The Web Collaborative Content Organiser (Webcoco): A Conceptual Framework for System Development

Hanafi Atana*, Zuraidah A. Rahmana, Omar Majida and Norzaini Dahlanb
School of Distance Education, Universiti Sains Malaysia, 11800 Penang, Malaysia

Abstract

This paper discusses a conceptual framework for the system development of the web collaborative content organiser (WebCoCo). The conceptual framework of the system focuses on four main elements of learning activities, namely, learning objects, collaborative tasks, reflection and evaluation. The learning object tool consists of a learning object template which allows a course manager to upload relevant resources from the learning object library. These learning objects stored in the library are meta-tagged to allow students to search for the specific ones they require. The collaborative tasks in the system involve the deployment of various tools, namely, concept mapping, problem solving and topic forum tools. Based on the learning objects made available to them, students then work collaboratively to construct the concept map of a particular lesson. The concept map tool encourages students to participate actively in generating relationships from the information they receive from the learning objects thus allowing them to participate in the active process of knowledge construction. The course manager may also launch the topic in the forum board to get the students involved in discussing and exploring the contents and materials learned. These reflection tools in the system allow students to reflect and demonstrate on their understanding of the course content via the development of individual e-portfolios. The e-portfolio provides a learning record and evidence of a student's abilities, achievement and understanding of the course content. In addition, various other interactive evaluation tools, such as the interactive quiz and a library of structured questions with guided answers, are also embedded in the system. These tools allow and facilitate the mastery, comprehension and understanding of the course content by the students.

* Corresponding author. E-mail address: hanafi@usm.com
1. Introduction

The phenomenal advancement of information and communication technology (ICT) has altered the way education is being delivered. Traditional classroom teaching is now increasingly being coupled with the use of technology to facilitate and enhance more meaningful and engaging teaching and learning processes. The changes have immense potential for the development of hybrid or fully online learning where the use of immense educational resources is readily available in the Internet and there is ease of communication between the teacher and learners. The Internet technology is now increasingly being used in tandem with student-centred learning (SCL) approaches such as collaborative learning (Lakkala, 2007) and generative learning (Bannan-Ritland, Dabbagh and Murphy, 2000). The use of technology and SCL make the students more responsible about their learning such as planning their studies, interacting with teachers and other students, researching and assessing the amount of learning that has taken place. The main attributes of the SCL, which are the students’ responsibility and independence in learning, encourage them to develop the characteristics of good learners – being highly motivated and possessing high order thinking skills necessary for advancement in this digital age.

1.1 Collaborative Learning

One of the aspects of SCL that can be readily supported by the advancement of ICT is the use of collaboration in learning processes. The collaboration can easily be integrated as part of the learning design and this can be achieved through the use of various Internet-based e-learning tools such as webmeeting, forums and chats.

The study on the effect of collaboration on learning using the Internet has been there at the forefront of educational technology research and has been documented immensely. A study by Hiltz (1998) demonstrated that collaborative learning can bring about learning outcomes as effective as those achieved in face-to-face learning. It is pointed out that students who collaborate to share ideas, solve problems, use various information sources and create knowledge together are learning actively and are more engaging (Lakkala, 2007). The importance of collaboration is that each member in a group is contributing to the success of the entire group. All the members in the group work together to accomplish shared learning goals (Gokhale, 1995).

Findings from research support the view that collaboration enhances social skills and competencies, such as leadership, communication skills and critical thinking. For example, Slavin (1996) and Gokhale (1995) showed that when students work in teams, they engage in active learning which requires them to use critical thinking. Johnson & Johnson (1989) highlighted their finding that collaborative learning increases student abilities in leadership and effective communication as well as enable them to manage conflicts constructively.

1.2 The Content Organiser

The content organiser is a web-based learning tool that integrates both learning objects and the concept map in a system. Such a system provides a pedagogical environment to engage learners to generate and to organise their ideas of the contents being studied. As such, it allows the students to personally organise learning objects in a way that they construct and reflect their understanding by linking their new and old knowledge.

The content organiser is conceived under the cognitive information processing. It focuses on the generative learning model where the learner is an active participant who works to construct meaningful
understanding by generating relationships between the different types of information he/she receives. Cognitive psychologists and educationists usually see these as the skills associated with thinking activities. Students are active participants in the instructional process whereby they construct new knowledge through information in the instructional environment, adding on to their prior knowledge and previous experience (Grabowski, 1996). These activities are completely in contrast to those which simply involve the memorising of information where the students passively receive information with or without processing the information meaningfully.

Using the content organiser, students are active participants in constructing meaningful understanding of information found in the learning environment and generate relationships between the various types of information. With the design of generative learning objects, students are able to generatively construct, manipulate and organise learning objects in the concept map.

1.3 Learning Objects

There are a number of definitions of learning objects (LOs) being offered. From the description found in literature, the definition of a LO primarily depends upon the context of the definition and background of authors. However, the definition of this object generally covers the following categories (Mortimer, 2002):

i) Content – the content and learning activities support the learning objectives.
ii) Size and seat time – a chunk of learning that takes no longer than 15 minutes to complete.
iii) Context and capabilities – a nugget of learning that can "stand alone" and be delivered to a learner on an as-needed, just-enough basis.

An LO can be a relatively small learning material, a unit of lesson or a subject containing some lessons. The granularity of an LO centres on combining units of the learning object in terms of sequencing (Wiley, 2002). According to Wiley (2002), granularity refers to the size of an LO. On the other hand, the combination of LOs refers to how these objects are assembled into a larger learning material.

1.4 The Concept Map

The concept map is a type of knowledge representation used in education; it is a graphical node illustrating the relationship among concepts (Novak, 1998). The concept map allows students to demonstrate and illustrate their knowledge and encourages them to reflect and elaborate on their knowledge graphically (Novak & Gowin, 1984). Novak and Gowin (1984) indicated that this technique is appropriate for all levels of students and they further pointed out that concept mapping encourages students to think. According to Jonassen (2000), concept maps engage learners in the reorganisation of knowledge; the explicit description of concepts and their interrelationships as well as the deep processing of knowledge promote better retention, retrieval and application of knowledge, relating new concepts to existing ones to improve understanding. The dynamic features of learning objects fit this goal very well.

2. Objectives

The objective of this paper is to propose theoretical and conceptual models for the design and development of the web collaborative content organiser (WebCoCo). It is an online learning system that uses LOs and concept map tools in the design approach of learning contents, resulting in generative learning in the design of the learning strategy. The model aims to facilitate student-centred learning where the learning environment is designed to allow for the maximum engagement of students in using the contents organiser to reflect their understanding of the course content. The ensuing collaboration in using
the content organiser is expected to foster higher order critical thinking and enhance students’ individual collaborative skills.

Apart from proposing the conceptual model, this paper also highlights the features of the prototype developed system based on the proposed model which is now almost ready for evaluation. We hope a very comprehensive study will be conducted soon to evaluate the effectiveness of the system.

3. The Theoretical Framework

The theoretical framework of the proposed conceptual framework incorporates a number of important components from different perspectives. The pedagogical and collaborative learning perspectives have been modified from Reid et al. (1989). The perspective of the design structure of the LOs has been modified from Bannan-Ritland, Dabbagh & Murphy (2000). The features of the learning within the theoretical framework include the following:

   a) Provision of a learning environment that enables the collaborative process of knowledge construction.
   b) Learners are able to interpret their learning via the LOs provided and build their mental model collaboratively to reflect the understanding of their knowledge.
   c) Learners are required to construct knowledge collaboratively through the design of the course content via the contents organiser.
   d) Provision of evidence of learning via the development of personalised e-portfolios.

It is evident that the system is a compromise of a learning environment that contains elements of generative learning, collaborative learning and learning objects which require learners to analyse, synthesize and evaluate facts and ideas in the process of knowledge construction. The critical thinking elements used in the proposed system are analysis, synthesis and evaluation as suggested by Lewittes (2007). The evidence of learning is reflected in the e-portfolio. Figure 1 depicts the theoretical framework.

![Fig. 1. The theoretical framework](image-url)
4. The Conceptual Framework

The design of the LOs by individual students is assisted via a structured collaborative learning mechanism. Thus, the conceptual model incorporates the following three important components:

i) Learning objects
ii) Collaborative learning
iii) The content organizer

Figure 2 shows the conceptual model of the system. It incorporates the theoretical, pedagogical and technological perspectives from the view of SCL. The aims of the conceptual model are to facilitate the collaboratively knowledge construction and higher order critical thinking skills among students. In this system, students will be using learning objects as the instructional design approach of learning contents and they collaboratively design the LOs using the organiser in a way that reflects their understanding of new knowledge being constructed and higher order thinking skills being acquired.

Fig. 2. The conceptual model of the WebCoCo system

5. System Development

WebCoCo contains many important functions to conform with SCL attributes such as the LO search engine within the system, the LO repository, LO uploading tools, forums, the reflection corner, assessment, the concept map, etc. Figure 3 shows the various functions of the WebCoCo system.
Three groups can gain access to the system, namely:

i. The administrators
ii. The lecturers
iii. The students

The students have to register to join the activities of the system. Each function in the WebCoCo system is designed with the goal of facilitating SCL which is highly collaborative in nature. The functions engage the students as active participants in designing their learning contents using the concept map. Screen shots of several functions of the system are shown below.
Fig. 5. List of learning objects

Fig. 6. The concept map
Summary

Numerous e-learning systems have been developed with the objective of promoting SCL through the use of ICT. This paper presents a theoretical framework and prototype of the system that uses the reusability and flexibility of LOs to promote SCL which incorporates pedagogical aspects such as generative and collaborative learning. The proposed conceptual model has been used successfully to provide a basis for the development of a WebCoCo system to promote SCL through the use of generative and collaborative learning approaches as well as the use of the LOs. We hope the developed system can be evaluated and the ensuing experience in using the system can be shared for the improvement of teaching and learning practices.

Acknowledgement

The support from the USM RU research grant No: 1001/PJJAUH/817042 is gratefully acknowledged

References


Slavin, R. E. (1996). Research on cooperative learning and achievement: What we know, what we need to know. Contemporary Educational Psychology, 21, 43-69