts (SMEs) who write the module invariably already familiar with and use MS Word to prepare the content.

- When displaying via Web browser these MS XML document can directly be rendered by local MS Word application (if MS Window is used). Using appropriate tool based on eXtensible Stylesheet (XSL) this XML document can also be converted on-the-fly into HTML which all browsers can then display.
• A PDF version of the documents will also be prepared and stored in the database for display by the user using PDF reader such as Acrobat Reader and xpdf program (under Linux). This format results in a more pleasant layout on the screen as well as on print.

**Tagging:** The modules will be broken down into smaller chunks of information which would be individually tagged with ID and attached with keywords, phrases and other necessary metadata prior storing in the database. This would facilitate indexing, searching and retrieval as well. Format compliancy for interoperability in terms meta-data specifications with the current e-learning content standard such as Sharable Content Object Reference Model (SCORM) and the one based on IMS Global Learning Consortium will also be explored.

![Figure 2: Conceptual Framework of the Digital Content Bank](image)

**Figure 2: Conceptual Framework of the Digital Content Bank**

• **Prototyping:** The DCBS prototype will be designed and developed together with the Web-based interface.

• **Implementation:** The DCBS prototype will be implemented and deployed for testing.

• **Evaluation:** To test the effectiveness of the DCBS prototype, a study will be conducted with SMEs and module writers, facilitators, and faculty members to use the system; in terms of: adequacy and relevancy of content, accessibility, user friendliness of the interface, speed and so forth.

**Phase Two**

In this phase of development the DCBS will be further enhanced to support e-Learning. It is suggested that one graduate course be selected and conducted via our existing LMS. The course will be designed based on relevant instructional design principles and pilot tested with a group of students and a facilitator. Their responses will provide insight into e-Learning course design, delivery and seamless interface with the DCBS.
• An instrument will be designed and administered to students for their reactions to the e-Learning approach. Among the aspects measured are technology and delivery, ease of use, speed of access, level of graphical realism, audio/video output and flexibility; contents, pedagogy, pace and quality of learning.

• Interviews will be conducted with selected students to obtain a deeper perspective of their opinions, comments and feelings about the course. Interview with the facilitator to seek his or her comments, opinions and feelings will be conducted as well.

• Online collaborative discussions will be analysed in terms of quantity and quality and related to academic performance.

• Analysis of online discussion to examine the performance of the facilitator interaction with students

Benefits of the DCBS

The development of the DCBS when widely implemented will facilitate various types of versioning of course materials such as follows:

• Updating – updating existing course materials.

• Reshaping – altering the structure or theme/topics of a course to improve its delivery.

• Resizing – breaking a course to form a number of shorter courses or the merging of courses.

• Repurposing a) preparing courses for sale locally or internationally b) altering a course for a specific sector or occupation e.g. KEMAS, Armed Forces c) altering a course to meet needs of a particular level such as adapting a degree course to a diploma level & vice-versa.

• Redesign for media – revise course material for presentation in another medium such as CD-ROM and Web.

• Generic adaptation – revising material so that it can be used by several programmes e.g. test and measurement (in science, mathematics, history)

With the DCBS, it is anticipated that module writing time may be reduced as reusable resources would be available for download. The e-Learning pilot project will provide insight into the value of e-Learning, design considerations and how the DCBS can be used as a resource to enhance learning (Asprey, 2003).

Future

It has been argued that the single biggest challenge of e-Learning is the design. We shall be focusing more on this issue to make ODL learning more engaging. More and more dynamic content such as using interactive graphical animation, video clips will be incorporated into the DCBS in support of the more traditional static content. The DCBS will be enhanced further by incorporating additional data consisting of task and activities related to content. It is envisage that the DCBS will be integrated with the Question Bank System that is also currently under development. We have only discussed about the content – pure content. The biggest challenge would be to design software agents and smart tutoring systems that manage all these various content in a way demanded by effective pedagogy and OUM mode of learning.
References


--------------------------------------------------------------------------------